# Manual on Codes

International Codes

Volume I.1

Annex II to the WMO Technical Regulations

Part A – Alphanumeric Codes

2011 edition

Updated in 2018

WEATHER CLIMATE WATER

WORLD
METEOROLOGICAL
ORGANIZATION

WMO-No. 306

# Manual on Codes

## International Codes

## Volume I.1

## Annex II to the WMO Technical Regulations

## Part A – Alphanumeric Codes

2011 edition
Updated in 2018

WORLD
METEOROLOGICAL
ORGANIZATION

WMO-No. 306

**EDITORIAL NOTE**

As a general rule, **standard coding practices** are printed in semi-bold roman in order to distinguish them from explanations.

Section A: **Regulations** are printed in semi-bold roman; explanatory notes relating to these regulations are printed in smaller type and preceded by the indication: Note.

Sections B and C: **Specifications** of symbolic letters and **standard coding procedures** relating to the specification concerned are printed in semi-bold roman. Definitions and explanations relating to these specifications are printed in light-face roman.

WMO-No. 306



Chairperson, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box 2300
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0) 22 730 84 03
Fax: +41 (0) 22 730 81 17
E-mail: publications@wmo.int

ISBN 978-92-63-10306-2

# PUBLICATION REVISION TRACK RECORD

| *Date* | *Part/ chapter/ section* | *Purpose of amendment* | *Proposed by* | *Approval Resolution or other* |
|---|---|---|---|---|
| 2012 | Part A,<br>Section C,<br>b. Code tables | Consolidation of amendments approved in May 2012 | CBS/OPAG-ISS/IPET-DRC | Procedure for adoption of amendments between CBS sessions (OBS/WIS/DRMM/DRC (PR-6630)) |
| 2013 | Part A,<br>Sections A, B and C | Consolidation of amendments approved in May 2013 | CBS/OPAG-ISS/ IPET-DRMM | Procedure for adoption of amendments between CBS sessions (OBS/WIS/DRMM/DRC (PR-6688)) |
| 2013 | Introduction | Clarification of the procedures for amending the Manual | CBS/OPAG-ISS/ IPET-DRMM | Resolution 15 (EC-65) |
| 2014 | Part A, Section A | Consolidation of amendments approved in April 2014 | CBS/OPAG-ISS/ IPET-DRMM | Procedure for adoption of amendments between CBS sessions (OBS/WIS/DRMM/DRC (PR-6745)) |
| 2015 | (i) Introductory pages (pp. i–xxi); and (ii) Part A, Sections A, B and C | (i) General provisions reproduced from the *Technical Regulations* (WMO-No. 49), 2015 edition, and other changes made for consistency of text throughout Volume I of the Manual; and (ii) editorial corrections | — | — |
| 2016 | Introduction and General provisions (pp. vii–xvi) | Alignment of the procedures for amendments to Manuals and Guides under the responsibility of the Commission for Basic Systems | CBS Management Group | Resolution 12 (EC-68) |
| 2017 | General provisions (pp. ix–xi) | Alignment with the new structure of the *Technical Regulations* (WMO-No. 49) | — | Resolution 20 (EC-69) |
| 2018 | Appendix: country names pp. A-383–386 | Alignment with changes in country names | — | — |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# CONTENTS

## VOLUME I.1 – INTERNATIONAL CODES

### Part A – Alphanumeric Codes

# INTRODUCTION

Volume I of the *Manual on Codes* contains WMO international codes for meteorological data and other geophysical data relating to meteorology; it constitutes Annex II to the *Technical Regulations* (WMO-No. 49) and has therefore the status of a Technical Regulation. It is issued in three volumes: Volume I.1, containing Part A; Volume I.2, containing Part B and Part C; and Volume I.3 containing Part D.

Coded messages are used for the international exchange of meteorological information comprising observational data provided by the World Weather Watch (WWW) Global Observing System and processed data provided by the WWW Global Data-processing and Forecasting System. Coded messages are also used for the international exchange of observed and processed data required in specific applications of meteorology to various human activities and for exchanges of information related to meteorology.

The codes are composed of a set of CODE FORMS and BINARY CODES made up of SYMBOLIC LETTERS (or groups of letters) representing meteorological or, as the case may be, other geophysical elements. In messages, these symbolic letters (or groups of letters) are transcribed into figures indicating the value or the state of the elements described. SPECIFICATIONS have been defined for the various symbolic letters to permit their transcription into figures. In some cases, the specification of the symbolic letter is sufficient to permit a direct transcription into figures. In other cases, it requires the use of CODE FIGURES, the specifications of which are given in CODE TABLES. Furthermore, a certain number of SYMBOLIC WORDS and SYMBOLIC FIGURE GROUPS have been developed for use as code names, code words, symbolic prefixes or indicator groups.

Rules concerning the selection of code forms to be exchanged for international purposes, and the selection of their symbolic words, figure groups and letters, are laid down in the *Technical Regulations* (WMO-No. 49), Volume I, Part II, section 2 (2015 edition, updated in 2017). These code forms are contained in Volume I of the *Manual on Codes*, issued as Volume I.1 – Part A, Volume I.2 – Part B and Part C, and Volume I.3 – Part D.

Apart from these international codes, several sets of *regional codes* exist which are intended only for exchanges within a given WMO Region. These codes are contained in Volume II of the *Manual on Codes*, which also contains descriptions of the following:

– Regional coding procedures for the use of international code forms;
– National coding practices in the use of international or regional codes of which the WMO Secretariat has been informed;
– National code forms.

A number of special codes that are used in messages exchanged over the WWW Global Telecommunication System circuits, and which comprise ice and satellite ephemeris codes, are included in Volume II as an appendix.

**VOLUME I.1:**

**Part A – Alphanumeric Codes** consists of five sections.

**Section A** contains lists of international code forms and corresponding standard coding procedures. The format and wording conventions used in this section are as follows:

*Code forms*: Groups in brackets are drop-out items and may or may not be included, depending on specified conditions. The absence of round brackets means that the inclusion of the group concerned is determined by international decision; these decisions are indicated in the regulations appearing under each code form.

*Parts and sections of code forms*: Code forms may have been built up from a number of well-defined components, each comprising a different type of coded information. Components which can be transmitted as a separate report are called parts and carry special identification groups. Code forms, or their parts, can be divided into sections which may be omitted from the report under certain conditions and therefore carry a symbolic indicator figure or group.

*Notes*: Brief explanations of the code form are included in a number of notes under the code form.

*Regulations*: The regulations, which follow the notes, contain standard coding procedures in the sense given to these procedures in the Technical Regulations. The standard coding procedures are distinguished by the use of the term "shall" in the English text, and by suitable equivalent terms in the French, Russian and Spanish texts. Where national practices do not conform with these regulations, Members concerned shall formally notify the Secretary-General of WMO for the benefit of other Members. Explanatory notes are sometimes added to regulations.

**Section B** contains the list of symbolic letters which are to be replaced, generally by figures in coded reports, analyses or forecasts with their specifications. Definitions and standard coding procedures relating to the specification concerned are added, where appropriate, to the specifications in the form of notes. Notes indicating standard coding procedures are distinguished from notes containing a definition by a difference in typographical practice and by the use of the word "shall" in the English text, and by suitable equivalents in the French, Russian and Spanish texts. Where symbolic letters represent coded information, that is, not just the scale of values as measured, the reference to the tables containing specifications of the code figures is added between brackets.

**Section C** contains the specifications of code figures in the form of code tables. The tables are preceded by a description of the numbering system of international code tables included in the part concerned.

**Section D** contains a description of the system of station index numbers.

**Section E** contains the Beaufort scale of wind for ease of reference and in order to provide the equivalent wind speeds for Beaufort numbers used in some codes.

Attachments II and III (yellow background) to Volume I.1 do not have the status of Technical Regulations and are given for information only.

This edition of Volume I.1 of the *Manual on Codes* replaces the 2010 edition.

**VOLUME I.2:**

**Part B – Binary Codes** consists of the list of binary codes with their specifications and associated code tables.

**Part C – Common Features to Binary and Alphanumeric Codes** consists of table-driven alphanumeric codes and of common code tables to binary and alphanumeric codes.

**VOLUME I.3:**

**Part D – Representations derived from data models** consists of the specification of the list of standard representations derived from data models, including those using extensible markup language (XML), with their specifications and associated code tables.

# GENERAL PROVISIONS

1. The *Technical Regulations* (WMO-No. 49) of the World Meteorological Organization are presented in three volumes:

Volume I – General meteorological standards and recommended practices

Volume II – Meteorological service for international air navigation

Volume III – Hydrology

**Purpose of the Technical Regulations**

2. The Technical Regulations are determined by the World Meteorological Congress in accordance with Article 8 (d) of the Convention.

3. These Regulations are designed:

(a) To facilitate cooperation in meteorology and hydrology among Members;

(b) To meet, in the most effective manner, specific needs in the various fields of application of meteorology and operational hydrology in the international sphere;

(c) To ensure adequate uniformity and standardization in the practices and procedures employed in achieving (a) and (b) above.

**Types of Regulations**

4. The Technical Regulations comprise *standard* practices and procedures and *recommended* practices and procedures.

5. The definitions of these two types of Regulations are as follows:

The *standard* practices and procedures:

(a) Shall be the practices and procedures that Members are required to follow or implement;

(b) Shall have the status of requirements in a technical resolution in respect of which Article 9 (b) of the Convention is applicable;

(c) Shall invariably be distinguished by the use of the term *shall* in the English text, and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

The *recommended* practices and procedures:

(a) Shall be the practices and procedures with which Members are urged to comply;

(b) Shall have the status of recommendations to Members, to which Article 9 (b) of the Convention shall not be applied;

(c) Shall be distinguished by the use of the term *should* in the English text (except where otherwise provided by decision of Congress) and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

6. In accordance with the above definitions, Members shall do their utmost to implement the *standard* practices and procedures. In accordance with Article 9 (b) of the Convention and in conformity with Regulation 128 of the General Regulations, Members shall formally notify the Secretary-General, in writing, of their intention to apply the *standard* practices and procedures of the Technical Regulations, except those

for which they have lodged a specific deviation. Members shall also inform the Secretary-General, at least three months in advance, of any change in the degree of their implementation of a *standard* practice or procedure as previously notified and the effective date of the change.

7. Members are urged to comply with *recommended* practices and procedures, but it is not necessary to notify the Secretary-General of non-observance except with regard to practices and procedures contained in Volume II.

8. In order to clarify the status of the various Regulations, the *standard* practices and procedures are distinguished from the *recommended* practices and procedures by a difference in typographical practice, as indicated in the editorial note.

**Status of annexes and appendices**

9. The following annexes to the *Technical Regulations* (Volumes I to III), also called Manuals, are published separately and contain regulatory material having the status of *standard* and/or *recommended* practices and procedures:

I *International Cloud Atlas* (WMO-No. 407) – Manual on the Observation of Clouds and Other Meteors, sections 1, 2.1.1, 2.1.4, 2.1.5, 2.2.2, 1 to 4 in 2.3.1 to 2.3.10 (for example, 2.3.1.1, 2.3.1.2, etc.), 2.8.2, 2.8.3, 2.8.5, 3.1 and the definitions (in grey-shaded boxes) of 3.2;

II *Manual on Codes* (WMO-No. 306), Volume I;

III *Manual on the Global Telecommunication System* (WMO-No. 386);

IV *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485);

V *Manual on the Global Observing System* (WMO-No. 544), Volume I;

VI *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I;

VII *Manual on the WMO Information System* (WMO-No. 1060);

VIII *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).

These annexes (Manuals) are established by decision of Congress and are intended to facilitate the application of Technical Regulations to specific fields. Annexes may contain both *standard* and *recommended* practices and procedures.

10. Texts called appendices, appearing in the *Technical Regulations* or in an annex to the *Technical Regulations*, have the same status as the Regulations to which they refer.

**Status of notes and attachments**

11. Certain notes (preceded by the indication “Note”) are included in the *Technical Regulations* for explanatory purposes; they may, for instance, refer to relevant WMO Guides and publications. These notes do not have the status of Technical Regulations.

12. The *Technical Regulations* may also include attachments, which usually contain detailed guidelines related to *standard* and *recommended* practices and procedures. Attachments, however, do not have regulatory status.

**Updating of the *Technical Regulations* and their annexes (Manuals)**

13. The *Technical Regulations* are updated, as necessary, in the light of developments in meteorology and hydrology and related techniques, and in the application of meteorology and operational hydrology. Certain principles previously agreed upon by Congress and applied in the selection of material for inclusion in the Technical Regulations are reproduced below. These principles provide guidance for constituent bodies, in particular technical commissions, when dealing with matters pertaining to the Technical Regulations:

(a) Technical commissions should not recommend that a Regulation be a *standard* practice unless it is supported by a strong majority;

(b) Technical Regulations should contain appropriate instructions to Members regarding implementation of the provision in question;

(c) No major changes should be made to the Technical Regulations without consulting the appropriate technical commissions;

(d) Any amendments to the Technical Regulations submitted by Members or by constituent bodies should be communicated to all Members at least three months before they are submitted to Congress.

14. Amendments to the *Technical Regulations* – as a rule – are approved by Congress.

15. If a recommendation for an amendment is made by a session of the appropriate technical commission and if the new regulation needs to be implemented before the next session of Congress, the Executive Council may, on behalf of the Organization, approve the amendment in accordance with Article 14 (c) of the Convention. Amendments to annexes to the *Technical Regulations* proposed by the appropriate technical commissions are normally approved by the Executive Council.

16. If a recommendation for an amendment is made by the appropriate technical commission and the implementation of the new regulation is urgent, the President of the Organization may, on behalf of the Executive Council, take action as provided by Regulation 9 (5) of the General Regulations.

Note: A simple (fast-track) procedure may be used for amendments to technical specifications in Annexes II (*Manual on Codes* (WMO-No. 306)), III (*Manual on the Global Telecommunication System* (WMO-No. 386)), IV (*Manual on the Global Data-processing and Forecasting System* (WMO-No. 485)), V (*Manual on the Global Observing System* (WMO-No. 544)), VII (*Manual on the WMO Information System* (WMO-No. 1060)) and VIII (*Manual on the WMO Integrated Global Observing System* (WMO-No. 1160)). Application of the simple (fast-track) procedure is defined in the appendix to these General Provisions.

17. After each session of Congress (every four years), a new edition of the *Technical Regulations*, including the amendments approved by Congress, is issued. With regard to the amendments between sessions of Congress, Volumes I and III of the *Technical Regulations* are updated, as necessary, upon approval of changes thereto by the Executive Council. The *Technical Regulations* updated as a result of an approved amendment by the Executive Council are considered a new update of the current edition. The material in Volume II is prepared by the World Meteorological Organization and the International Civil Aviation Organization working in close cooperation, in accordance with the Working Arrangements agreed by these Organizations. In order to ensure consistency between Volume II and Annex 3 to the Convention on International Civil Aviation – *Meteorological Service for International Air Navigation*, the issuance of amendments to Volume II is synchronized with the respective amendments to Annex 3 by the International Civil Aviation Organization.

Note: Editions are identified by the year of the respective session of Congress whereas updates are identified by the year of approval by the Executive Council, for example “Updated in 2012”.

**WMO Guides**

18. In addition to the *Technical Regulations*, appropriate Guides are published by the Organization. They describe practices, procedures and specifications which Members are invited to follow or implement in establishing and conducting their arrangements for compliance with the Technical Regulations, and in otherwise developing meteorological and hydrological services in their respective countries. The Guides are updated, as necessary, in the light of scientific and technological developments in hydrometeorology, climatology and their applications. The technical commissions are responsible for the selection of material to be included in the Guides. These Guides and their subsequent amendments shall be considered by the Executive Council.

# APPENDIX. PROCEDURES FOR AMENDING WMO MANUALS AND GUIDES THAT ARE THE RESPONSIBILITY OF THE COMMISSION FOR BASIC SYSTEMS

## 1. DESIGNATION OF RESPONSIBLE COMMITTEES

The Commission for Basic Systems (CBS) shall, for each Manual and Guide, designate one of its Open Programme Area Groups (OPAGs) as being responsible for that Manual and its associated technical guides. The Open Programme Area Group may choose to designate one of its Expert Teams as the designated committee for managing changes to all or part of that Manual; if no Expert Team is designated, the Implementation Coordination Team for the OPAG takes on the role of the designated committee.

## 2. GENERAL VALIDATION AND IMPLEMENTATION PROCEDURES

### 2.1 Proposal of amendments

Amendments to a Manual or a Guide managed by CBS shall be proposed in writing to the Secretariat. The proposal shall specify the needs, purposes and requirements and include information on a contact point for technical matters.

### 2.2 Drafting recommendation

The designated committee for the relevant part of a Manual or a Guide, supported by the Secretariat, shall validate the stated requirement (unless it is consequential to an amendment to the WMO Technical Regulations) and develop a draft recommendation to respond to the requirement, as appropriate.

### 2.3 Procedures for approval

After a draft recommendation of the designated committee is validated in accordance with the procedure given in section 7 below, depending on the type of amendments, the designated committee should select one of the following procedures for the approval of the amendments:

(a) Simple (fast-track) procedure (see section 3 below);

(b) Standard (adoption of amendments between CBS sessions) procedure (see section 4 below);

(c) Complex (adoption of amendments during CBS sessions) procedure (see section 5 below).

### 2.4 Date of implementation

The designated committee should define an implementation date in order to give WMO Members sufficient time to implement the amendments after the date of notification. For procedures other than the simple (fast-track) one, if the time between the date of notification and implementation date is less than six months, the designated committee shall document the reasons for its decision.

### 2.5 Urgent introduction

Regardless of the above procedures, as an exceptional measure, the following procedure accommodates urgent user needs to introduce elements in lists of technical details, or to correct errors:

(a) A draft recommendation developed by the designated committee shall be validated according to the steps defined in section 7 below;

(b) The draft recommendation for pre-operational use of a list entry, which can be used in operational data and products, shall be approved by the chairperson of the designated committee and the chairperson of the responsible OPAG, and the president of CBS. A listing of pre-operational list entries is kept online on the WMO web server;

(c) Pre-operational list entries shall then be submitted for approval by one of the procedures in 2.3 above for operational use;

(d) Any version numbers associated with the technical implementation should be incremented at the least significant level.

### 2.6 Issuing updated version

Once amendments to a Manual or a Guide are adopted, an updated version of the relevant part of the Manual shall be issued in the languages agreed for its publication. The Secretariat shall inform all Members of the availability of a new updated version of that part at the date of notification mentioned in 2.4 above. If amendments are not incorporated into the published text of the relevant Manual or Guide at the time of the amendment, there should be a mechanism to publish the amendments at the time of their implementation and to retain a permanent record of the sequence of amendments.

## 3. SIMPLE (FAST-TRACK) PROCEDURE

### 3.1 Scope

The simple (fast-track) procedure shall be used only for changes to components of the Manual that have been designated and marked as “technical specifications to which the simple (fast-track) procedure for the approval of amendments may be applied”.

Note: An example would be the addition of code list items in the *Manual on Codes* (WMO-No. 306).

### 3.2 Endorsement

Draft recommendations developed by the responsible committee, including a date for implementation of the amendments, shall be submitted to the chairperson of the relevant OPAG for endorsement.

### 3.3 Approval

#### 3.3.1 *Minor adjustments*

Correcting typographical errors in descriptive text is considered a minor adjustment, and will be done by the Secretariat in consultation with the president of CBS. See Figure 1.

#### 3.3.2 *Other types of amendments*

For other types of amendments, the English version of the draft recommendation, including a date of implementation, should be distributed to the focal points for matters concerning the relevant Manual for comments, with a deadline of two months for the reply. It should then be submitted to the president of CBS for consultation with presidents of technical commissions affected by the change. If endorsed by the president of CBS, the change should be passed to the President of WMO for consideration and adoption on behalf of the Executive Council (EC).

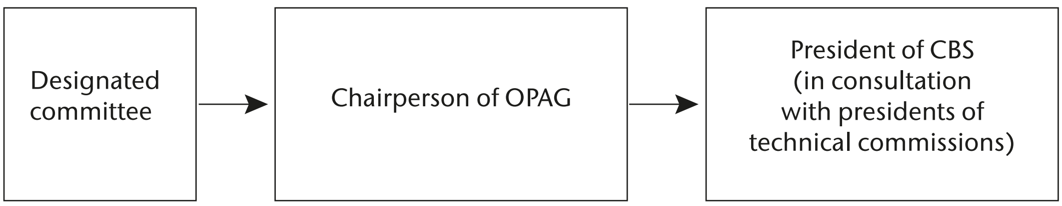



**Figure 1. Adoption of amendments to a Manual by minor adjustment**

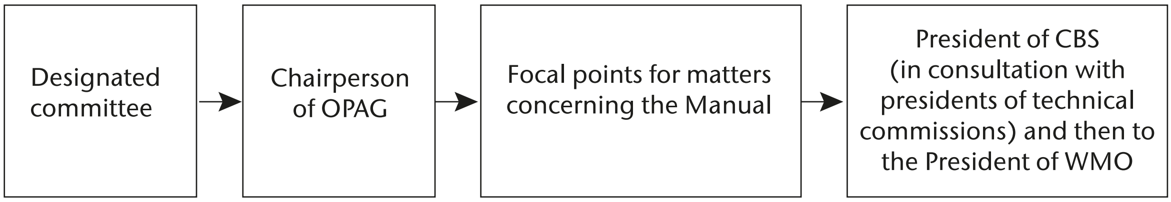



**Figure 2. Adoption of amendments to a Manual by simple (fast-track) procedure**

### 3.3.3 *Frequency*

The implementation of amendments approved through the simple (fast-track) procedure can be twice a year in May and November. See Figure 2.

## 4. STANDARD (ADOPTION OF AMENDMENTS BETWEEN CBS SESSIONS) PROCEDURE

### 4.1 Scope

The standard (adoption of amendments between CBS sessions) procedure shall be used for changes that have an operational impact on those Members who do not wish to exploit the change, but that have only minor financial impact, or that are required to implement changes in the *Technical Regulations* (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation.

### 4.2 Approval of draft recommendations

For the direct adoption of amendments between CBS sessions, the draft recommendation developed by the designated committee, including a date of implementation of the amendments, shall be submitted to the chairperson of the responsible OPAG and president and vice-president of CBS for approval. The president of CBS shall consult with the presidents of technical commissions affected by the change. In the case of recommendations in response to changes in the *Technical Regulations* (WMO-No 49), Volume II – Meteorological Service for International Air Navigation, the president of CBS shall consult with the president of the Commission for Aeronautical Meteorology.

### 4.3 Circulation to Members

Upon approval of the president of CBS, the Secretariat sends the recommendation to all Members, in the languages in which the Manual is published, including a date of implementation of the amendments, for comments to be submitted within two months following the dispatch of the amendments. If the recommendation is sent to Members via electronic mail, there shall be public announcement of the amendment process including dates, for example by WMO Operational Newsletter on the WMO website, to ensure all relevant Members are informed.

### 4.4 Agreement

Those Members not having replied within the two months following the dispatch of the amendments are implicitly considered as having agreed with the amendments.

### 4.5 Coordination

Members are invited to designate a focal point responsible to discuss any comments/disagreements with the designated committee. If the discussion between the designated committee and the focal point cannot result in an agreement on a specific amendment by a Member, this amendment will be reconsidered by the designated committee. If a Member cannot agree that the financial or operational impact is minor, the redrafted amendment shall be approved by the complex (adoption of amendments during CBS sessions) procedure described in section 5 below.

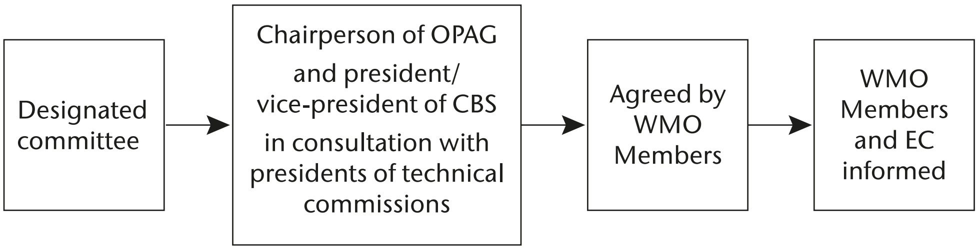



**Figure 3. Adoption of amendments between CBS sessions**

### 4.6 Notification

Once amendments are agreed by Members, and after consultation with the chairperson of the responsible OPAG, the vice-president of CBS and the president of CBS (who should consult with presidents of other commissions affected by the change), the Secretariat notifies at the same time the Members and the members of the Executive Council of the approved amendments and of the date of their implementation. See Figure 3.

## 5. COMPLEX (ADOPTION OF AMENDMENTS DURING CBS SESSIONS) PROCEDURE

### 5.1 Scope

The complex (adoption of amendments during CBS sessions) procedure shall be used for changes for which the simple (fast-track) procedure or standard (adoption of amendments between CBS sessions) procedure cannot be applied.

### 5.2 Procedure

For the adoption of amendments during CBS sessions, the designated committee submits its recommendation, including a date of implementation of the amendments, to the Implementation Coordination Team of the responsible Open Programme Area Group. The recommendation is then passed to the presidents of technical commissions affected by the change for consultation, and to a CBS session that shall be invited to consider comments submitted by presidents of technical commissions. The document for the CBS session shall be distributed not later than 45 days before the opening of the session. Following the CBS session, the recommendation shall then be submitted to a session of the Executive Council for decision. See Figure 4.

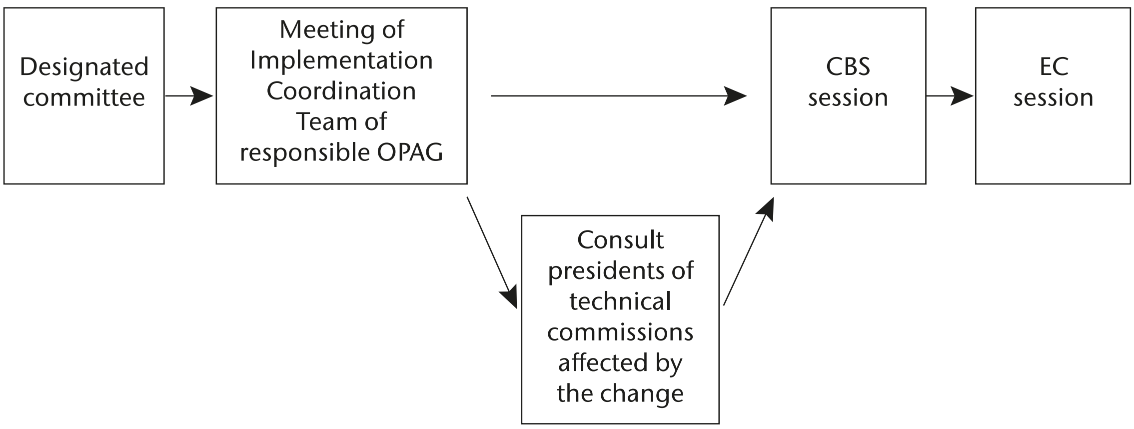



**Figure 4. Adoption of amendments during CBS sessions**

## 6. PROCEDURE FOR THE CORRECTION OF EXISTING MANUAL CONTENTS

### 6.1 Correcting errors in items within Manuals

Where a minor error in the specification of an item that defines elements within a Manual is found, for example, a typing error or an incomplete definition, the item shall be amended and re-published. Any version numbers associated with items edited as a result of the change should be incremented at their lowest level of significance. If, however, the change has an impact on the meaning of the item, then a new item should be created and the existing (erroneous) item marked as deprecated. This situation is considered a minor adjustment according to 3.3.1 above.

Note: An example of an item for which this type of change applies is a code list entry for the Table Driven Code Forms or WMO Core Metadata Profile, in which the description contains typographical errors that can be corrected without changing the meaning of the description.

### 6.2 Correcting an error in the specification of how conformance with the requirements of the Manual can be checked

If an erroneous specification of a conformance-checking rule is found, the preferred approach is to add a new specification using the simple (fast-track) procedure or standard (adoption of amendments between CBS sessions) procedure. The new conformance-checking rule should be used instead of the old. An appropriate explanation shall be added to the description of the conformance-checking rule to clarify the practice along with the date of the change.

Note: An example of such a change would be correcting a conformance-checking rule in the WMO Core Metadata Profile.

### 6.3 Submission of corrections to errors

Such changes shall be submitted through the simple (fast-track) procedure.

## 7. VALIDATION PROCEDURE

### 7.1 Documentation of need and purpose

The need for, and the purpose of, the proposal for changes should be documented.

### 7.2 Documentation of result

This documentation shall include the results of validation testing of the proposal as described in 7.3 below.

### 7.3 Testing with relevant applications

For changes that have an impact on automated processing systems, the extent of the testing required before validation should be decided by the designated committee on a case-by-case basis, depending on the nature of the change. Changes involving a relatively high risk and/or impact on the systems should be tested by the use of at least two independently developed tool sets and two independent centres. In that case, results should be made available to the designated committee with a view to verifying the technical specifications.

# DEFINITIONS

*Actual time of observation*.

(1) In the case of a surface synoptic observation, the time at which the barometer is read.

(2) In the case of upper-air observations, the time at which the balloon, parachute or rocket is actually released.

*All-components schema document*. An XML schema document that includes, either directly, or indirectly, all the components defined and declared in a namespace.

*Alpine glow*. Pink or yellow colouring assumed by mountain tops opposite the Sun when it is only just below the horizon before it rises and after it sets. This phenomenon vanishes after a brief interval of blue colouring, when the Earth's shadow reaches these summits.

*Anomalous propagation*. Propagation of radio energy in abnormal conditions of vertical distribution of refractive index, in association with abnormal distribution of atmospheric temperature and humidity. Use of the term is mainly confined to conditions in which abnormally large distances of propagation are attained.

*Application schema*. A conceptual schema for data required by one or more applications. (Source: International Organization for Standardization (ISO) 19101:2002, definition 4.2)

*Atmospheric – Sferic*. Electromagnetic wave resulting from an electric discharge (lightning) in the atmosphere.

*Automatic station*. Meteorological station at which instruments make and transmit observations, the conversion to code form for international exchange being made either directly or at an editing station.

*Aviation routine weather report*. A statement of the observed meteorological conditions related to a specified time and location, issued on a routine basis for use in international air navigation.

*BUFR – Binary universal form for the representation of meteorological data*. BUFR is the name of a binary code for the exchange and storage of data.

*BUFR message*. A single complete BUFR entity.

*Category*. The lists of sequence descriptors tabulated in BUFR or CREX Table D are categorized according to their application; categories are provided for non-meteorological sequences, for various types of meteorological sequences, and for sequences which define reports, or major subsets of reports.

*Class*. A set of elements tabulated together in BUFR/CREX Table B.

*Condensation trails (contrails)*. Clouds which form in the wake of an aircraft when the atmosphere at flying level is sufficiently cold and humid.

*Coordinate class*. Classes 0–9 inclusive in BUFR/CREX Table B define elements which assist in the definition of elements from subsequent classes; each of these classes is referred to as a coordinate class.

*CREX – Character form for the representation and exchange of data*. CREX is the name of a table-driven alphanumeric code for the exchange and storage of data.

*Data description operator*. Operators which define replication or the operations listed in BUFR or CREX Table C.

*Data entity*. A single data item.

*Data subset*. A set of data corresponding to the data description in a BUFR or CREX message; for observational data, a data subset usually corresponds to one observation.

*Day darkness*. Sky covered with clouds with very strong optical thickness (dark clouds) having a threatening appearance.

*Descriptor*. An entity entered within the Data description section to describe or define data; a descriptor may take the form of an element descriptor, a replication operator, an operator descriptor, or a sequence descriptor.

*Dry thunderstorm*. A thunderstorm without precipitation reaching the ground (distinct from a nearby thunderstorm with precipitation reaching the ground but not at the station at the time of observation).

*Dust wall or sand wall*. Front of a duststorm or sandstorm, having the appearance of a gigantic high wall which moves more or less rapidly.

*Element descriptor*. A descriptor containing a code figure reference to BUFR/CREX Table B; the referenced entry defines an element, together with the units, scale factor, reference value and data width to be used to represent that element as data.

*Equatorial region*. For the purpose of the analysis codes, the region between 30 °N and 30 °S latitudes.

*Extensible markup language (XML)*. A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the World Wide Web Consortium (W3C) XML 1.0 Specification.

*Geography markup language (GML).* An XML encoding in compliance with ISO 19118 for the transport and storage of geographic information modelled in accordance with the conceptual modelling framework used in the ISO 19100 series of International Standards and including both the spatial and non-spatial properties of geographic features.

*Geometric altitude*. Vertical distance (Z) of a level, a point or an object considered as a point, measured from mean sea level.

*Geopotential*. That potential with which the Earth's gravitational field is associated. It is equivalent to the potential energy of unit mass relative to a standard level (mean sea level by convention) and is numerically equal to the work which would be done against gravity in raising the unit mass from sea level to the level at which the mass is located.

Geopotential $\boldsymbol{\phi}$ at geometric height $z$ is given by

$$\phi = \int_o^z g\,dz$$

where $g$ is the acceleration of gravity.

*Geopotential height*. Height of a point in the atmosphere expressed in units (geopotential metres) proportional to $g/9.8$ the geopotential at that height. Geopotential height expressed in geopotential metres is approximately equal to times the geometric height expressed in (geometric) metres, $g$ being the local acceleration of gravity.

*GML application schema*. An application schema written in XML schema in accordance with the rules specified in ISO 19136:2007.

*GML document*. An XML document with a root element that is one of the XML elements AbstractFeature, Dictionary or TopoComplex specified in the GML schema or any element of a substitution group of any of these XML elements.

*GML schema*. The XML schema components in the XML namespace http://www.opengis.net/gml/3.2 as specified in ISO 19136:2007.

*Haboob*. A strong wind and duststorm or sandstorm in northern and central Sudan. Its average duration is three hours; the average maximum wind velocity is over 15 m $s^{-1}$. The dust or sand forms a dense whirling wall which may be 1 000 m high; it is often preceded by isolated dust whirls. Haboobs usually occur after a few days of rising temperature and falling pressure.

*Ice crust (ice slick)*.

(1) A type of snow crust; a layer of ice, thicker than a film crust, upon a snow surface. It is formed by the freezing of melt water or rainwater which has flowed into it.

(2) See *Ice rind*.

*Ice rind*. A thin but hard layer of sea ice, river ice or lake ice. Apparently this term is used in at least two ways: (a) for a new encrustation upon old ice; and (b) for a single layer of ice usually found in bays and fjords where freshwater freezes on top of slightly colder sea water.

*Instrumental wave data*. Data on measured characteristics relating to period and height of the wave motion of the sea surface.

*Inversion (layer).* Atmospheric layer, horizontal or approximately so, in which the temperature increases with increasing height.

*Isothermal layer*. Atmospheric layer through which there is no change of temperature with height.

*Jet stream*. Flat tubular current of air, quasi-horizontal, whose axis is along a line of maximum speed and which is characterized not only by great speeds but also by strong transverse gradients of speed.

*Line squall*. Squall which occurs along a squall line.

*Lithometeor*. Meteor consisting of an ensemble of particles most of which are solid and non-aqueous. The particles are more or less suspended in the air, or lifted by the wind from the ground.

*Mountain waves*. Oscillatory motions of the atmosphere induced by flow over a mountain; such waves are formed over and to the lee of the mountain or mountain chain.

*Namespace*. A collection of names, identified by a uniform resource identifier reference, which are used in XML documents as element names and attribute names.

*Normals*. Period averages computed for over a uniform and relatively long period comprising at least three consecutive 10-year periods.

*Obscured sky*. Occasions of hydrometeors or lithometeors which are so dense as to make it impossible to tell whether there is cloud above or not.

*Ocean weather station*. A station aboard a suitably equipped and staffed ship that endeavours to remain at a fixed sea position and that makes and reports surface and upper-air observations and may also make and report subsurface observations.

*Operator descriptor*. A descriptor containing a code figure reference to BUFR or CREX Table C, together with data to be used as an operand.

*Past weather*. Predominant characteristic of weather which had existed at the station during a given period of time.

*Persistent condensation trail*. Long-lived condensation trails which have spread to form clouds having the appearance of cirrus or patches of cirrocumulus or cirrostratus. It is sometimes impossible to distinguish such clouds from other cirrus, cirrocumulus or cirrostratus.

*Present weather*. Weather existing at the time of observation, or under certain conditions, during the hour preceding the time of observation.

*Prevailing visibility*. The greatest visibility value, observed in accordance with the definition of "visibility", which is reached within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors.

Note: This value may be assessed by human observation and/or instrumented systems. When instruments are installed, they are used to obtain the best estimate of the prevailing visibility.

*Purple light*. Glow with a hue varying between pink and red, which is to be seen in the direction of the Sun before it rises and after it sets and is about 3° to 6° below the horizon. It takes the form of a segment of a more or less large luminous disc which appears above the horizon.

*Reference value*. All data are represented within a BUFR or CREX message by positive integers; to enable negative values to be represented, suitable negative base values are specified as reference values. The true value is obtained by addition of the reference value and the data as represented.

*Replication descriptor*. A special descriptor is reserved to define the replication operation; it is used to enable a given number of subsequent descriptors to be replicated a given number of times.

*Root element*. Each XML document has exactly one root element. This element, also known as the document element, encloses all the other elements and is therefore the sole parent element to all the other elements. The root element provides the starting point for processing the document.

*Runway visual range*. The range over which the pilot of an aircraft on the centre line of the runway can see the runway markings or the lights delineating the runway or identifying its centre line.

*Schematron*. A definition language for making assertions about patterns found in XML documents, differing in basic concept from other schema languages in that it is not based on grammars but on finding patterns in the parsed document.

*Sea station*. An observing station situated at sea. Sea stations include ships, ocean weather stations and stations on fixed or drifting platforms (rigs, platforms, lightships and buoys).

*Section*. A logical subdivision of a BUFR or CREX message, to aid description and definition.

*Sequence descriptor*. A descriptor used as a code figure to reference a single entry in BUFR or CREX Table D; the referenced entry contains a list of descriptors to be substituted for the sequence descriptor.

*Severe line squall*. Severe squall which occurs along squall line (see *Line squall*).

*Snow haze*. A suspension in the air of numerous minute snow particles, considerably reducing the visibility at the Earth’s surface (visibility in snow haze often decreases to 50 m). Snow haze is observed most frequently in Arctic regions, before or after a snowstorm.

*Squall*. Atmospheric phenomenon characterized by a very large variation of wind speed: it begins suddenly, has a duration of the order of minutes and decreases rather suddenly in speed. It is often accompanied by a shower or thunderstorm.

*Squall line*. Fictitious moving line, sometimes of considerable extent, along which squall phenomena occur.

*Sun pillar*. Pillar of white light, which may or may not be continuous, which may be observed vertically above or below the sun. Sun pillars are most frequently observed near sunrise or sunset; they may extend to about 20° above the Sun, and generally end in a point. When a sun pillar appears together with a well-developed parhelic circle, a sun cross may appear at their intersection.

*Synoptic hour*. Hour, expressed in terms of universal time coordinated (UTC), at which, by international agreement, meteorological observations are made simultaneously throughout the globe.

*Synoptic observation*. A surface or upper-air observation made at standard time.

*Synoptic surface observation*. Synoptic observation, other than an upper-air observation, made by an observer or an automatic weather station on the Earth's surface.

*Template*. Description of the standardized layout of a set of data entities.

*Tropical (Tropic)*. Pertaining to that region of the Earth's surface lying between the Tropic of Cancer and Tropic of Capricorn at 23° 30´ N and S, respectively.

*Tropical cyclone*. Cyclone of tropical origin of small diameter (some hundreds of kilometres) with minimum surface pressure in some cases less than 900 hPa, very violent winds and torrential rain; sometimes accompanied by thunderstorms. It usually contains a central region, known as the "eye" of the storm, with a diameter of the order of some tens of kilometres, and with light winds and more or less lightly clouded sky.

*Tropical revolving storm*. Tropical cyclone.

*Tropopause*.

(1) Upper limit of the troposphere. By convention, the "first tropopause" is defined as the lowest level at which the lapse rate decreases to 2 °C km$^{-1}$ or less, provided also the average lapse rate between this level and all higher levels within 2 km does not exceed 2 °C km$^{-1}$.

(2) If, above the first tropopause, the average lapse rate between any level and all higher levels within 1 km exceeds 3 °C km$^{-1}$, then a "second tropopause" is defined by the same criterion as under (1). This second tropopause may be either within or above the 1-km layer.

*Twilight glow*. See *Purple light*.

*Twilight glow in the mountains* (Alpenglühen). See *Alpine glow*.

*Uniform resource identifier (URI)*. A compact sequence of characters that identifies an abstract or physical resource. URI syntax is defined in the Internet Engineering Task Force (IETF) RFC 3986.

*Unit of geopotential ($H_{m'}$)*. 1 standard geopotential metre = 0.980 665 dynamic metre

$$H_{m'} = \frac{1}{9.80665}\int_o^z g(z)dz$$

where $g(z)$ = acceleration of gravity, in m s$^{-2}$, as a function of geometric height;

$z$ = geometric height, in metres;

$H_{m'}$ = geopotential, in geopotential metres.

*Vertical visibility*. Maximum distance at which an observer can see and identify an object on the same vertical as himself, above or below.

*Visibility (for aeronautical purposes)*. Visibility for aeronautical purposes is the greater of:

(a) The greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;

(b) The greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note: The two distances have different values in air of a given extinction coefficient, and the latter (b) varies with the background illumination. The former (a) is represented by the meteorological optical range (MOR).

*Whiteout*. Uniformly white appearance of the landscape when the ground is snow covered and the sky is uniformly covered with clouds. An atmospheric optical phenomenon of the polar regions in which the observer appears to be engulfed in a uniformly white glow. Neither shadows, horizon, nor clouds are discernible; sense of depth and orientation are lost; only very dark, nearby objects can be seen. Whiteout occurs over an unbroken snow cover and beneath a uniformly overcast sky, when, with the aid of the snowblink effect, the light from the sky is about equal to that from the snow surface. Blowing snow may be an additional cause. The phenomenon is experienced in the air as well as on the ground.

*Wind (mean wind, spot wind)*. Air motion relative to the Earth's surface. Unless it is otherwise specified, only the horizontal component is considered.

(1) *Mean wind*: For the purpose of upper air reports from aircraft, mean wind is derived from the drift of the aircraft when flying from one fixed point to another or obtained by flying on a circuit around a fixed observed point and an immediate wind deduced from the drift of the aircraft.

(2) *Spot wind*: For the purpose of upper-air reports from aircraft, the wind velocity, observed or predicted, for a specified location, height and time.

*XML attribute*. A start tag delimiting an XML element may contain one or more attributes. Attributes are Name-Value pairs, with the Name in each pair referred to as the attribute name and the Value (the text between the quote delimiters, that is, ' or ") as the attribute value. The order of attribute specifications in a start-tag or empty-element tag is not significant.

*XML document*. A structured document conforming to the rules specified in Extensible Markup Language (XML) 1.0 (Second Edition).

*XML element*. Each XML document contains one or more elements, the boundaries of which are either delimited by start-tags and end-tags, or, for empty elements, by an empty-element tag. Each element has a type, identified by name, sometimes called its generic identifier (GI), and may have a set of attribute specifications. An XML element may contain other XML elements, XML attributes or character data.

*XML schema*. A definition language offering facilities for describing the structure and constraining the contents of XML documents. The set of definitions for describing a particular XML document structure and associated constraints is referred to as an XML schema document.

*XML schema document (XSD)*. An XML document containing XML schema component definitions and declarations.

*Zodiacal light*. White or yellowish light which spreads out, in the night sky, more or less along the zodiac from the horizon on the side on which the Sun is hidden. It is observed when the sky is sufficiently dark and the atmosphere sufficiently clear.

_________

## Section A

# CODE FORMS

a. FM system of numbering code forms

b. List of code forms with notes and regulations

# a. FM SYSTEM OF NUMBERING CODE FORMS

Each code form bears a number, preceded by the letters FM. This number is followed by a Roman numeral to identify the session of CSM or (from 1974 onwards) of CBS which either approved the code form as a new one or made the latest amendment to its previous version. A code form approved or amended by correspondence after a session of CSM/CBS receives the number of that session.

Furthermore, an indicator term is used to designate the code form colloquially and is therefore called a "code name". In some cases, this code name is included as a symbolic prefix in the code form and during transmission ensures ready identification of the type of report (e.g. CLIMAT).

The FM system of numbering the code forms, together with the corresponding code names and their reference list of CBS approved decisions, is the following:

**FM SYSTEM OF CODE FORMS**

| | |
|---|---|
| **FM 12–XIV Ext. SYNOP** | **Report of surface observation from a fixed land station**<br>Res. 5 (EC-XXXI), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Res. 4 (EC-XLVII), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV), Res. 10 (EC-LIX) and amendments between CBS sessions (2011) |
| **FM 13–XIV Ext. SHIP** | **Report of surface observation from a sea station**<br>Res. 5 (EC-XXXI), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV), Res. 10 (EC-LIX) and amendments between CBS sessions (2011) |
| **FM 14–XIV Ext. SYNOP MOBIL** | **Report of surface observation from a mobile land station**<br>Res. 4 (EC-XLVII), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV), Res. 10 (EC-LIX) and amendments between CBS sessions (2011) |
| **FM 15–XV METAR** | **Aerodrome routine meteorological report (with or without trend forecast)**<br>Res. 13 (EC-XVIII), paragraph 4.10.10 of the general summary of EC-XXI, Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res. 10 (EC-LIX), amendments between CBS sessions (2010), Res. 4 (Cg-XVI) and amendments between CBS sessions (2013) |
| **FM 16–XV SPECI** | **Aerodrome special meteorological report (with or without trend forecast)**<br>Res. 13 (EC-XVIII), paragraph 4.10.10 of the general summary of EC-XXI, Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res. 10 (EC-LIX), amendments between CBS sessions (2010), Res. 4 (Cg-XVI) and amendments between CBS sessions (2013) |
| **FM 18–XII BUOY** | **Report of a buoy observation**<br>Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Rec. 16 (CBS-94), approved by the President of WMO, Res. 4 (EC-XLIX), Rec. 9 (CBS-97), approved by the President of WMO, and Res. 4 (EC-LIII) |
| **FM 20–VIII RADOB** | **Report of ground radar weather observation**<br>Res. 15 (EC-XXII) and Res. 4 (EC-XXXV) |

| | |
|---|---|
| **FM 22–IX Ext. RADREP** | **Radiological data report (monitored on a routine basis and/or in case of accident)**<br>Res. 8 (EC-XLIII) |
| **FM 32–XI Ext. PILOT** | **Upper-wind report from a fixed land station**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Rec. 22 (CBS-89), approved by the President of WMO and Res. 8 (EC-LI) |
| **FM 33–XI Ext. PILOT SHIP** | **Upper-wind report from a sea station**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL) and Res. 8 (EC-LI) |
| **FM 34–XI Ext. PILOT MOBIL** | **Upper-wind report from a mobile land station**<br>Rec. 22 (CBS-89), approved by the President of WMO and Res. 8 (EC-LI) |
| **FM 35–XI Ext. TEMP** | **Upper-level pressure, temperature, humidity and wind report from a fixed land station**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Rec. 22 (CBS-89), approved by the President of WMO, Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI) |
| **FM 36–XI Ext. TEMP SHIP** | **Upper-level pressure, temperature, humidity and wind report from a sea station**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI) |
| **FM 37–XI Ext. TEMP DROP** | **Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft**<br>Res. 4 (EC-XXXI), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI) |
| **FM 38–XI Ext. TEMP MOBIL** | **Upper-level pressure, temperature, humidity and wind report from a mobile land station**<br>Rec. 22 (CBS-89), approved by the President of WMO, Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI) |
| **FM 39–VI ROCOB** | **Upper-level temperature, wind and air density report from a land rocketsonde station**<br>Paragraph 2.1.4 of the general summary of EC-XVI, Res.15 (EC-XXII) and Res. 3 (EC-XXVI) |
| **FM 40–VI ROCOB SHIP** | **Upper-level temperature, wind and air density report from a rocketsonde station on a ship**<br>Paragraph 2.1.4 of the general summary of EC-XVI, Res. 15 (EC-XXII) and Res. 3 (EC-XXVI) |

| | |
|---|---|
| **FM 41–IV CODAR** | **Upper-air report from an aircraft (other than weather reconnaissance aircraft)**<br>Res. 13 (EC-XVIII) |
| **FM 42–XI Ext. AMDAR** | **Aircraft report (aircraft meteorological data relay)**<br>Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLIX) and Res. 8 (EC-LI) |
| **FM 44–V ICEAN** | **Ice analysis**<br>Rec. 47 (CBS-74), approved by the President of WMO |
| **FM 45–IV IAC** | **Analysis in full form**<br>Res. 156 (CD Washington 1947), Res. 22 (EC-X), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII) |
| **FM 46–IV IAC FLEET** | **Analysis in abbreviated form**<br>Res. 156 (CD Washington 1947), Res. 21 (EC-IV), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII) |
| **FM 47–IX Ext. GRID** | **Processed data in the form of grid-point values**<br>Rec. 46 (CBS-73), approved by the President of WMO, Res. 4 (EC-XXXI) and Res. 8 (EC-XLIII) |
| **FM 49–IX Ext. GRAF** | **Processed data in the form of grid-point values (abbreviated code form)**<br>Res. 4 (EC-XXXI) and Res. 8 (EC-XLIII) |
| **FM 50–XIII WINTEM** | **Forecast upper wind and temperature for aviation**<br>Res. 5 (EC-XXXV), Res. 4 (EC-XXXVIII) and Res. 2 (EC-LVII) |
| **FM 51–XV TAF** | **Aerodrome forecast**<br>Res. 21 (EC-IV), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), paragraph 2.1.4 of the general summary of EC–XXII, Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res. 10 (EC-LIX), Res. 4 (Cg-XVI) and amendments between CBS sessions (2013) |
| **FM 53–X Ext. ARFOR** | **Area forecast for aviation**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII) and Rec. 14 (CBS-95), approved by the President of WMO |
| **FM 54–X Ext. ROFOR** | **Route forecast for aviation**<br>Res. 21 (EC-IV), Res. 22 (EC-X), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII) and Rec. 14 (CBS-95), approved by the President of WMO |
| **FM 57–IX Ext. RADOF** | **Radiological trajectory dose forecast (defined time of arrival and location)**<br>Res. 8 (EC-XLIII) |

| | |
|---|---|
| **FM 61–IV MAFOR** | **Forecast for shipping**<br>Res. 22 (EC-X), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII) |
| **FM 62–VIII Ext. TRACKOB** | **Report of marine surface observation along a ship's track**<br>Res. 4 (EC-XXXVIII) |
| **FM 63–XI Ext. BATHY** | **Report of bathythermal observation**<br>Res. 15 (EC-XXII), Res. 4 (EC-XXXV), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI) |
| **FM 64–XI Ext. TESAC** | **Temperature, salinity and current report from a sea station**<br>Res. 15 (EC-XXII), Res. 4 (EC-XXXV), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII) and Res. 8 (EC-LI) |
| **FM 65–XI Ext. WAVEOB** | **Report of spectral wave information from a sea station or from a remote platform (aircraft or satellite)**<br>Res. 1 (EC-XL), Res. 4 (EC-XLIX) and Res. 8 (EC-LI) |
| **FM 67–VI HYDRA** | **Report of hydrological observation from a hydrological station**<br>Res. 3 (EC-XXVI) |
| **FM 68–VI HYFOR** | **Hydrological forecast**<br>Res. 3 (EC-XXVI) |
| **FM 71–XII CLIMAT** | **Report of monthly values from a land station**<br>Res. 71 and 72 (CD Washington 1947), Res. 13 (EC-XVIII), paragraph 2.1.4 of the general summary of EC–XXII, Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-XLIX) and Res. 4 (EC-LIII) |
| **FM 72–XII CLIMAT SHIP** | **Report of monthly means and totals from an ocean weather station**<br>Res. 71 and 72 (CD Washington 1947), Res. 22 (EC-X), Res. 13 (EC-XVIII), paragraph 2.1.4 of the general summary of EC-XXII, Res. 3 (EC-XXVI) and Res. 4 (EC-LIII) |
| **FM 73-VI** { **NACLI**, **CLINP**, **SPCLI**, **CLISA**, **INCLI** } | **Report of monthly means for an oceanic area**<br>Res. 22 (IMC Salzburg 1937), Res. 71 (CD Washington 1947) and Res. 3 (EC-XXVI) |
| **FM 75–XII Ext. CLIMAT TEMP** | **Report of monthly aerological means from a land station**<br>Res. 71 (CD Washington 1947), paragraph 5.11 of the general summary of EC-XV, Res. 13 (EC-XVIII), Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-LIII) and Res. 8 (EC-LV) |
| **FM 76–XII Ext. CLIMAT TEMP SHIP** | **Report of monthly aerological means from an ocean weather station**<br>Res. 71 (CD Washington 1947), paragraph 5.11 of the general summary of EC-XV, Res. 13 (EC-XVIII), Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-LIII) and Res. 8 (EC-LV) |
| **FM 81–I SFAZI** | **Synoptic report of bearings of sources of atmospherics**<br>Res. 21 (EC-IV) |

| | |
|---|---|
| **FM 82–I SFLOC** | **Synoptic report of the geographical location of sources of atmospherics**<br>Res. 21 (EC-IV) |
| **FM 83–I SFAZU** | **Detailed report of the distribution of sources of atmospherics by bearings for any period up to and including 24 hours**<br>Res. 21 (EC-IV) |
| **FM 85–IX SAREP** | **Report of synoptic interpretation of cloud data obtained by a meteorological satellite**<br>Res. 15 (EC-XXII), Res. 3 (EC-XXVI) and Res. 1 (EC-XL) |
| **FM 86–XI SATEM** | **Report of satellite remote upper-air soundings of pressure, temperature and humidity**<br>Rec. 2 (CBS-Ext.(76)), approved by the President of WMO, Res. 4 (EC-XXXVIII) and Res. 4 (EC-XLIX) |
| **FM 87–XI SARAD** | **Report of satellite clear radiance observations**<br>Rec. 3 (CBS-Ext.(76)), approved by the President of WMO, 4 (EC–XXXVIII) and Res. 4 (EC-XLIX) |
| **FM 88–XI SATOB** | **Report of satellite observations of wind, surface temperature, cloud, humidity and radiation**<br>Rec. 4 (CBS-Ext.(76)), approved by the President of WMO, Res. 4 (EC-XLV) and Res. 4 (EC-XLIX) |

# b. LIST OF CODE FORMS WITH NOTES AND REGULATIONS

**FM 12–XIV Ext. SYNOP** — **Report of surface observation from a fixed land station**

**FM 13–XIV Ext. SHIP** — **Report of surface observation from a sea station**

**FM 14–XIV Ext. SYNOP MOBIL** — **Report of surface observation from a mobile land station**

**C O D E   F O R M :**

SECTION 0

$$M_iM_iM_jM_j \quad \left\{\begin{matrix} D\ .\ .\ .\ .\ D^{****} \\ \text{or} \\ A_1b_wn_bn_bn_b^{**} \end{matrix}\right\} \quad YYGGi_w \quad \left\{\begin{matrix} IIiii^{*} \\ \text{or} \\ 99L_aL_aL_a\ Q_cL_oL_oL_oL_o^{****} \end{matrix}\right\} \quad MMMU_{La}U_{Lo}^{***} \quad h_0h_0h_0h_0i_m^{***}$$

SECTION 1

$$i_Ri_xhVV \quad Nddff \quad (00fff) \quad 1s_nTTT \quad \left\{\begin{matrix} 2s_nT_dT_dT_d \\ \text{or} \\ 29UUU \end{matrix}\right\} \quad 3P_0P_0P_0P_0$$

$$\left\{\begin{matrix} 4PPPP \\ \text{or} \\ 4a_3hhh \end{matrix}\right\} \quad 5appp \quad 6RRRt_R \quad \left\{\begin{matrix} 7wwW_1W_2 \\ \text{or} \\ 7w_aw_aW_{a1}W_{a2} \end{matrix}\right\} \quad 8N_hC_LC_MC_H \quad 9GGgg$$

SECTION 2

$$222D_sv_s \quad (0s_sT_wT_wT_w) \quad (1P_{wa}P_{wa}H_{wa}H_{wa}) \quad (2P_wP_wH_wH_w) \quad ((3d_{w1}d_{w1}d_{w2}d_{w2})$$

$$(4P_{w1}P_{w1}H_{w1}H_{w1}) \quad (5P_{w2}P_{w2}H_{w2}H_{w2})) \quad \left( \left\{\begin{matrix} 6I_sE_sE_sR_s \\ \text{or} \\ \text{ICING + plain} \\ \text{language} \end{matrix}\right\} \right)$$

$$(70H_{wa}H_{wa}H_{wa}) \quad (8s_wT_bT_bT_b) \quad \left(\text{ICE} + \left\{\begin{matrix} c_iS_ib_iD_iz_i \\ \text{or} \\ \text{plain language} \end{matrix}\right\} \right)$$

SECTION 3

$$333 \quad (0\ .\ .\ .\ .) \quad (1s_nT_xT_xT_x) \quad (2s_nT_nT_nT_n) \quad (3Ejjj) \quad (4E'sss) \quad (5j_1j_2j_3j_4\ (j_5j_6j_7j_8j_9))$$

$$(6RRRt_R) \quad (7R_{24}R_{24}R_{24}R_{24}) \quad (8N_sCh_sh_s) \quad (9S_PS_Ps_ps_p)$$

$$(80000\ (0\ .\ .\ .\ .) \quad (1\ .\ .\ .\ .)\ .\ .\ .\ .)$$

SECTION 4 444 $N'C'H'H'C_t$

SECTION 5 555 Groups to be developed nationally

---

* Used in FM 12 only.

** Used in FM 13 only.

*** Used in FM 14 only.

**** Used in FM 13 and FM 14 only.

**Notes:**

(1) The code form FM 12 SYNOP is used for reporting synoptic surface observations from a fixed land station, manned or automatic. The code form FM 13 SHIP is used for the same kind of observations from a sea station, manned or automatic. The code form FM 14 SYNOP MOBIL is used for surface observations from an automatic or manned land station not at a fixed location.

(2) A SYNOP report from a fixed land station is identified by the symbolic letters $M_iM_iM_jM_j$ = AAXX.

(3) A SHIP report from a sea station is identified by the symbolic letters $M_iM_iM_jM_j$ = BBXX.

(4) A SYNOP MOBIL report from a mobile land station is identified by the symbolic letters $M_iM_iM_jM_j$ = OOXX.

(5) The code form is made up of figure groups arranged by sections in ascending order of their numerical indicators with the exception of the following:

(a) All the groups of Section 0 and for the first two groups of Section 1, which are always included in the report of any surface observing station;

(b) The first data group of Section 2 – $222D_sv_s$, which is always included in the report of a sea station if data are available;

(c) The data group of Section 4, which is clearly identified by a three-figure indicator group.

As a result, the following features are achieved:

(d) The loss of information due to the accidental loss of any one of these groups is strictly limited to the information content of that group;

(e) The rules of inclusion or omission of sections or of groups between brackets can be laid down for each specific case of station type or of data requirements;

(f) The length of the report can be kept to a strict minimum by dropping out some groups whenever their information content is considered insignificant or when that information content is not normally available.

It is to be noted that the code word ICE of Section 2 plays the role of a numerical indicator for the last data group of the section or for the equivalent plain language information.

(6) The code form is divided into a number of sections as follows:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Data for reporting identification (type, ship's call sign/buoy identifier, date, time, location) and units of wind speed used |
| 1 | — | Data for global exchange which are common to the SYNOP, SHIP and SYNOP MOBIL code forms |
| 2 | 222 | Maritime data for global exchange pertaining to a sea, or to a coastal station |
| 3 | 333 | Data for regional exchange |
| 4 | 444 | Data for national use for clouds with base below station level, included by national decision |
| 5 | 555 | Data for national use |

**R E G U L A T I O N S :**

## 12.1 General

**12.1.1 The code name SYNOP, SHIP or SYNOP MOBIL shall not be included in the report.**

**Note: See Regulation 12.1.7.**

**12.1.1.1 SYNOP MOBIL is intended for encoding meteorological observations from a non-fixed location. SYNOP MOBIL shall not be used as a replacement to SYNOP from a fixed location.**

**Note: An example of the intended application is to temporarily monitor meteorological parameters in the area of an environmental emergency.**

**12.1.2** *Use of groups* $\mathbf{M_iM_iM_jM_j} \left\{ \begin{array}{l} \mathbf{D \ldots . D^{**}} \\ \mathbf{or} \\ \mathbf{A_1b_wn_bn_bn_b^{*}} \end{array} \right\} \mathbf{YYGGi_w}$

**Note: See Regulation 18.2.3, Notes (1), (2) and (3).**

**12.1.2.1 In a bulletin of SYNOP reports from fixed land stations, the groups $M_iM_iM_jM_j$ $YYGGi_w$ shall be included only as the first line of the text, provided all the reports of the bulletin were taken at the same time and use the same unit for reporting wind speed.**

**12.1.2.2 In a bulletin of SHIP reports from sea stations or SYNOP MOBIL reports from mobile land stations, the group $M_iM_iM_jM_j$ shall be included only as the first line of the text, and the groups**

$\left\{ \begin{array}{l} \mathbf{D \ldots . D^{**}} \\ \mathbf{or} \\ \mathbf{A_1b_wn_bn_bn_b^{*}} \end{array} \right\}$ **$YYGGi_w$ shall be included in every individual report.**

**Note: See Regulation 12.1.7.**

**12.1.3** ***Use of sections***

**12.1.3.1 Reports from a fixed or mobile land station shall always contain at least Sections 0 and 1. When a report from a coastal land station contains maritime data, that report shall also include Section 2. The identification and position of a fixed land station shall be indicated by means of the group IIiii.**

**12.1.3.2 The identification of a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for mobile land stations. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station, including the units of measure for the elevation and the accuracy of the elevation.**

**12.1.3.3 Mobile land station reports shall include (besides Sections 0 and 1), whenever the corresponding data are available, Section 3 containing at least the groups with indicator figures 5, 8 and 9.**

**12.1.3.4 Reports from a sea station shall always include Sections 0 and 1 and, whenever the corresponding data are available, Section 2. Section 2 shall always include the maximum number of data groups consistent with observed conditions. The identification of a sea station shall be indicated by either the group D . . . . D or the group $A_1b_wn_bn_bn_b$. The position of a sea station shall be indicated by the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$.**

**12.1.3.5 Ocean weather station reports shall include (besides Sections 0, 1 and 2), whenever the corresponding data are available, Section 3 containing at least the groups with indicator figures 5, 8 and 9.**

---

* Used in FM 13 only.

** Used in FM 13 and FM 14 only.

**12.1.3.6 In reports from supplementary ships, Section 1 shall contain at least:**

**$i_R i_x hVV$ Nddff $1s_nTTT$ 4PPPP $7wwW_1W_2$ $8N_hC_LC_MC_H$**

**where**

**(a) $i_R$ shall be set to code figure 4;**

**(b) $i_x$ shall be coded as 1 or 3 as the case may be.**

**12.1.3.7 In reports from auxiliary ships, Section 1 shall contain at least:**

**$i_R i_x hVV$ Nddff $1s_nTTT$ 4PPPP $7wwW_1W_2$**

**where**

**(a) $i_R$ shall be set to code figure 4;**

**(b) $i_x$ shall be coded as 1 or 3 as the case may be.**

Notes:

(1) The above-mentioned version of Section 1 is considered suitable for any ship which is not supplied with tested instruments and may be requested to report in areas where shipping is relatively sparse, or on request, and especially when storm conditions threaten or prevail. These ships may report in plain language if the use of code is impracticable.

(2) If the ship does not report cloud data, h should be coded with a solidus (/).

(3) If the ship is not equipped with tested instruments permitting the determination of tenths of degrees of air temperature and/or tenths of hectopascals of pressure, a solidus should be coded for the tenths of degrees and/or tenths of hectopascals, as appropriate.

**12.1.4 In reports from automatic stations, mandatory group elements specified by symbolic letters shall be coded with solidi (/) if the station is not equipped to report the relevant data, taking into account that $i_R$, $i_x$, and N = 0, N = 9, N = / provide for omission of groups $6RRRt_R$, $7w_aw_aW_{a1}W_{a2}$ and $8N_hC_LC_MC_H$, as the case may be.**

**12.1.5 A fixed sea station (other than an ocean weather station or a moored buoy), which is considered by the Member operating it to be in the same category as a fixed land station, shall report its identification and position by means of the group IIiii.**

**12.1.6 The actual time of observation shall be the time at which the barometer is read.**

**12.1.7 (a) The identification of stations located at sea on a drilling rig or an oil- or gas-production platform shall be indicated by the group $A_1b_wn_bn_bn_b$.**

**(b) In reports of sea stations other than buoys, drilling rigs and oil- or gas-production platforms, and in the absence of a ship's call sign, the word SHIP shall be used for D . . . . D.**

**(c) In reports from a mobile land station, only in the absence of a suitable call sign, the word MOBIL shall be used for D . . . . D.**

## 12.2 Section 1

**12.2.1** ***Group*** **$i_R i_x hVV$**

**12.2.1.1 This group shall always be included in the report.**

**12.2.1.2** ***Base of lowest cloud:*** **h**

**When the station is in fog, a sandstorm or a duststorm or in blowing snow but the sky is discernible, h shall refer to the base of the lowest cloud observed, if any. When, under the above conditions, the sky is not discernible, h shall be reported as /.**

Note: See regulations relative to the use of Section 4.

**12.2.1.3** ***Visibility:*** **VV**

**12.2.1.3.1 When the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV.**

**12.2.1.3.2 In reporting visibility at sea, the decile 90–99 shall be used for VV.**

**12.2.2** *Group* **Nddff**

**12.2.2.1** **This group shall always be included in the report.**

**12.2.2.2** ***Total cloud cover:*** **N**

**12.2.2.2.1** **N shall be reported as actually seen by the observer during the observation.**

**12.2.2.2.2** **Altocumulus perlucidus or Stratocumulus perlucidus ("mackerel sky") shall be reported using N = 7 or less (unless overlying clouds appear to cover the whole sky) since breaks are always present in this cloud form even if it extends over the whole celestial dome.**

**12.2.2.2.3** **N shall be coded as 0 when blue sky or stars are seen through existing fog or other analogous phenomena without any trace of cloud being seen.**

**12.2.2.2.4** **When clouds are observed through fog or analogous phenomena, their amount shall be evaluated and reported as if these phenomena were non-existent.**

**12.2.2.2.5** **The total cloud cover shall not include the amount resulting from rapidly dissipating condensation trails.**

**12.2.2.2.6** **Persistent condensation trails and cloud masses which have obviously developed from condensation trails shall be reported as cloud, using the appropriate $C_H$ or $C_M$ code figure.**

**12.2.2.3** ***Wind direction and speed:*** **ddff**

**12.2.2.3.1** **The mean direction and speed of the wind over the 10-minute period immediately preceding the observation shall be reported for ddff. However, when the 10-minute period includes a discontinuity in the wind characteristics, only data obtained after the discontinuity shall be used for reporting the mean values, and hence the period in these circumstances shall be correspondingly reduced.**

**12.2.2.3.2** **In the absence of wind instruments, the wind speed shall be estimated on the basis of the Beaufort wind scale. The Beaufort number obtained by estimation is converted into metres per second or knots by the use of the wind speed equivalent columns of the Beaufort scale, and this speed is reported for ff.**

**12.2.2.3.3** **When the wind speed, in units indicated by $i_w$, is 99 units or more:**

**(a)** **ff in the group Nddff shall be encoded 99;**

**(b)** **The group 00fff shall be included immediately following the group Nddff.**

**Note: The apparent wind speed measured on board a moving ship is to be corrected for the course and the speed of the ship, in order to obtain the speed of the true wind, which is to be reported. The correction can be made on the basis of the parallelogram of velocities or by means of special tables.**

**12.2.3** *Groups* **$1s_nTTT$, $2s_nT_dT_dT_d$, 4PPPP, 5appp**

**12.2.3.1** **Groups $1s_nTTT$, $2s_nT_dT_dT_d$ and 4PPPP shall be included whenever the corresponding data are available, unless stated otherwise in specific regulations.**

**Note: See Regulation 12.2.3.5 relative to group 5appp.**

**12.2.3.2** *Group* **$1s_nTTT$**

**When the data are not available as a result of a temporary instrument failure, automatic weather stations programmed to transmit this group shall either omit the group altogether or include it in their reports in the form 1////.**

**12.2.3.3** *Group* **$2s_nT_dT_dT_d$**

**12.2.3.3.1** **Under unusual conditions, when the dew-point temperature is temporarily unavailable (e.g. because of instrument failure) but relative humidity is available, the group 29UUU shall replace the group $2s_nT_dT_dT_d$. Every attempt shall first be made, however, to convert relative humidity to dew-point temperature, and the relative humidity included only as a last resort.**

**12.2.3.3.2** **Regulation 12.2.3.2 shall apply to this group, which shall in that case either be omitted or encoded as 2////.**

**12.2.3.4** *Group* **4PPPP**

**12.2.3.4.1** **Whenever air pressure at mean sea level can be computed with reasonable accuracy, this pressure shall be reported in the 4PPPP group.**

**Notes:**

**(1) For a station situated in a region of normal synoptic network density, the pressure at mean sea level is considered not to be computed with reasonable accuracy when it introduces a deformation into the analysis of the horizontal pressure field which is purely local and recurring.**

**(2) For a station lying in a data-sparse area of the synoptic network, reasonable accuracy will be obtained when using a reduction method which has proved to be satisfactory in a region of normal network density and under similar geographical conditions.**

**12.2.3.4.2** **By regional decision, a high-level station which cannot give pressure at mean sea level to a satisfactory degree of accuracy shall report both the station-level pressure group $3P_0P_0P_0P_0$ and the geopotential height of an agreed standard isobaric surface. In that case, the group 4PPPP shall be replaced by the group $4a_3hhh$.**

**Note: The level chosen for each station is indicated in *Weather Reporting* (WMO-No. 9), Volume A.**

**12.2.3.5** *Group* **5appp**

**12.2.3.5.1** **Unless specified otherwise by regional decision, this group shall be included whenever the three-hourly pressure tendency is available.**

**12.2.3.5.2** **The pressure tendency over the past three hours, a, shall, wherever possible, be determined on the basis of pressure samplet at equi-spaced intervals not exceeding one hour.**

**Note: Algorithms for selecting the appropriate code figure are included in the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8).**

**12.2.3.5.3** **Where it is not possible to apply the algorithms specified in Regulation 12.2.3.5.2 in reports from automatic weather stations, a shall be coded as 2 when the tendency is positive; as 7 when the tendency is negative; and as 4 when the atmospheric pressure is the same as three hours before.**

**12.2.4** *Group* **$3P_0P_0P_0P_0$**

**This group shall be included in reports for global exchange from land stations, together with either the group 4PPPP or, in accordance with Regulation 12.2.3.4.2, the group $4a_3hhh$.**

**Note: Inclusion of this group at other times is left to the decision of individual Members.**

**12.2.5** *Group* **$6RRRt_R$**

**12.2.5.1** **When precipitation data are to be exchanged in time periods of six hours at main standard times (i.e. to report the amount of precipitation over the preceding 6, 12, 18 and 24 hours), this group shall be included in Section 1.**

**12.2.5.2** **When precipitation data are to be exchanged in time periods of three hours or other periods required for regional exchange, this group shall be included in Section 3.**

**12.2.5.3** **For lightships reporting in the SHIP code form and for ocean weather stations, the use of this group shall be fixed regionally or nationally. In the case of mobile ship stations which make precipitation observations, the group shall be included in each SHIP report.**

**12.2.5.4** **This group shall:**

**(a) Coded with RRR = 000 (3 zeros) when precipitation is measured but no precipitation occurred during the reference period;**

**(b) Coded with RRR = /// (3 solidi) when precipitation is normally measured but is not available for the current report;**

**(c) Omitted when precipitation is not normally measured. In this case, $i_R$ should be coded as 4;**

**(d) Existing automated weather stations (AWS) may continue to report no precipitation with $i_R$ coded as 3 and the $6RRRt_R$ group omitted. New systems and human observer should report the $6RRRt_R$ group with RRR = 000 (3 zeros) to indicate no precipitation occurred during the reference period.**

**12.2.6 *Group* $7wwW_1W_2$ or $7w_aw_aW_{a1}W_{a2}$**

**12.2.6.1 This group shall be included in an observation by a manually operated station after a period of closure or at start up, when past weather conditions for the period applicable to the report are unknown, and shall take the form 7ww// (with $i_x$ = 1), even if ww = 00–03. Otherwise it shall only be included if present or past weather phenomena of significance, or both, were observed. $W_1W_2$ = // shall indicate that previous conditions are unknown. This regulation shall also apply to automatic reporting stations with the facility to report present and past weather. Where a single past weather form is recognized it shall take the form of $7wwW_1$/ or $7w_aw_aW_{a1}$/.**

**12.2.6.2 Code figures 00, 01, 02, 03 of the ww code table and code figures 0, 1 and 2 of the $W_1$, $W_2$ code table shall be considered to represent phenomena without significance.**

**Note: All present weather and past weather including phenomena without significance observed at sea shall be reported in the SHIP message.**

**12.2.6.3 This group shall be omitted if both present and past weather were:**

**(a) Not available (no observation made); or**

**(b) Observation made but observed phenomena were not of significance.**

**The indicator $i_x$ shall indicate which one of these conditions applies.**

**12.2.6.4 *Present weather reported from a manned weather station:* ww**

**12.2.6.4.1 If more than one form of weather is observed, the highest applicable code figure shall be selected for the group $7wwW_1W_2$. Other weather may be reported in Section 3, using the group 960ww or $961w_1w_1$, repeated as necessary. In any case, in the group $7wwW_1W_2$, code figure 17 shall have precedence over figures 20–49.**

**12.2.6.4.2 In coding 01, 02 and 03, there is no limitation on the magnitude of the change of the cloud amount. ww = 00, 01 and 02 can each be used when the sky is clear at the time of observation. In this case, the following interpretation of the specifications shall apply:**

**00 is used when the preceding conditions are not known;**

**01 is used when the clouds have dissolved during the past hour;**

**02 is used when the sky has been continuously clear during the past hour.**

**12.2.6.4.3 When the phenomenon is not predominantly water droplets, the appropriate code figure shall be selected without regard to VV.**

**12.2.6.4.4 The code figure 05 shall be used when the obstruction to vision consists predominantly of lithometeors.**

**12.2.6.4.5 National instructions shall be used to indicate the specifications for ww = 07 and 09.**

**12.2.6.4.6 The visibility restriction on ww = 10 shall be 1 000 metres or more. The specification refers only to water droplets and ice crystals.**

**12.2.6.4.7 For ww = 11 or 12 to be reported, the apparent visibility shall be less than 1 000 metres.**

**12.2.6.4.8 For ww = 18, the following criteria for reporting squalls shall be used:**

**(a) When wind speed is measured:**

**A sudden increase of wind speed of at least 8 metres per second (16 knots), the speed rising to 11 metres per second (22 knots) or more and lasting for at least one minute;**

**(b) When the Beaufort scale is used for estimating wind speed:**

**A sudden increase of wind speed by at least three stages of the Beaufort scale, the speed rising to force 6 or more and lasting for at least one minute.**

**12.2.6.4.9 Figures 20–29 shall never be used when precipitation is observed at the time of observation.**

**12.2.6.4.10** **For ww = 28, visibility shall have been less than 1 000 metres.**

**Note: The specification refers only to visibility restrictions which occurred as a result of water droplets or ice crystals.**

**12.2.6.4.11** **For synoptic coding purposes, a thunderstorm shall be regarded as being at the station from the time thunder is first heard, whether or not lightning is seen or precipitation is occurring at the station. A thunderstorm shall be reported in present weather if thunder is heard within the normal observational period preceding the time of the report. A thunderstorm shall be regarded as having ceased at the time thunder is last heard and the cessation is confirmed if thunder is not heard for 10–15 minutes after this time.**

**12.2.6.4.12** **The necessary uniformity in reporting ww = 36, 37, 38 and 39 which may be desirable within certain regions shall be obtained by means of national instructions.**

**12.2.6.4.13** **A visibility restriction "less than 1 000 metres" shall be applied to ww = 42–49. In the case of ww = 40 or 41, the apparent visibility in the fog or ice fog patch or bank shall be less than 1 000 metres. 40–47 shall be used when the obstructions to vision consist predominantly of water droplets or ice crystals, and 48 or 49 when the obstructions consist predominantly of water droplets.**

**12.2.6.4.14** **When referring to precipitation, the phrase "at the station" in the ww table shall mean "at the point where the observation is normally taken".**

**12.2.6.4.15** **The precipitation shall be encoded as intermittent if it has been discontinuous during the preceding hour, without presenting the character of a shower.**

**12.2.6.4.16** **The intensity of precipitation shall be determined by the intensity at the time of observation.**

**12.2.6.4.17** **Code figures 80–90 shall be used only when the precipitation is of the shower type and takes place at the time of observation.**

**Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.**

**12.2.6.4.18** **In reporting code figure 98, the observer shall be allowed considerable latitude in deter mining whether precipitation is or is not occurring, if it is not actually visible.**

**12.2.6.5** ***Present weather reported from an automatic weather station:*** $w_aw_a$

**12.2.6.5.1** **The highest applicable figure shall be selected.**

**12.2.6.5.2** **In coding 01, 02 and 03, there is no limitation on the magnitude of the change of the cloud amount.** $w_aw_a$ **= 00, 01 and 02 can each be used when the sky is clear at the time of observation. In this case, the following interpretation of the specifications shall apply:**

**00 is used when the preceding conditions are not known;**

**01 is used when the clouds have dissolved during the past hour;**

**02 is used when the sky has been continuously clear during the past hour.**

**12.2.6.5.3** **When the phenomenon is not predominantly water droplets, the appropriate code figure shall be selected without regard to VV.**

**12.2.6.5.4** **The code figures 04 and 05 shall be used when the obstruction to vision consists predominantly of lithometeors.**

**12.2.6.5.5** **The visibility restriction on** $w_aw_a$ **= 10 shall be 1 000 metres or more. The specification refers only to water droplets and ice crystals.**

**12.2.6.5.6** **For** $w_aw_a$ **= 18, the following criteria for reporting squalls shall be used:**

**A sudden increase of wind speed of at least 8 metres per second (16 knots), the speed rising to 11 metres per second (22 knots) or more and lasting for at least one minute.**

**12.2.6.5.7** **Code figures 20–26 shall never be used when precipitation is observed at the time of observation.**

**12.2.6.5.8** **For $w_aw_a$ = 20, visibility shall have been less than 1 000 metres.**

**Note: The specification refers only to visibility restrictions which occurred as a result of water droplets or ice crystals.**

**12.2.6.5.9** **For synoptic coding purposes, a thunderstorm shall be regarded as being at the station from the time thunder is first detected, whether or not lightning is detected or precipitation is occurring at the station. A thunderstorm shall be reported in present weather if thunder is detected within the normal observational period preceding the time of the report. A thunderstorm shall be regarded as having ceased at the time thunder is last detected and the cessation is confirmed if thunder is not detected for 10–15 minutes after this time.**

**12.2.6.5.10** **A visibility restriction “less than 1 000 metres” shall be applied to $w_aw_a$ = 30–35.**

**12.2.6.5.11** **The precipitation shall be encoded as intermittent if it has been discontinuous during the preceding hour, without presenting the character of a shower.**

**12.2.6.5.12** **The intensity of precipitation shall be determined by the intensity at the time of observation.**

**12.2.6.5.13** **Code figures 80–89 shall be used only when the precipitation is intermittent or of the shower type and takes place at the time of observation.**

**Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.**

**12.2.6.6** ***Past weather reported from a manned weather station:*** **$W_1W_2$**

**12.2.6.6.1** **The period covered by $W_1$ and $W_2$ shall be:**

**(a) Six hours for observations at 0000, 0600, 1200 and 1800 UTC;**

**(b) Three hours for observations at 0300, 0900, 1500 and 2100 UTC;**

**(c) Two hours for intermediate observations if taken every two hours;**

**(d) One hour for intermediate observations if taken every hour.**

**12.2.6.6.2** **The code figures for $W_1$ and $W_2$ shall be selected in such a way that $W_1W_2$ and ww together give as complete a description as possible of the weather in the time interval concerned. For example, if the type of weather undergoes a complete change during the time interval concerned, the code figures selected for $W_1$ and $W_2$ shall describe the weather prevailing before the type of weather indicated by ww began.**

**12.2.6.6.3** **When $W_1$ and $W_2$ are used in hourly reports other than those covered by Regulation 12.2.6.6.1 (a) and (b), they cover a short period of time and Regulation 12.2.6.6.2 shall apply.**

**12.2.6.6.4** **If, using Regulation 12.2.6.6.2, more than one code figure may be given to $W_1$ with regard to the past weather, the highest figure shall be reported for $W_1$ and the second highest code figure shall be reported for $W_2$.**

**12.2.6.6.5** **If the weather during the period has not changed so that only one code figure may be selected for the past weather, then that code figure shall be reported for both $W_1$ and $W_2$. For example, rain during the entire period shall be reported as $W_1W_2$ = 66.**

**12.2.6.7** ***Past weather reported from an automatic weather station*****: $W_{a1}W_{a2}$**

**12.2.6.7.1** **The period covered by $W_{a1}W_{a2}$ shall be:**

**(a) Six hours for observations at 0000, 0600, 1200 and 1800 UTC;**

**(b) Three hours for observations at 0300, 0900, 1500 and 2100 UTC;**

**(c) Two hours for intermediate observations if taken every two hours;**

**(d) One hour for intermediate observations if taken every hour.**

**12.2.6.7.2 The code figures for $W_{a1}W_{a2}$ shall be selected so that the maximum capability of the automatic station to discern past weather is utilized, and so that $W_{a1}W_{a2}$ and $w_aw_a$ together give as complete a description as possible of the weather in the time interval concerned.**

**12.2.6.7.3 In cases where the automatic station is capable only of discerning very basic weather conditions, the lower code figures representing basic and generic phenomena may be used. If the automatic station has higher discrimination capabilities, the higher code figures representing more detailed explanation of the phenomena shall be used. For each basic type of phenomenon, the highest code figure within the discrimination capability of the automatic station shall be reported.**

**12.2.6.7.4 If the type of weather during the time interval concerned undergoes complete and discernible changes, the code figures selected for $W_{a1}$ and $W_{a2}$ shall describe the weather prevailing before the type of weather indicated by $w_aw_a$ began. The highest figure shall be reported for $W_{a1}$, and the second highest code figure shall be reported for $W_{a2}$.**

**12.2.6.7.5 If a discernible change in weather has not occurred during the period, so that only one code figure may be selected for the past weather, then that code figure shall be reported for both $W_{a1}$ and $W_{a2}$. For example, rain during the entire period shall be reported as $W_{a1}$ $W_{a2}$ = 44 in the case of an automatic station incapable of differentiating types of precipitation, or $W_{a1}W_{a2}$ = 66 in the case of a station with the higher discrimination capability.**

**12.2.7** ***Group*** **$8N_hC_LC_MC_H$**

**12.2.7.1 This group shall be omitted in the following cases:**

**(a) When there are no clouds (N = 0);**

**(b) When the sky is obscured by fog and/or other meteorological phenomena (N = 9);**

**(c) When the cloud cover is indiscernible for reasons other than (b) above, or observation is not made (N = /).**

**Note: All cloud observations at sea including no cloud observation shall be reported in the SHIP message.**

**12.2.7.2 Certain regulations concerning the coding of N shall also apply to the coding of $N_h$.**

**12.2.7.2.1 (a) If there are $C_L$ clouds then the total amount on all $C_L$ clouds, as actually seen by the observer during the observation, shall be reported for $N_h$;**

**(b) If there are no $C_L$ clouds but there are $C_M$ clouds, then the total amount of the $C_M$ clouds shall be reported for $N_h$;**

**(c) If there are no $C_L$ clouds and there are no $C_M$ level clouds, but there are $C_H$ clouds, then $N_h$ shall be coded as 0.**

**12.2.7.2.2 If the variety of the cloud reported for $N_h$ is perlucidus (stratocumulus perlucidus for a $C_L$ cloud or altocumulus perlucidus for a $C_M$ cloud) then $N_h$ shall be coded as 7 or less.**

**Note: See Regulation 12.2.2.2.2.**

**12.2.7.2.3 When the clouds reported for $N_h$ are observed through fog or an analogous phenomenon their amount shall be reported as if these phenomena were not present.**

**12.2.7.2.4 If the clouds reported for $N_h$ include contrails, then $N_h$ shall include the amount of persistent contrails. Rapidly dissipating contrails shall not be included in the value for $N_h$.**

**Note: See Regulation 12.5 concerning the use of Section 4.**

**12.2.7.3 The coding of $C_L$, $C_M$ and $C_H$ clouds shall be as specified in the *International Cloud Atlas* (WMO-No. 407), Volume I.**

**Note: It is recommended that the pictorial guides included at the end of Chapter II.8 in the *International Cloud Atlas*, Volume I, be fully utilized in determining the priority of reporting the code figures for $C_L$, $C_M$ and $C_H$.**

**12.2.8** *Group* **9GGgg**

**This group shall be included:**

**(a) When the actual time of observation differs by more than 10 minutes from the standard time GG reported in Section 0;**

**(b) When additionally specified by regional decision.**

**Note: See Regulation 12.1.6.**

## 12.3 Section 2

***General***

**The inclusion of the groups of Section 2 in reports of merchant ships shall be determined by the Member who recruits the ship. The same rule shall be applied for automatic sea stations.**

**Note: Members are recommended to encourage the inclusion of the maximum possible number of data groups in Section 2 in accordance with Regulation 12.1.3.4.**

**12.3.1** *Group* **222$D_sv_s$**

**12.3.1.1** **This group shall always be included in reports from stations which have observed maritime conditions and in reports from ships being requested to include $D_sv_s$ as a routine procedure.**

**12.3.1.2** **This group shall be encoded as:**

**(a) 22200 for a stationary sea station;**

**(b) 222// for:**

**(i) A coastal land station which reports maritime conditions;**

**(ii) A supplementary or auxiliary ship, except when reporting from an area for which the ship report collecting centre, in order to meet a requirement of a search and rescue centre, has requested inclusion of $D_sv_s$ as a routine procedure.**

**12.3.2** *Group* **($0s_sT_wT_wT_w$)**

**This group shall always be included in reports from ocean weather stations, when data are available.**

**12.3.3** *Groups* **($1P_{wa}P_{wa}H_{wa}H_{wa}$), ($2P_wP_wH_wH_w$), ($70H_{wa}H_{wa}H_{wa}$)**

**12.3.3.1** **Regulation 12.3.2 shall apply to these groups.**

**12.3.3.2** **The group $1P_{wa}P_{wa}H_{wa}H_{wa}$ shall be used to report instrumental wave data in units of 0.5 metre.**

**12.3.3.3** **The group $2P_wP_wH_wH_w$ shall be used to report wind waves, when instrumental wave data are not available.**

**12.3.3.4** **(a) When the sea is calm (no waves and no swell) $P_{wa}P_{wa}H_{wa}H_{wa}$, or $P_wP_wH_wH_w$ as the case may be, shall be reported as 0000;**

**(b) When the estimation of the period is impossible owing to confused sea, $P_wP_w$ shall be reported as 99. When, for the same reason, the height of the waves cannot be determined, $H_wH_w$ shall be encoded as //;**

**(c) In a report from a station that includes instrumental wave data, if data are not available for any other reason for either period or height of waves, $P_{wa}P_{wa}$ or $H_{wa}H_{wa}$, as the case may be, shall be encoded as //. If data are not available for either period or height of waves, Regulation 12.2.3.2 shall apply and the group $1P_{wa}P_{wa}H_{wa}H_{wa}$ shall either be omitted or encoded as 1////;**

**(d) In a report from a station that does not include instrumental wave data, if data are not available for any other reason for either period or height of waves, $P_wP_w$ or $H_wH_w$, as the case may be, shall be encoded as //. If data are not available for either period or height of waves, the group $2P_wP_wH_wH_w$ shall be omitted.**

**12.3.3.5** **The group $70H_{wa}H_{wa}H_{wa}$ shall be reported in addition to the group $1P_{wa}P_{wa}H_{wa}H_{wa}$ when the following conditions have been met:**

**(a) The sea is not calm (e.g. $P_{wa}P_{wa}H_{wa}H_{wa}$ has not been reported as 0000);**

**(b) $H_{wa}H_{wa}$ has not been reported as //;**

**(c) The station has the capability of accurately measuring instrumental wave height in units of 0.1 metre.**

**12.3.4** ***Groups*** **$((3d_{w1}d_{w1}d_{w2}d_{w2})$ $(4P_{w1}P_{w1}H_{w1}H_{w1})$ $(5P_{w2}P_{w2}H_{w2}H_{w2}))$**

**12.3.4.1** **These groups shall be used to report swell data only when swell can be distinguished from wind waves.**

**12.3.4.2** **If only one system of swell is observed:**

**(a) Its direction, period and height shall be indicated, respectively, by $d_{w1}d_{w1}$, $P_{w1}P_{w1}$, $H_{w1}$ $H_{w1}$;**

**(b) $d_{w2}d_{w2}$ shall be encoded as //;**

**(c) Group $5P_{w2}P_{w2}H_{w2}H_{w2}$ shall be omitted.**

**12.3.4.3** **If a second system of swell is observed:**

**(a) Its direction, period and height shall be indicated, respectively, by $d_{w2}d_{w2}$, $P_{w2}P_{w2}$, $H_{w2}H_{w2}$;**

**(b) The corresponding data for the first system of swell shall be reported as prescribed by Regulation 12.3.4.2 (a).**

**12.3.4.4** **Ocean weather stations shall always include swell data when data are available.**

**12.3.5** ***Group*** **$(6I_sE_sE_sR_s)$**

**When the ice accretion on ships is reported in plain language, it shall be preceded by the word ICING.**

**12.3.6** ***Group*** **$(8s_wT_bT_bT_b)$**

**When the wet bulb is used to derive dew-point value in a SHIP report, the group $8s_wT_bT_bT_b$ shall be included to report the wet-bulb temperature measurement.**

**12.3.7** ***Groups*** **$\left(\text{ICE} + \left\{\begin{array}{l} c_iS_ib_iD_iz_i \\ \text{or} \\ \text{plain language} \end{array}\right\}\right)$**

**12.3.7.1** **The reporting of sea ice and ice of land origin in FM 13 shall not supersede the reporting of sea ice and icebergs in accordance with the International Convention for the Safety of Life at Sea.**

**12.3.7.2** **The group $c_iS_ib_iD_iz_i$ shall be reported whenever sea ice and/or ice of land origin are observed from the ship's position at the time of observation, unless the ship is required to report ice conditions by means of a special sea-ice code.**

**12.3.7.3** **When an ice edge is crossed or sighted between observation hours, it shall be reported as a plain-language addition in the form "ice edge lat. long." (with position in degrees and minutes).**

**12.3.7.4** **If the ship is in the open sea reporting an ice edge, the concentration $c_i$ and stage of development $S_i$ shall be reported only if the ship is close to the ice (i.e. within 0.5 nautical mile).**

**12.3.7.5** **The situation in which the ship is in an open lead more than 1.0 nautical mile wide shall be coded as $c_i = 1$ and $D_i = 0$. The situation in which the ship is in fast ice with ice boundary beyond limit of visibility shall be coded as $c_i = 1$ and $D_i = 9$.**

**12.3.7.6** **If no sea ice is visible and the code group is used to report ice of land origin only, the group shall be coded as $0/b_i/0$; e.g. 0/2/0 would mean 6–10 icebergs in sight, but no sea ice.**

**12.3.7.7** **In coding concentration or arrangement of sea ice (code $c_i$), that condition shall be reported which is of the most navigational significance.**

12.3.7.8 **The bearing of the principal ice edge reported shall be to the closest part of that edge.**

**Note: The requirements for sea-ice reporting are covered in the following way by the associated code tables:**

**Symbolic code letter $c_i$**

**(a) The purpose of the first code figure (0) is to establish in relation to code $z_i$ (code figure 0) and code $b_i$ whether the floating ice that is visible is only ice of land origin;**

**(b) The possible variations in sea-ice concentration and arrangement within an area of observation are almost infinite. However, the field of reasonably accurate observation from a ship's bridge is limited. For this reason, and also because minor variations are of temporary significance, the choice of concentrations and arrangements has been restricted for reporting purposes to those representing significantly different conditions from a navigational point of view. The code figures 2–9 have been divided into two sections depending on:**

**(i) Whether sea-ice concentration within the area of observation is more or less uniform (code figures 2–5); or**

**(ii) Whether there are marked contrasts in concentration or arrangement (code figures 6–9).**

**Symbolic code letter $S_i$**

**(a) This table represents a series of increasing navigational difficulties for any given concentration; i.e. if the concentration is, for example, 8/10ths, then new ice would hardly have any effect on navigation while predominantly old ice would provide difficult conditions requiring reductions in speed and frequent course alterations;**

**(b) The correlation between the stage of development of sea ice and its thickness is explained in the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8).**

**Symbolic code letter $b_i$**

**(a) This code provides a scale of increasing navigational hazard;**

**(b) Growlers and bergy bits, being much smaller and lower in the water than icebergs, are more difficult to see either by eye or radar. This is especially so if there is a heavy sea running. For this reason, code figures 4 and 5 represent more hazardous conditions than code figures 1 to 3.**

**Symbolic code letter $D_i$**

**There is no provision in this code for the reporting of distance from the ice edge. It will be assumed by those receiving the report that the bearing has been given to the closest part of the ice edge. From the reported code figures for concentration and stage of development, it will be clear whether the ship is in ice or within 0.5 nautical mile of the ice edge. If the ship is in open water and more than 0.5 nautical mile from the ice edge, the ice edge will be assumed to be aligned at right angles to the bearing which is reported.**

**Symbolic code letter $z_i$**

**(a) The purpose of this element in the code is to establish:**

**(i) Whether the ship is in pack ice or is viewing floating ice (i.e. sea ice and/or ice of land origin) from the open sea; and**

**(ii) A qualitative estimate, dependent on the sea-ice navigation capabilities of the reporting ship, of the penetrability of the sea ice and of the recent trend in conditions;**

**(b) The reporting of the conditions represented by code figures 1–9 in Code table 5239 can be used to help in the interpretation of reports from the two code tables (concentration $c_i$ and stage of development $S_i$).**

**12.4 Section 3**

**This section shall be used for regional exchange.**

**12.4.1** **The inclusion of groups with indicator figures 1 to 6, 8 and 9 shall be decided regionally. However group $7R_{24}R_{24}R_{24}R_{24}$ shall be included by all stations (with the exception of stations situated in the Antarctic) capable of doing so, once a day at one appropriate time of the main standard times (0000, 0600, 1200 or 1800 UTC).**

**12.4.2** **The symbolic form of the group with indicator figure 0 shall be developed regionally, as well as the rules for its inclusion in Section 3.**

**12.4.3** **Other figure groups shall be developed regionally in order to cover requirements which cannot be satisfied by the existing groups. In order to avoid ambiguities, these other groups shall be:**

**(a)** **Provided with indicator figures 0, 1, 2, etc.;**

**(b)** **Preceded by an indicator group 80000 located after the last of the existing figure groups that was included in the report.**

**Notes:**

**(1)** **For example, if three supplementary groups are developed, a report including state of the ground, precipitation and cloud data would present Section 3 as 333 3Ejjj $6RRRt_R$ $8N_sCh_sh_s$ 80000 0 . . . . 1 . . . . 2 . . . .**

**(2)** **See Regulation 12.1.3.5.**

**12.4.4** ***Groups*** **($1s_nT_xT_xT_x$), ($2s_nT_nT_nT_n$)**

**The period of time covered by the maximum and the minimum temperature and the synoptic hour at which these temperatures are reported shall be determined by regional decision.**

**12.4.5** ***Group*** **(3Ejjj)**

**The use of the parameter(s) jjj shall be fixed regionally.**

**12.4.6** ***Group*** **(4E´sss)**

**12.4.6.1** **The measurement shall include snow, ice and all other forms of solid precipitation on the ground at the time of observation.**

**12.4.6.2** **When the depth is not uniform, the average depth over a representative area shall be reported.**

**12.4.7** ***Groups*** **($5j_1j_2j_3j_4$ ($j_5j_6j_7j_8j_9$))**

**12.4.7.1** ***Symbolic expression***

**12.4.7.1.1** **When the group $5j_1j_2j_3j_4$ is used in the form $55j_2j_3j_4$, $553j_3j_4$, $554j_3j_4$ or $555j_3j_4$, the supplementary group $j_5j_6j_7j_8j_9$ shall be added to report net radiation, global solar radiation, diffused solar radiation, long-wave radiation, short-wave radiation, net short-wave radiation or direct solar radiation if data are available. The group shall be repeated as often as necessary.**

**Note: If sunshine duration is not available, the group shall be reported as 55///, 553//, 55407, 55408, 55507 or 55508 whenever the group $j_5j_6j_7j_8j_9$ is required to report radiation data.**

**12.4.7.1.2** **When the group $5j_1j_2j_3j_4$ is used, one or more of the following symbolic expressions shall be adopted:**

**(a)** **$5EEEi_E$** **to report the daily amount of either evaporation or evapo-transpiration;**

**(b)** **$54g_0s_nd_T$** **to report temperature change data in period covered by $W_1W_2$;**

**(c)** **55SSS** **to report the daily hours of sunshine;**

**(d)** **553SS** **to report the duration of sunshine in the past hour;**

**(e)** **55407** **to indicate that the supplementary group 4FFFF, which follows immediately, is used to report net short-wave radiation during the previous hour, in kJ $m^{-2}$;**

**(f) 55408 to indicate that the supplementary group 4FFFF, which follows immediately, is used to report direct solar radiation during the previous hour, in kJ $m^{-2}$;**

**(g) 55507 to indicate that the supplementary group $5F_{24}F_{24}F2_{24}F_{24}$, which follows immediately, is used to report net short-wave radiation during the preceding 24 hours, in J $cm^{-2}$;**

**(h) 55508 to indicate that the supplementary group $5F_{24}F_{24}F2_{24}F_{24}$, which follows immediately, is used to report direct solar radiation during the preceding 24 hours, in J $cm^{-2}$;**

**(i) $56D_LD_MD_H$ to report data on direction of cloud drift;**

**(j) $57CD_ae_C$ to report data on direction and elevation of cloud;**

**(k) $58p_{24}p_{24}p_{24}$ to report positive or zero change of surface pressure over the last 24 hours;**

**(l) $59p_{24}p_{24}p_{24}$ to report negative change of surface pressure over the last 24 hours.**

**12.4.7.1.3 When more than one group $5j_1j_2j_3j_4$ is used, these groups shall be included in the order as listed in Regulation 12.4.7.1.2 with the supplementary groups $j_5j_6j_7j_8j_9$ at the appropriate place.**

**12.4.7.2** ***Daily evaporation or evapotranspiration***

**12.4.7.2.1 The symbolic expression $5EEEi_E$ shall be used to report either daily evaporation or evapotranspiration.**

**12.4.7.2.2 EEE shall indicate the amount of either evaporation or evapotranspiration, in tenths of a millimetre, during the preceding 24 hours at either 0000, 0600 or 1200 UTC.**

**12.4.7.3** ***Temperature change***

**For a change of temperature to be reported, the change shall be equal to or more than 5°C and occur in less than 30 minutes during the period covered by $W_1W_2$.**

Note: The reporting of this information is restricted by regional or national decision to islands or other widely separated stations.

**12.4.7.4** ***Duration of sunshine and radiation data***

**12.4.7.4.1 The symbolic expression SSS shall be used to report the daily sunshine, in hours and tenths of an hour. The symbolic expression SS (in group 553SS) shall be used to report the duration of sunshine in the past hour, in tenths of an hour.**

**12.4.7.4.2 In the form 55SSS, this group shall, by regional decision, be reported by all stations capable of doing so and included at either 0000, 0600, 1200 or 1800 UTC.**

**12.4.7.4.3 When the group $5j_1j_2j_3j_4$ has the form 553SS, the supplementary group(s) $j_5$FFFF may take one or more of the following forms:**

**$j_5$ = 0 FFFF = positive net radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 1 FFFF = negative net radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 2 FFFF = global solar radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 3 FFFF = diffused solar radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 4 FFFF = downward long-wave radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 5 FFFF = upward long-wave radiation during the previous hour, in kJ $m^{-2}$;**

**$j_5$ = 6 FFFF = short-wave radiation during the previous hour, in kJ $m^{-2}$.**

Note: For reporting net short-wave and direct solar radiation during the previous hour, see Regulation 12.4.7.1.2 (e) and (f), respectively.

**12.4.7.4.4 When the group $5j_1j_2j_3j_4$ has the form 55SSS, the supplementary group(s) $j_5F_{24}F_{24}F_{24}F_{24}$ may take one or more of the following forms:**

**$j_5$ = 0 $F_{24}F_{24}F_{24}F_{24}$ = positive net radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 1 $F_{24}F_{24}F_{24}F_{24}$ = negative net radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 2 $F_{24}F_{24}F_{24}F_{24}$ = global solar radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 3 $F_{24}F_{24}F_{24}F_{24}$ = diffused solar radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 4 $F_{24}F_{24}F_{24}F_{24}$ = downward long-wave radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 5 $F_{24}F_{24}F_{24}F_{24}$ = upward long-wave radiation during the preceding 24 hours, in J $cm^{-2}$;**

**$j_5$ = 6 $F_{24}F_{24}F_{24}F_{24}$ = short-wave radiation during the preceding 24 hours, in J $cm^{-2}$.**

**Note: For reporting net short-wave and direct solar radiation during the preceding 24 hours, see Regulation 12.4.7.1.2 (g) and (h), respectively.**

**12.4.7.4.5 FFFF shall indicate the absolute value of the amount of solar or terrestrial radiation as appropriate, in kJ $m^{-2}$, during the preceding hour. $F_{24}F_{24}F_{24}F_{24}$ shall indicate the absolute value of the amount of solar or terrestrial radiation as appropriate, in J $cm^{-2}$, during the preceding 24 hours at either 0000, 0600, 1200 or 1800 UTC.**

**12.4.7.5** ***Direction, drift and elevation of cloud***

**Note: This information is required from land stations and fixed ship stations, mainly in the tropics.**

**12.4.8** ***Group*** **($6RRRt_R$)**

**12.4.8.1 This group shall be included in Section 3 only when Regulation 12.2.5.2 applies.**

**12.4.8.2 The decision to implement Regulation 12.2.5.2 shall be taken at the regional level.**

**12.4.9** ***Group*** **($7R_{24}R_{24}R_{24}R_{24}$)**

**This group shall be used to report the total amount of precipitation during the 24-hour period ending at the time of observation, in tenths of a millimetre (coded 9998 for 999.8 mm or more, and coded 9999 for trace).**

**12.4.10** ***Group*** **($8N_sCh_sh_s$)**

**12.4.10.1 This group shall be repeated to report a number of different layers or masses of cloud. When reported from a manned station, the number of such groups shall in the absence of Cumulonimbus clouds not exceed three. Cumulonimbus clouds, when observed, shall always be reported, so that the total number of groups can be four. When the station operates in the automatic mode, the total number of groups shall not exceed four.**

**The selection of layers (masses) to be reported shall be made in accordance with the following criteria:**

**(a) The lowest individual layer (mass) of any amount ($N_s$ equals 1 or more);**

**(b) The next higher individual layer (mass) the amount of which is greater than two oktas ($N_s$ equals 3 or more);**

**(c) The next higher individual layer (mass) the amount of which is greater than four oktas ($N_s$ equals 5 or more);**

**(d) Cumulonimbus clouds, whenever observed and not reported under (a), (b) and (c) above by means of a group referring exclusively to Cb.**

**12.4.10.2 The order of reporting the groups shall always be from lower to higher levels.**

**12.4.10.3 In determining the cloud amounts to be reported for individual layers or masses in the 8-group, the observer shall estimate, by taking into consideration the evolution of the sky, the cloud amounts of each layer or mass at the different levels, as if no other clouds existed.**

**12.4.10.4 When the sky is clear (N = 0), the 8-group shall not be used.**

**12.4.10.5** **When the sky is obscured ($N_s$ = 9), the 8-group shall read 89/$h_sh_s$, where $h_sh_s$ is the vertical visibility. When the observation of clouds is not made (N = /), the 8-group shall not be included.**

**Note: The vertical visibility is defined as the vertical visual range into an obscuring medium.**

**12.4.10.6** **If two or more types of cloud occur with their bases at the same level and this level is one to be reported in accordance with Regulation 12.4.10.1, the selection for C and $N_s$ shall be made in accordance with the following criteria:**

**(a) If these types do not include cumulonimbus then C shall refer to the cloud type that represents the greatest amount, or if there are two or more types of cloud all having the same amount, the highest applicable code figure for C shall be reported. $N_s$ shall refer to the total amount of cloud whose bases are all at the same level;**

**(b) If these types do include cumulonimbus then one group shall be used to describe only this type with C reported as 9 and $N_s$ as the amount of cumulonimbus. If the total amount of the remaining type(s) of cloud (excluding cumulonimbus) whose bases are all at the same level is greater than that required by Regulation 12.4.10.1, then another group shall be reported with C being selected in accordance with (a) and $N_s$ referring to the total amount of the remaining cloud (excluding cumulonimbus).**

**12.4.10.7** **Regulations 12.2.2.2.3 to 12.2.2.2.6, inclusive, shall apply.**

**12.4.11** ***Group*** **(9$S_PS_Ps_ps_p$)**

**The use of this group and the specifications for the supplementary information shall be as specified in Code table 3778.**

## 12.5 Section 4

**12.5.1** **The inclusion of this section shall be fixed nationally.**

**12.5.2** **Clouds with tops below station level shall be reported only by this section and any coexistent clouds with bases above station level shall be reported in group 8$N_hC_LC_MC_H$ of Section 1.**

**12.5.3** **$C_L$ clouds with bases below and tops above station level shall be reported in both 8$N_hC_LC_MC_H$ and Section 4, provided that the station is out of cloud sufficiently frequently to enable the various features to be recognized. In this case:**

**(a) $N_h$ shall correspond with N´ and $C_L$ with C´ while h shall be coded as /;**

**(b) If the upper surface of the clouds with tops above station level can be observed, it shall be reported by means of H´H´. If the upper surface cannot be observed, H´H´ shall be coded as //;**

**(c) Other $C_L$ clouds present with tops below station level shall be reported in a second N´C´H´H´$C_t$ group;**

**(d) Other $C_L$ clouds present with bases above station level shall be reported in plain language after the N´C´H´H´$C_t$ group.**

**12.5.4** **If the station is in almost continuous cloud, Regulation 12.2.7.1 shall apply and Section 4 shall be omitted.**

**12.5.5** **When two or more cloud layers with their bases below station level occur at different levels, two or more groups N´C´H´H´$C_t$ shall be used. $C_t$ shall be reported as 9 in the groups indicating the layer of the smaller cloud amount and, in the remaining group, $C_t$ shall be coded in Code table 0552.**

**12.5.6** **Rapidly dissipating condensation trails shall not be reported in Section 4.**

**Note: See Regulation 12.2.2.2.5.**

**12.5.7** **The top of persistent condensation trails and cloud masses which have obviously developed from condensation trails shall be reported, using the appropriate $C_t$ code figure.**

**12.5.8** **Regulations 12.2.2.2.1 to 12.2.2.2.6, inclusive, shall apply.**

**12.5.9** **Spaces occupied by mountains emerging from the cloud layers shall be counted as occupied by cloud.**

## 12.6 Section 5

**12.6.1** **The use of this section, the symbolic form of groups and the specifications of symbolic letters shall be determined by national decision.**

**12.6.2** **Preference shall be given to symbolic 5-figure groups identified by numerical indicator figures.**

**FM 15–XV METAR** **Aerodrome routine meteorological report (with or without trend forecast)**

**FM 16–XV SPECI** **Aerodrome special meteorological report (with or without trend forecast)**

**C O D E F O R M :**

$$\left.\begin{matrix}\textbf{METAR}\\ \text{or}\\ \textbf{SPECI}\end{matrix}\right\}\quad \textbf{COR}\quad \text{CCCC}\quad \text{YYGGgg}\textbf{Z}\quad \textbf{NIL}\quad \textbf{AUTO}\quad \text{dddff}\textbf{G}\text{f}_m\text{f}_m \left\{\begin{matrix}\textbf{KT}\\ \text{or}\\ \textbf{MPS}\end{matrix}\right\}\quad \text{d}_n\text{d}_n\text{d}_n\textbf{V}\text{d}_x\text{d}_x\text{d}_x$$

$$\left\{\begin{matrix}\text{VVVV}\\ \text{or}\\ \textbf{CAVOK}\end{matrix}\right.\quad \text{V}_N\text{V}_N\text{V}_N\text{V}_N\text{D}_v\quad \textbf{R}\text{D}_R\text{D}_R/\text{V}_R\text{V}_R\text{V}_R\text{V}_R\text{i}\quad \text{w}'\text{w}'\quad \left\{\begin{matrix}\text{N}_s\text{N}_s\text{N}_s\text{h}_s\text{h}_s\text{h}_s\\ \text{or}\\ \textbf{VV}\text{h}_s\text{h}_s\text{h}_s\\ \text{or}\\ \textbf{NSC}\\ \text{or}\\ \textbf{NCD}\end{matrix}\right\}$$

$$\text{T}'\text{T}'/\text{T}'_d\text{T}'_d\quad \textbf{Q}\text{P}_H\text{P}_H\text{P}_H\text{P}_H\quad \textbf{RE}\text{w}'\text{w}'\quad \left\{\begin{matrix}\textbf{WS R}\text{D}_R\text{D}_R\\ \text{or}\\ \textbf{WS ALL RWY}\end{matrix}\right.\left\{\begin{matrix}(\textbf{W}\text{T}_s\text{T}_s/\textbf{S}\text{S}')\\ \text{or}\\ (\textbf{W}\text{T}_s\text{T}_s/\textbf{H}\text{H}_s\text{H}_s\text{H}_s)\end{matrix}\right\}\quad (\textbf{R}\text{D}_R\text{D}_R/\text{E}_R\text{C}_R\text{e}_R\text{e}_R\text{B}_R\text{B}_R)$$

$$\left\{\begin{matrix}(\text{TTTTT}\\ \text{or}\\ \textbf{NOSIG})\end{matrix}\right.\quad \text{TTGGgg}\quad \text{dddff}\textbf{G}\text{f}_m\text{f}_m\left\{\begin{matrix}\textbf{KT}\\ \text{or}\\ \textbf{MPS}\end{matrix}\right.\quad \left\{\begin{matrix}\text{VVVV}\\ \text{or}\\ \textbf{CAVOK}\end{matrix}\right.\quad \left\{\begin{matrix}\text{w}'\text{w}'\\ \text{or}\\ \textbf{NSW}\end{matrix}\right.\quad \left\{\begin{matrix}\text{N}_s\text{N}_s\text{N}_s\text{h}_s\text{h}_s\text{h}_s\\ \text{or}\\ \textbf{VV}\text{h}_s\text{h}_s\text{h}_s\\ \text{or}\\ \textbf{NSC}\end{matrix}\right.$$

(**RMK** . . . . . . . . . . )

**Notes:**

(1) METAR is the name of the code for an aerodrome routine meteorological report. SPECI is the name of the code for an aerodrome special meteorological report. A METAR report and a SPECI report may have a trend forecast appended.

(2) The groups contain a non-uniform number of characters. When an element or phenomenon does not occur, the corresponding group, or the extension of a group, is omitted from a particular report. Detailed instructions are given for each group in the following Regulations. The groups enclosed in brackets are used in accordance with regional or national decisions. Groups may have to be repeated in accordance with the detailed instructions for each group. The code words COR and NIL shall be used, as appropriate, for corrected and missing reports, respectively.

(3) The code form includes a section containing the trend forecast identified either by a change indicator (TTTTT = BECMG or TEMPO as the case may be), or by the code word NOSIG.

(4) The governing criteria for issuing SPECI reports are specified in the *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

**REGULATIONS:**

## 15.1 General

**15.1.1** **The code name METAR or SPECI shall be included at the beginning of each individual report.**

**15.1.2** **When a deterioration of one weather element is accompanied by an improvement in another element (for example, lowering of clouds and an improvement in visibility), a single SPECI report shall be issued.**

## 15.2 Group CCCC

**The identification of the reporting station in each individual report shall be indicated by means of the ICAO location indicator.**

## 15.3 Group YYGGggZ

**15.3.1** **The day of the month and the time of observation in hours and minutes UTC followed, without a space, by the letter indicator Z shall be included in each individual METAR report.**

**15.3.2** **This group shall be included in each individual SPECI report. In SPECI reports, this group shall indicate the time of occurrence of the change(s) which justified the issue of the report.**

## 15.4 Code word AUTO

**The optional code word AUTO shall be inserted before the wind group when a report contains fully automated observations without human intervention. The ICAO requirement is that all of the specified elements shall be reported. However, if any element cannot be observed, the group in which it would have been encoded shall be replaced by the appropriate number of solidi. The number of solidi depends on the number of symbolic letters for the specific group which is not able to be reported; i.e. four for the visibility group, two for the present weather group and three or six for the cloud group, as appropriate.**

## 15.5 Groups $dddffGf_mf_m \left\{\begin{matrix} KT \\ or \\ MPS \end{matrix}\right\}$ $d_nd_nd_nVd_xd_xd_x$

**15.5.1** **The mean true direction in degrees rounded off to the nearest 10 degrees from which the wind is blowing and the mean speed of the wind over the 10-minute period immediately preceding the observation shall be reported for dddff followed, without a space, by one of the abbreviations KT or MPS, to specify the unit used for reporting wind speed. Values of wind direction less than 100° shall be preceded by 0 and a wind from true north shall be reported as 360. Values of wind speed less than 10 units shall be preceded by 0. However, when the 10-minute period includes a marked discontinuity in the wind characteristics, only data after the discontinuity shall be used for obtaining mean wind speed and maximum gust values, and mean wind direction and variations of the wind direction, hence the time interval in these circumstances shall be correspondingly reduced.**

**Notes:**

(1) KT and MPS are the standard ICAO abbreviations for knots and metres per second, respectively.

(2) The primary unit prescribed in ICAO Annex 5 for wind speed is the metre per second (MPS), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided.

(3) A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 5 m $s^{-1}$ (10 KT) or more before or after the change, or a change in wind speed of 5 m $s^{-1}$ (10 KT) or more, lasting at least two minutes.

**15.5.2** **In the case of variable wind direction, ddd shall be encoded as VRB when the mean wind speed is less than 1.5 m $s^{-1}$ (3 knots). A variable wind at higher speeds shall be reported only when the variation of wind direction is 180° or more or when it is impossible to determine a single wind direction, for example when a thunderstorm passes over the aerodrome.**

**15.5.3** **If, during the 10-minute period preceding the observation, the total variation in wind direction is 60° or more but less than 180° and the mean wind speed is 1.5 m $s^{-1}$ (3 knots) or more, the observed two extreme directions between which the wind has varied shall be given for $d_nd_nd_n\mathbf{V}d_xd_xd_x$ in clockwise order. Otherwise this group shall not be included.**

**15.5.4** **"Calm" shall be coded as 00000 followed immediately, without a space, by one of the abbreviations KT or MPS to specify the unit, used normally for reporting wind.**

**15.5.5** **If, during the 10-minute period preceding the observation, the maximum wind gust speed exceeds the mean speed by 5 m $s^{-1}$ (10 knots) or more, this maximum speed shall be reported as $\mathbf{G}f_mf_m$ immediately after dddff, followed immediately, without a space, by one of the abbreviations KT or MPS to specify the units used for reporting wind speed. Otherwise the element $\mathbf{G}f_mf_m$ shall not be included.**

**Note: It is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average.**

**15.5.6** **For wind speeds of 100 units or greater, the exact number of wind speed units shall be given in lieu of the two-figure code ff or $f_mf_m$. When the wind speed is 50 m $s^{-1}$ (100 knots) or more, the groups ff and $f_mf_m$ shall be preceded by the letter indicator P and reported as P49MPS (P99KT).**

**Note: There is no aeronautical requirement to report surface wind speeds of 50 m $s^{-1}$ (100 KT) or more; however, provision has been made for reporting wind speeds up to 99 m $s^{-1}$ (199 KT) for non-aeronautical purposes, as necessary.**

## 15.6 Groups VVVV $V_NV_NV_NV_ND_v$

**Note: The coding of visibility is based on the use of the metre and kilometre, in accordance with the units specified in ICAO Annex 5.**

**15.6.1** **The group VVVV shall be used to report prevailing visibility. When the horizontal visibility is not the same in different directions and when the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, the group VVVV shall be used to report the lowest visibility.**

**15.6.2** ***Directional variation in visibility*** **$V_NV_NV_NV_ND_v$**

**When the horizontal visibility is not the same in different directions and when the minimum visibility is different from the prevailing visibility, and less than 1 500 metres or less than 50% of the prevailing visibility, and less than 5 000 metres, the group $V_NV_NV_NV_ND_v$ shall also be used to report the minimum visibility and, when possible, its general direction in relation to the aerodrome reference point indicated by reference to one of the eight points of the compass. If the minimum visibility is observed in more than one direction, the $D_v$ shall represent the most operationally significant direction.**

**15.6.3** **Visibility shall be reported using the following reporting steps:**

**(a) Up to 800 metres rounded down to the nearest 50 metres;**

**(b) Between 800 and 5 000 metres rounded down to the nearest 100 metres;**

**(c) Between 5 000 metres up to 9 999 metres rounded down to the nearest 1 000 metres;**

**(d) With 9999 indicating 10 km and above.**

**15.6.4** ***Code word* CAVOK**

**Regulation 15.10 shall apply.**

## 15.7 Group $\mathbf{R}D_RD_R/V_RV_RV_RV_Ri$

**Note: The coding of runway visual range is based on the use of the metre in accordance with the unit specified in ICAO Annex 5.**

**15.7.1** **During periods when either the horizontal visibility reported in the group VVVV or the runway visual range for one or more runways available for landing is observed to be less than 1 500 metres, one or more groups under Regulation 15.7 shall be included in the report. The letter indicator R followed immediately, without a space, by the runway designator $D_RD_R$ shall always precede the RVR reports.**

**15.7.2** **The groups shall be repeated to report runway visual range values for each runway, up to a maximum of four, which is available for landing and for which runway visual range is determined.**

**15.7.3** ***Runway designator* $D_RD_R$**

**The designator of each runway for which runway visual range is reported shall be indicated by $D_RD_R$. Parallel runways should be distinguished by appending to $D_RD_R$ letters L, C or R indicating the left, central or right parallel runway, respectively. The letter(s) shall be appended to $D_RD_R$ as necessary in accordance with the standard practice for runway designation, as laid down by ICAO in Annex 14 – Aerodromes, Volume I – Aerodrome design and operations, paragraphs 5.2.2.4 and 5.2.2.5.**

**15.7.4** ***Mean value and tendency of runway visual range over the 10-minute period immediately preceding the observation* $V_RV_RV_RV_Ri$**

**15.7.4.1** **The runway visual range values to be reported shall be representative of the touchdown zone of the active landing runway(s) up to a maximum of four.**

**15.7.4.2** **The mean value of the runway visual range over the 10-minute period immediately preceding the observation shall be reported for $V_RV_RV_RV_R$. However, when the 10-minute period includes a marked discontinuity in the RVR (for example, sudden advection of fog, rapid onset or cessation of an obscuring snow shower), only data after the discontinuity shall be used for obtaining mean RVR values, hence the time interval in these circumstances shall be correspondingly reduced.**

**Notes:**

**(1) The extreme values of the runway visual range are indicated in accordance with Regulation 15.7.5 and the trend is indicated in accordance with Regulation 15.7.4.3.**

**(2) Any observed value which does not fit the reporting scale in use should be rounded down to the nearest lower step in the scale.**

**(3) A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least two minutes and during which it reaches or passes 800, 550, 300 and 175 m.**

**15.7.4.3** **If the runway visual range values during the 10-minute period preceding the observation show a distinct upward or downward tendency such that the mean during the first five minutes varies by 100 metres or more from the mean during the second five minutes of the period, this shall be indicated by i = U for upward and i = D for downward tendency of runway visual range values. When no distinct change in runway visual range is observed, i = N shall be used. When it is not possible to determine the tendency, i shall be omitted.**

**15.7.5** ***Extreme values of runway visual range***

**When actual RVR values are outside the measuring range of the observing system in use, the following procedure shall apply:**

**(a) When the RVR, to be reported in accordance with the *Technical Regulations*, is greater than the maximum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator P ($PV_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the highest value which can be assessed. When the RVR is assessed to be more than 2 000 metres, it shall be reported as P2000;**

**(b) When the RVR is below the minimum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator M ($MV_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the lowest value which can be assessed. When the RVR is assessed to be less than 50 metres, it shall be reported as M0050.**

## 15.8 Group w´w´

**15.8.1** **One or more groups w´w´, but not more than three, shall be used to report all present weather phenomena observed at or near the aerodrome and of significance to aeronautical operations in accordance with Code table 4678.**

**Appropriate intensity indicators and letter abbreviations (Code table 4678) shall be combined in groups of two to nine characters to indicate present weather phenomena.**

**15.8.2** **If the observed present weather cannot be reported by use of Code table 4678, the group w´w´ shall be omitted from the report.**

**15.8.3** **The w´w´ groups shall be ordered as follows:**

**(a) First, if appropriate, the qualifier for intensity *or* for proximity, followed without a space by;**

**(b) If appropriate, the abbreviation for the descriptor followed without a space by;**

**(c) The abbreviation for the observed weather phenomenon or combinations thereof.**

**15.8.4** **Intensity shall be indicated only with precipitation, precipitation associated with showers and/or thunderstorms, funnel cloud, duststorm or sandstorm. If the intensity of the phenomena reported in the group is either light or heavy, this shall be indicated by the appropriate sign (see Code table 4678 and specially Note (5)). No indicator shall be included in the group when the intensity of the reported phenomenon is moderate.**

**15.8.5** **The intensity of present weather phenomena reported in the group w´w´ shall be determined by the intensity at the time of observation.**

**15.8.6** **If more than one significant weather phenomenon is observed, separate w´w´ groups shall be included in the report in accordance with Code table 4678. However, if more than one form of precipitation is observed, the appropriate letter abbreviations shall be combined in a single group with the dominant type of precipitation being reported first. In such a single group, the intensity shall refer to the total precipitation and be reported with one or no indicator as appropriate.**

**When an automatic observing system is used and when the type of the precipitation cannot be identified by this system, the abbreviation UP shall be used for precipitation. The abbreviation UP may be combined, as necessary, with the following characteristics of present weather: FZ, SH and TS.**

**15.8.7** **The qualifier SH shall be used to indicate precipitation of the shower type. When associated with the indicator VC, the type and intensity of precipitation shall not be specified.**

**Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers, openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.**

**15.8.8 The qualifier TS shall be used whenever thunder is heard or lightning is detected at the aerodrome within the 10-minute period preceding the time of observation. When appropriate, TS shall be followed immediately, without a space, by relevant letter abbreviations to indicate any precipitation observed. The letter abbreviation TS on its own shall be used when thunder is heard or lightning detected at the aerodrome but no precipitation observed.**

Note: A thunderstorm shall be regarded as being at the aerodrome from the time thunder is first heard, whether or not lightning is seen or precipitation is observed at the aerodrome. A thunderstorm shall be regarded as having ceased or being no longer at the aerodrome at the time thunder is last heard, and the cessation is confirmed if thunder is not heard for 10 minutes after this time.

**15.8.9 The qualifier FZ shall be used only to indicate supercooled water droplets or supercooled precipitation.**

Notes:

(1) Any fog consisting predominantly of water droplets at temperatures below 0°C shall be reported as freezing fog (FZFG) whether it is depositing rime ice or not.

(2) Whether or not the supercooled precipitation is of the shower type shall not be specified.

**15.8.10 The qualifier VC shall be used to indicate the following significant weather phenomena observed in the vicinity of the aerodrome: TS, DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN and VA. Regulations referring to the combination of VC and FG are given in Regulation 15.8.16.**

Notes:

(1) Such weather phenomena should be reported with the qualifier VC only when observed between approximately 8 km and 16 km from the aerodrome reference point. The actual range for which the qualifier VC is to be applied will be determined locally, in consultation with aeronautical authorities.

(2) See Regulation 15.8.7.

**15.8.11 The letter abbreviation GR shall be used to report hail only when the diameter of the largest hailstones observed is 5 mm or more. The letter abbreviation GS shall be used to report small hail (diameter of the hailstones less than 5 mm) and/or snow pellets.**

**15.8.12 The letter abbreviations FU, HZ, DU and SA (except DRSA) shall be used only when the obstruction to vision consists predominantly of lithometeors and the visibility is reduced by the reported phenomenon to 5 000 metres or less.**

**15.8.13 The letter abbreviation BR shall be used when the obstruction to vision consists of water droplets or ice crystals. For w´w´= BR to be reported, the visibility reported in the group VVVV shall be at least 1 000 metres but not more than 5 000 metres.**

**15.8.14 The letter abbreviation FG shall be used when the obstruction to vision consists of water droplets or ice crystals (fog or ice fog). For w´w´= FG to be reported without the qualifiers MI, BC, PR or VC, the visibility reported in the group VVVV shall be less than 1 000 metres.**

**15.8.15 For w´w´= MIFG to be reported, the visibility at two metres above ground level shall be 1 000 metres or more and the apparent visibility in the fog layer shall be less than 1 000 metres.**

**15.8.16 The letter abbreviation VCFG shall be used to report any type of fog observed in the vicinity of the aerodrome.**

**15.8.17 The letter abbreviation BCFG shall be used to report fog patches and the letter abbreviation PRFG to report fog covering part of the aerodrome; the apparent visibility in the fog patch or bank shall be less than 1 000 metres, the fog extending to at least 2 metres above ground level.**

Note: BCFG should be used only when the visibility in parts of the aerodrome is 1 000 metres or more although, when the fog is close to the observing point, the minimum visibility reported by $V_NV_NV_NV_ND_v$ will be less than 1 000 metres.

**15.8.18** **The letter abbreviation SQ shall be used to report squalls when a sudden increase in wind speed is observed of at least 8 m $s^{-1}$ (16 knots), the speed rising to 11 m $s^{-1}$ (22 knots) or more and lasting for at least one minute.**

**15.8.19** **When an automatic observing system is used and the present weather cannot be observed, the present weather group shall be replaced by //.**

**15.8.20** **Regulation 15.10 shall apply.**

**15.9** **Group** $\left\{\begin{array}{l}\mathbf{N_sN_sN_sh_sh_sh_s}\\ \text{or}\\ \mathbf{VVh_sh_sh_s}\\ \text{or}\\ \mathbf{NSC}\\ \text{or}\\ \mathbf{NCD}\end{array}\right.$

**15.9.1** ***Cloud amount and cloud height*** $\mathbf{N_sN_sN_sh_sh_sh_s}$

**15.9.1.1** **Cloud amount, cloud type and height of cloud base shall be reported to describe only the clouds of operational significance, i.e., clouds with the height of base below 1 500 meters (5 000 ft) or below the highest minimum sector altitude, whichever is greater, or cumulonimbus or towering cumulus at any height. The cloud amount $N_sN_sN_s$ shall be reported as few (1 to 2 oktas), scattered (3 to 4 oktas), broken (5 to 7 oktas) or overcast (8 oktas), using the three-letter abbreviations FEW, SCT, BKN and OVC followed, without a space, by the height of the base of the cloud layer (mass) $h_sh_sh_s$. If there are no clouds below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, no cumulonimbus and no towering cumulus and no restriction on vertical visibility, and the abbreviations CAVOK is not appropriate, then the abbreviation NSC shall be used. When an automatic observing system is used and no clouds are detected by that system, the abbreviation NCD shall be used.**

**15.9.1.2** **The amount of each cloud layer (mass) shall be determined as if no other clouds were existing.**

**15.9.1.3** **The cloud group shall be repeated to report different layers or masses of cloud. The number of groups shall not exceed three, except that significant convective clouds, when observed, shall always be reported.**

**Note:** **The following clouds shall be reported as significant convective clouds:**

**(a)** **Cumulonimbus cloud (CB);**

**(b)** **Cumulus congestus of great vertical extent (TCU). The contraction TCU, taken from the term "towering cumulus", is an ICAO abbreviation used in aeronautical meteorology to describe this cloud.**

**15.9.1.4** **The selection of layers or masses of cloud to be reported shall be made in accordance with the following criteria:**

| | |
|---|---|
| **1st group:** | **the lowest individual layer (mass) of any amount, to be reported as FEW, SCT, BKN or OVC;** |
| **2nd group:** | **the next individual layer (mass) covering more than two oktas, to be reported as SCT, BKN or OVC;** |
| **3rd group:** | **the next higher individual layer (mass) covering more than four oktas, to be reported as BKN or OVC;** |
| **Additional groups:** | **significant convective clouds (CB or TCU) when observed and not already reported in one of the three groups above.** |

**The order of reporting the groups shall be from lower to higher levels.**

**15.9.1.5** **The height of cloud base shall be reported in steps of 30 m (100 ft) up to 3 000 m (10 000 ft). Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.**

**15.9.1.6** **When cumulonimbus clouds or towering cumulus clouds are detected by the automatic observing system and the cloud amount and/or the height of cloud base cannot be observed, the cloud amount and/or the height of cloud base elements should be replaced by ///.**

**15.9.1.7** **Types of cloud other than significant convective clouds shall not be identified. Significant convective clouds, when observed, shall be identified by appending the letter abbreviations CB (cumulonimbus) or TCU (cumulus congestus of great vertical extent), as appropriate, to the cloud group without a space. When an automatic observing system is used and the cloud type cannot be observed by that system, the cloud type in each cloud group shall be replaced by ///.**

**Note: When an individual layer (mass) of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only and the amount of clouds shall be encoded as the sum of the CB and TCU amounts.**

**15.9.2** *Vertical visibility* **VV**$h_sh_sh_s$

**When the sky is obscured and information on vertical visibility is available, the group VV**$h_sh_sh_s$ **shall be reported, where** $h_sh_sh_s$ **is the vertical visibility in units of 30 metres (hundreds of feet). When information on vertical visibility is not available due to a temporary failure of a sensor or system, the group shall read VV///.**

**Notes:**

**(1) The vertical visibility is defined as the vertical visual range into an obscuring medium.**

**(2) See Note (2) to Regulation 15.7.4.2.**

**15.9.3** **Regulation 15.10 shall apply.**

## 15.10 Code word CAVOK

**The code word CAVOK shall be included in place of the groups under Regulations 15.6, 15.8 and 15.9, when the following conditions occur simultaneously at the time of observation:**

**(a) Visibility reported in the group VVVV is 10 km or more and criteria for inclusion of the group** $V_NV_NV_NV_ND_V$ **are not met;**

**(b) No cloud below 1 500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus;**

**(c) No significant weather phenomena (see Code table 4678).**

**Note: Highest minimum sector altitude is defined in ICAO PANS-OPS, Part 1 – *Definitions,* as the lowest altitude which may be used under emergency conditions which will provide a minimum clearance of 300 metres (1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 nautical miles) radius centred on a radio aid to navigation.**

## 15.11 Group $T'T'/T'_dT'_d$

**15.11.1** **The observed air temperature and dew-point temperature rounded to the nearest whole degree Celsius shall be given for** $T'T'/T'_dT'_d$**. Observed values involving 0.5°C shall be rounded up to the next higher Celsius degree.**

**15.11.2** **Rounded whole degree values of air temperature and dew-point temperature of –9°C to +9°C shall be preceded by 0; for example, +9°C shall be reported as 09.**

**15.11.3** **Temperatures below 0°C shall be immediately preceded by M, that is minus; for example, –9°C shall be reported as M09 and –0.5°C shall be reported as M00.**

## 15.12 Group $\mathbf{Q}P_HP_HP_HP_H$

**15.12.1** **The observed QNH value rounded down to the nearest whole hectopascal shall be given for $P_HP_HP_HP_H$ preceded, without a space, by the letter indicator Q.**

**15.12.2** **If the value of QNH is less than 1 000 hPa, it shall be preceded by 0; for example, QNH 995.6 shall be reported as Q0995.**

**Notes:**

(1) **When the first digit following the letter indicator Q is either 0 or 1, the QNH value is reported in the unit hectopascal (hPa).**

(2) **The unit prescribed by ICAO Annex 5 for pressure is the hectopascal.**

## 15.13 Supplementary information – groups

$$\mathbf{RE}w'w' \left\{\begin{array}{l} \mathbf{WS\ R}D_RD_R \\ \text{or} \\ \mathbf{WS\ ALL\ RWY}\end{array}\right. \left\{\begin{array}{l}(\mathbf{W}T_sT_s/\mathbf{S}S') \\ \text{or} \\ (\mathbf{W}T_sT_s/\mathbf{H}H_sH_sH_s)\end{array}\right\} (\mathbf{R}D_RD_R/E_RC_Re_Re_RB_RB_R)$$

**15.13.1** **For international dissemination, the section on supplementary information shall be used only to report recent weather phenomena of operational significance, available information on wind shear in the lower layers and, subject to regional air navigation agreement, sea-surface temperature and state of the sea or significant wave height, and also subject to regional air navigation agreement, the state of the runway.**

**15.13.2** *Recent weather phenomena of operational significance* $\mathbf{RE}w'w'$

**15.13.2.1** **Up to three groups of information on recent weather shall be given by the indicator letters RE followed, without a space, by the appropriate abbreviations, in accordance with Regulation 15.8 (but no intensity of the recent weather phenomena shall be indicated) if the following weather phenomena were observed during the period since the last routine report, or last hour, whichever is shorter, but not at the time of observation:**

- **Freezing precipitation;**
- **Moderate or heavy drizzle, rain or snow;**
- **Moderate or heavy: ice pellets, hail, small hail and/or snow pellets;**
- **Blowing snow;**
- **Sandstorm or duststorm;**
- **Thunderstorm;**
- **Funnel cloud(s) (tornado or waterspout);**
- **Volcanic ash.**

**When an automatic observing system is used and when the type of the precipitation cannot be identified by this system, the abbreviation REUP shall be used for recent precipitation. It may be combined with the characteristics of the present weather in accordance with Regulation 15.8.6.**

**Note: The meteorological authority, in consultation with users, may agree not to provide recent weather information where SPECI are issued.**

**15.13.3** *Wind shear in the lower layers* $\left\{\begin{array}{l} \mathbf{WS\ R}D_RD_R \\ \text{or} \\ \mathbf{WS\ ALL\ RWY}\end{array}\right.$

**Information on the existence of wind shear along the take-off path or approach path between one runway level and 500 metres (1 600 ft) significant to aircraft operations shall be reported whenever available and if local circumstances so warrant, using the group set $\mathbf{WS\ R}D_RD_R$ repeated as necessary. If the wind shear along the take-off path or approach path is affecting all runways in the airport, WS ALL RWY shall be used.**

**Note: Concerning runway designator $D_RD_R$, Regulation 15.7.3 applies.**

**15.13.4** **Supplementary information other than specified by Regulations 15.13.2 and 15.13.3 shall be added only in accordance with regional decision.**

**15.13.5** ***Sea-surface temperature and the state of the sea* (W$T_sT_s$/SS') *or sea-surface temperature and the significant wave height* (W$T_sT_s$/H$H_sH_sH_s$)**

**15.13.5.1** **The sea-surface temperature shall, by regional agreement, be reported according to the regional ICAO Regulation 15.11. The state of the sea shall be reported in accordance with Code table 3700. The significant wave height shall be reported in decimetres.**

**15.13.6** ***State of the runway* (R$D_RD_R$/$E_RC_Re_Re_RB_RB_R$)**

**15.13.6.1** **Subject to regional air navigation agreement, information on the state of the runway provided by the appropriate airport authority shall be included. The runway deposits $E_R$, the extent of runway contamination $C_R$, the depth of deposit $e_Re_R$ and the estimated surface friction $B_RB_R$ shall be indicated in accordance with code tables 0919, 0519, 1079 and 0366, respectively. The state of the runway group shall be replaced by the abbreviation R/SNOCLO when the aerodrome is closed due to extreme deposit of snow. If contaminations on a single runway or on all runways at an aerodrome have ceased to exist, this should be reported by replacing the last six digits of the group by CLRD//.**

Note: Concerning runway designator $D_RD_R$, Regulation 15.7.3 applies. Additional code figures 88 and 99 are reported in accordance with the European Air Navigation Plan, FASID, Part III-AOP, Attachment A: Code figure 88 indicates "all runways"; code figure 99 shall be used if a new runway state report is not available in time for dissemination of the appropriate METAR message, in which case the previous runway state report will be repeated.

## 15.14 Trend forecasts

Note: The governing criteria for issuing trend forecasts are specified in the *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

**15.14.1** **When included in METAR or SPECI reports, the trend forecasts shall be in coded form.**

**15.14.2** **When a change, required to be indicated in accordance with the governing criteria for significant changes, is expected for one or several of the observed elements – wind, horizontal visibility, present weather, clouds or vertical visibility – one of the following change indicators shall be used for TTTTT: BECMG or TEMPO.**

Note: Where possible, values corresponding to the local operating minima should be selected to indicate changes.

**15.14.3** **The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from), TL (until) or AT (at), shall be used as appropriate, to indicate the beginning (FM) or the end (TL) of a forecast change, or the time (AT) at which specific forecast condition(s) is (are) expected.**

**15.14.4** **The change indicator BECMG shall be used to describe expected changes to meteorological conditions which reach or pass specified threshold criteria at either a regular or irregular rate.**

**15.14.5** **Changes in meteorological conditions which reach or pass specified threshold criteria for trend forecasts shall be indicated as follows:**

**(a) When the change is forecast to begin and end wholly within the trend forecast period: by the change indicator BECMG followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the change (for example, for a trend forecast period from 1000 to 1200 UTC in the form: BECMG FM1030 TL1130);**

**(b) When the change is forecast to occur from the beginning of the trend forecast period and be completed before the end of that period: by the change indicator BECMG followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the end of the change (for example: BECMG TL1100);**

**(c) When the change is forecast to begin during the trend forecast period and be completed at the end of that period: by the change indicator BECMG followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the change (for example: BECMG FM1100);**

**(d) When it is possible to specify a time for the change to occur during the trend forecast period: by the change indicator BECMG followed by the letter indicator AT and its associated time group, to indicate the time of the change (for example: BECMG AT1100);**

**(e) When changes are forecast to take place at midnight UTC, the time shall be indicated:**

**(i) By 0000 when associated with FM and AT;**

**(ii) By 2400 when associated with TL.**

**15.14.6 When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period, or when the change is forecast to occur within the trend forecast period but the time of the change is uncertain (possibly shortly after the beginning of the trend forecast period, or midway or near the end of that period), the change shall be indicated by only the change indicator BECMG (letter indicator(s) FM and TL or AT and associated time group(s) being omitted).**

**15.14.7 The change indicator TEMPO shall be used to describe expected temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria and last for a period of less than one hour in each instance and in the aggregate cover less than half of the forecast period during which the fluctuations are expected to occur.**

**15.14.8 Periods of temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria shall be indicated as follows:**

**(a) When the period of temporary fluctuations is forecast to begin and end wholly within the trend forecast period: by the change indicator TEMPO followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the fluctuations (for example, for a trend forecast period from 1000 to 1200 UTC in the form: TEMPO FM1030 TL1130);**

**(b) When the period of temporary fluctuations is forecast to occur from the beginning of the trend forecast period but cease before the end of that period: by the change indicator TEMPO followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the cessation of the fluctuations (for example: TEMPO TL1130);**

**(c) When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period: by the change indicator TEMPO followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the fluctuation (for example: TEMPO FM1030).**

**15.14.9 When the period of temporary fluctuations to meteorological conditions is forecast to occur from the beginning of the trend forecast period and cease by the end of that period, the temporary fluctuations shall be indicated by only the change indicator TEMPO (letter indicators FM and TL and associated time groups being omitted).**

**15.14.10 Following the change groups TTTTT TTGGgg, only the group(s) referring to the element(s) which is (are) forecast to change significantly shall be included. However, in the case of significant changes of the clouds, all cloud groups, including any significant layer(s) or masses not expected to change, shall be given.**

**15.14.11 Regulation 15.5.6 shall apply.**

**15.14.12 Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.8, shall be restricted to indicate:**

**(1) The onset, cessation or change in intensity of the following weather phenomena:**

- **Freezing precipitation;**
- **Moderate or heavy precipitation (including showers);**
- **Duststorm;**

**–  Sandstorm**

**–  Thunderstorm (with precipitation);**

**–  Other weather phenomena – given in Code table 4678 as agreed by the meteorological authority and air traffic services authority and operators concerned.**

**(2) The onset or cessation of the following weather phenomena:**

**–  Freezing fog;**

**–  Low drifting dust, sand or snow;**

**–  Blowing dust, sand or snow;**

**–  Thunderstorm (without precipitation);**

**–  Squall;**

**–  Funnel cloud (tornado or waterspout).**

**15.14.13** **To indicate the end of significant weather phenomena w´w´, the abbreviation NSW (Nil Significant Weather) shall replace the group w´w´.**

**15.14.14** **When no cloud below 1 500 metres (5 000 ft) or the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus are forecast, and CAVOK is not appropriate, the abbreviation NSC shall be used.**

**15.14.15** **When none of the elements listed in Regulation 15.14.2 is expected to change significantly as to require a change to be indicated, this shall be indicated by the code word NOSIG. NOSIG (no significant change) shall be used to indicate meteorological conditions which do not reach or pass specified threshold criteria.**

## 15.15 Group (RMK . . . . . . . . . . )

**The indicator RMK denotes the beginning of a section containing information included by national decision which shall not be disseminated internationally.**

**FM 18–XII BUOY** **Report of a buoy operation**

**CODE FORM:**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 0 | $M_iM_iM_jM_j$ | $A_1b_wn_bn_bn_b$ | YYMMJ | $GGggi_w$ | $Q_cL_aL_aL_aL_aL_a$ |
| | | $L_oL_oL_oL_oL_oL_o$ | $(6Q_lQ_tQ_A/)$ | | |
| SECTION 1 | $(111Q_dQ_x$ | 0ddff | $1s_nTTT$ | $2s_nT_dT_dT_d$<br>or<br>29UUU | $3P_0P_0P_0P_0$ |
| | | 4PPPP | 5appp) | | |
| SECTION 2 | $(222Q_dQ_x$ | $0s_nT_wT_wT_w$ | $1P_{wa}P_{wa}H_{wa}H_{wa}$ | $20P_{wa}P_{wa}P_{wa}$ | $21H_{wa}H_{wa}H_{wa})$ |
| SECTION 3 | $(333Q_{d1}Q_{d2}$ | $(8887k_2$ | $2z_0z_0z_0z_0$<br>. . . . .<br>$2z_nz_nz_nz_n$ | $3T_0T_0T_0T_0$<br>. . . . .<br>$3T_nT_nT_nT_n$ | $4S_0S_0S_0S_0$<br>. . . . .<br>$4S_nS_nS_nS_n)$ |
| | | $(66k_69k_3$ | $2z_0z_0z_0z_0$<br>. . . . .<br>$2z_nz_nz_nz_n$ | $d_0d_0c_0c_0c_0$<br>. . . . .<br>$d_nd_nc_nc_nc_n))$ | |
| SECTION 4 | (444 | $1Q_PQ_2Q_{TW}Q_4$ | $2Q_NQ_LQ_AQ_Z$ | $(Q_cL_aL_aL_aL_aL_a$<br>or<br>(YYMMJ | $L_oL_oL_oL_oL_oL_o)$<br><br>GGgg/) |
| | | $(3Z_hZ_hZ_hZ_h$ $4Z_cZ_cZ_cZ_c)$ $(5B_tB_tX_tX_t)$<br>$(6A_hA_hA_hA_N)$ $(7V_BV_Bd_Bd_B)$ $(8V_iV_iV_iV_i)$ $(9/Z_dZ_dZ_d))$ | | | |
| SECTION 5 | (555 Groups to be developed nationally) | | | | |

**Notes:**

(1) BUOY is the name of the code for reporting buoy observations.

(2) A BUOY report, or a bulletin of BUOY reports, is identified by the group $M_iM_iM_jM_j$ = ZZYY.

(3) The inclusion of the group $9/Z_dZ_dZ_d$ is strongly recommended for buoys which have been deployed with drogues.

(4) The group $9/Z_dZ_dZ_d$ should not be used in reports from a buoy on which a drogue has never been installed.

(5) The code form is divided into six sections, the first being mandatory in its entirety, except group $6Q_lQ_tQ_A/$, and the remainder optional as data are available:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Identification, time and position data |
| 1 | 111 | Meteorological and other non-marine data |
| 2 | 222 | Surface marine data |
| 3 | 333 | Temperatures, salinity and current (when available) at selected depths |
| 4 | 444 | Information on engineering and technical parameters, including quality control data |
| 5 | 555 | Data for national use |

**REGULATIONS:**

## 18.1 General

**The code name BUOY shall not be included in the report.**

## 18.2 Section 0

**18.2.1** **All groups in Section 0 are mandatory, except group $6Q_lQ_tQ_A/$, and shall be included in each report, even if no other data are reported.**

**18.2.2** **Each individual BUOY report, even if included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$.**

**18.2.3** ***Group*** **$A_1b_wn_bn_bn_b$**

**Only buoy numbers ($n_bn_bn_b$) 001 through 499 are assigned. In the case of a drifting buoy, 500 shall be added to the original $n_bn_bn_b$ number.**

**Notes:**

(1) $A_1b_w$ normally corresponds to the maritime zone in which the buoy was deployed. The WMO Secretariat allocates to Members, who request and indicate the maritime zone(s) of interest, a block or blocks of serial numbers ($n_bn_bn_b$) to be used by their environmental buoy stations.

(2) The Member concerned registers with the WMO Secretariat the serial numbers actually assigned to individual stations together with their geographical positions of deployment.

(3) The Secretariat informs all concerned of the allocation of serial numbers and registrations made by individual Members.

**18.2.4** ***Groups*** **$Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$**

**Position shall be reported in tenths, hundredths or thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the groups shall be encoded as $Q_cL_aL_aL_a//$ $L_oL_oL_oL_o//$. When the position is in hundredths of a degree, the groups shall be encoded as $Q_cL_aL_aL_aL_a/$ $L_oL_oL_oL_oL_o/$.**

**18.2.5** ***Group*** **$(6Q_lQ_tQ_A/)$**

**$Q_lQ_tQ_A$ are quality control indicators. $Q_l$ and $Q_A$ apply to position and $Q_t$ to time.**

## 18.3 Section 1

**18.3.1** **Each of the groups in Section 1 shall be included for all parameters that have been measured, when data are available.**

**18.3.2** **When data are missing for all groups, the entire section shall be omitted from the report.**

**18.3.3** ***Group*** **$111Q_dQ_x$**

**$Q_d$ is a quality control indicator for the section. If all data groups have the same quality control flag value, $Q_d$ shall be coded with that value and $Q_x$ shall be set to 9. If only one data group in the section has a quality control flag other than 1, $Q_d$ shall be coded with that flag and $Q_x$ shall indicate the position of this group within the section. If more than one data group have a quality control flag greater than 1, $Q_d$ shall be set to the greater flag value and $Q_x$ shall be set to 9.**

Note: When $Q_x$ shows the position of the data group, it should be relative to the group containing $Q_x$. For example, $Q_x$ = 1 refers to the data group immediately following.

## 18.4 Section 2

**18.4.1** **Each of the groups in Section 2 shall be included for all parameters that have been measured, when data are available.**

**18.4.2** **When data are missing for all groups, the entire section shall be omitted from the report.**

**18.4.3** *Group* **$222Q_dQ_x$**

**Regulation 18.3.3 shall apply.**

## 18.5 Section 3

**18.5.1** *General*

**Section 3 is in two parts. The first part, identified by the indicator group $8887k_2$, shall be used to report temperatures and/or salinity at selected depths. The second part, identified by the indicator group $66k_69k_3$, shall be used to report current at selected depths. Either or both parts shall be transmitted, depending on the availability of the temperature and/or salinity data for the first part and of the current data for the second part.**

**18.5.2** **Temperatures shall be reported in hundredths of a degree Celsius. When accuracy is limited to tenths of a degree, data shall be encoded using the general form $3T_nT_nT_n/$.**

**18.5.3** *Group* **$333Q_{d1}Q_{d2}$**

**$Q_{d1}Q_{d2}$ are two quality control indicators. $Q_{d1}$ is used to indicate the quality of the temperature and salinity profile and $Q_{d2}$ is used to indicate the quality of the current speed and direction profile.**

## 18.6 Section 4

**18.6.1** *General*

**Additional groups in this section shall be included as data are available or required.**

**18.6.2** *Group* **$(1Q_PQ_2Q_{TW}Q_4)$**

**When $Q_P$, $Q_2$, $Q_{TW}$ and $Q_4$ = 0, the corresponding group shall not be transmitted. Its absence thus indicates a satisfactory general operation.**

**18.6.3** *Group* **$(2Q_NQ_LQ_AQ_z)$**

**$Q_N$ gives the quality of the satellite transmission. $Q_L$ and $Q_A$ are indicators on the quality of location. $Q_z$ indicates whether or not probe depths as reported in Section 3 are corrected using hydrostatic pressure.**

**18.6.4** **In Section 4, pressure of fields ($Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$) and (YYMMJ GGgg/) is driven by the value of the $Q_L$ indicator:**

**(a) Group $2Q_NQ_LQ_AQ_z$ absent: fields ($Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$) and (YYMMJ GGgg/) not coded;**

**(b) $Q_L$ = 1: fields YYMMJ GGgg/ coded (fields $Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$ absent);**

**(c) $Q_L$ = 2: fields $Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$ coded (fields YYMMJ GGgg/ absent).**

**18.6.5** *Group* **$(Q_cL_aL_aL_aL_aL_a)$**

**This group shall be transmitted only when $Q_L$ = 2 (location over one pass only). It gives the latitude of the second possible solution (symmetrical to the satellite subtrack).**

**Note: Same coding as in Section 0.**

**18.6.6** *Group* **$(L_oL_oL_oL_oL_oL_o)$**

**This group shall be transmitted only when $Q_L$ = 2 and it gives the longitude of the second possible position, the latitude being indicated by the previous group.**

**Note: Same coding as in Section 0.**

**18.6.7** *Groups* **(YYMMJ GGgg/)**

**The groups YYMMJ GGgg/ give the exact time of the last known position and shall be transmitted only when $Q_L$ = 1 together with the following group $7V_BV_Bd_Bd_B$.**

**18.6.8** *Group* **($3Z_hZ_hZ_hZ_h$)**

**Hydrostatic pressure of lower end of cable. Pressure is expressed in units of kPa (kilopascal, i.e. centibars). If group ($3Z_hZ_hZ_hZ_h$) is present, then group ($4Z_cZ_cZ_cZ_c$) is mandatory.**

**18.6.9** *Group* **($4Z_cZ_cZ_cZ_c$)**

**Length of cable in metres (thermistor strings).**

**18.6.10** *Group* **($5B_tB_tX_tX_t$)**

**Group ($5B_tB_tX_tX_t$) should be omitted if buoy-type and drogue-type information is not available.**

**18.6.11** *Group* **($6A_hA_hA_hA_N$)**

**Group 6 ($6A_hA_hA_hA_N$) should be omitted if the buoy is not reporting wind or if the information is not available for both anemometer height and anemometer type. $A_hA_hA_h$ is the anemometer height above station level. Height is expressed in decimetres. For drifting and moored buoys, station level is assumed to be sea level. /// shall be used for unknown values. A value of 999 shall be used to say that anemometer height is artificially corrected to 10 metres by applying a formula.**

**18.6.12** *Group* **($7V_BV_Bd_Bd_B$)**

**This group shall be transmitted only when $Q_L$ = 1.**

**Example: At the last location, the true direction of the buoy is 47° and its speed is 13 cm $s^{-1}$ – the group is coded 71304.**

**18.6.13** *Group* **($8V_iV_iV_iV_i$)**

**The number of groups $8V_iV_iV_iV_i$ containing information on the engineering status of the buoy shall not exceed three.**

**Notes:**

**(1) The physical equivalent of the value $V_iV_iV_iV_i$ will be different from one buoy to another.**

**(2) Interpretation of these groups will not be necessary to permit use of the meteorological data.**

## FM 20–VIII RADOB    Report of ground radar weather observations

**C O D E   F O R M :**

**Part A**

| | | | | |
|---|---|---|---|---|
| | $M_iM_iM_jM_j$ | YYGGg | $\left\{ \begin{array}{l} \mathrm{IIiii} \\ \text{or} \\ 99L_aL_aL_a \end{array} \right.$ | $\left. Q_cL_oL_oL_oL_o \right\}$ |
| | $4R_wL_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $A_CS_CW_Ca_Cr_t$ | $t_ed_sd_sf_sf_s$ |
| | D . . . . D | | | |

**Part B**

| | | | | |
|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGGg | $\left\{ \begin{array}{l} \mathrm{IIiii} \\ \text{or} \\ 99L_aL_aL_a \end{array} \right.$ | $\left. Q_cL_oL_oL_oL_o \right\}$ |
| | $N_eN_eW_RH_eI_e$ | . . . . | . . . . | $N_eN_eW_RH_eI_e$ |
| | /555/ | $N_eN_ea_eD_ef_e$ | . . . . | $N_eN_ea_eD_ef_e$ |
| SECTION 2 | 51515 | Code groups to be developed regionally | | |
| SECTION 3 | 61616 | Code groups to be developed nationally | | |
| | D . . . . D | | | |

**Notes:**

(1) RADOB is the name of the code for reporting ground radar weather observations.

(2) A RADOB report from a land station is identified by $M_iM_i$ = FF, a RADOB report from a sea station by $M_iM_i$ = GG.

(3) The code form is divided into two parts:

| *Part* | *Identifier letters* ($M_jM_j$) | *Contents* |
|---|---|---|
| A | AA | Information on tropical cyclone |
| B | BB | Information on significant features |

Each part can be transmitted separately.

(4) Part B is divided into three sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data; information on significant features |
| 2 | 51515 | Code groups to be developed regionally |
| 3 | 61616 | Code groups to be developed nationally |

**REGULATIONS:**

## 20.1 General

**20.1.1** **The code name RADOB shall not be included in the report.**

**20.1.2** **The call sign D . . . . D shall be included only in RADOB reports from sea stations.**

## 20.2 Part A

**20.2.1** **Part A shall be used whenever the observed echo pattern is recognized as relating to a tropical cyclone.**

**20.2.2** ***Groups*** $4R_wL_aL_aL_a$ $Q_cL_oL_oL_oL_o$

**The position of the centre, or the eye, of the tropical cyclone shall be reported by means of the groups** $4R_wL_aL_aL_a$ $Q_cL_oL_oL_oL_o$**.**

**20.2.3** ***Group*** $A_CS_CW_Ca_Cr_t$

**20.2.3.1** **The characteristics as regards size, development and relative location of the centre or the eye of the tropical cyclone shall be reported by the group** $A_CS_CW_Ca_Cr_t$**.**

**20.2.3.2** **Whenever doubt exists as to the location of the eye or whether the outermost spiral band is indeed visible on the radar scope,** $r_t$ **shall be coded as /.**

**20.2.4** ***Group*** $t_ed_sd_sf_sf_s$

**20.2.4.1** **Information on the movement of the centre, or eye, of the tropical cyclone shall be included in the report by means of the group** $t_ed_sd_sf_sf_s$**.**

**20.2.4.2** **If no information on the movement of the centre, or eye, of the tropical cyclone is available, the group** $t_ed_sd_sf_sf_s$ **shall be coded as /////.**

## 20.3 Part B

**20.3.1** **In Part B, one series of groups** $N_eN_eW_RH_eI_e$ **shall be used to report the location of phenomena and/or clouds and their characteristics. Group** $N_eN_eW_RH_eI_e$ **shall be repeated as necessary for a full description of the spatial distribution of the echo on the radar scope in 60 × 60 km squares.**

**20.3.2** ***Group*** $N_eN_eW_RH_eI_e$

**20.3.2.1** **Characteristics concerning the location, type of phenomena and/or clouds and the elevation and intensity of their echoes shall be reported by groups** $N_eN_eW_RH_eI_e$**.**

**20.3.2.2** **Groups** $N_eN_eW_RH_eI_e$ **shall be included in the report in the rising order of the squares' sequential numbers** $N_eN_e$**.**

**20.3.2.3** **If several weather phenomena were observed in a single 60 × 60 km square, the most dangerous phenomenon shall be reported in** $W_R$**, the highest echo elevation in** $H_e$ **and the greatest echo intensity in** $I_e$**.**

**20.3.2.4** **Cloud type data (**$W_R$**) shall be reported only if no weather phenomena were observed in the 60 × 60 km square.**

**20.3.2.5** **Data on stratiform cloud without precipitation shall be reported if it occupies no less than** $^1/4$ **of the 60 × 60 km square´s area.**

**20.3.2.6** **Data on convective cloud shall be reported irrespective of the centres' dimensions within the limits of the 60 × 60 km square.**

**20.3.2.7** **If, in the 60 × 60 km square, convective and stratiform clouds were observed, only data on the convective clouds shall be reported.**

**20.3.2.8** **Cloud echo intensity (**$I_e$**) shall be coded as /.**

**20.3.3** ***Group*** **$N_eN_ea_eD_ef_e$**

**20.3.3.1** **Characteristics concerning change and movement of the echo pattern shall be reported by groups $N_eN_ea_eD_ef_e$, preceded by the identifier group /555/.**

**20.3.3.2** **Group $N_eN_ea_eD_ef_e$ shall be used to report the evolutionary characteristics of no more than three echo patterns. The identifier group /555/ shall not be repeated.**

**20.3.3.3** **$N_eN_e$ shall be used to report the number of the 60 × 60 km square in which the radar operator placed the origin of the speed vector characterizing the direction of movement $D_e$ of the echo pattern. If only the tendency of the echo pattern $a_e$ has been estimated, the number of any square covered by the pattern shall be reported in $N_eN_e$.**

**20.3.3.4** **The tendency of the echo pattern $a_e$ shall be estimated over a period of approximately one hour, but not longer than 90 minutes and not shorter than 30 minutes. The echo area shall be considered as increasing or diminishing if it changes by more than 25 per cent over a period of time not exceeding 90 minutes.**

**20.3.3.5** **If no information is available on the change and movement of the echo, groups /555/ and $N_eN_ea_eD_ef_e$ shall not be included in the report.**

**20.3.3.6** **The movement of individual echoes in the echo pattern shall not be reported.**

**20.3.4** ***Reporting of inoperative equipment, anomalous propagation and absence of an echo***

**In the case of inoperative equipment, anomalous propagation or absence of an echo on the radar scope, groups $N_eN_eW_RH_eI_e$, /555/ and $N_eN_ea_eD_ef_e$ shall be replaced by one of the following groups, as appropriate:**

**0/0/0 Radar equipment inoperative;**

**or 0//// Anomalous propagation; or**

**00000 No echo visible on radar scope.**

**FM 22–IX Ext. RADREP** **Radiological data report (monitored on a routine basis and/or in case of accident)**

**CODE FORM:**

SECTION 0 RADREP $\left\{\begin{array}{l} \text{IIiii*} \\ \text{or} \\ \text{D . . . . D**} \\ \text{or} \\ A_1b_wn_bn_bn_b \end{array}\right\}$ $Y_rY_rG_rG_ra_5$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$

SECTION 1 111AA MMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_a^1L_a^1L_a^1L_a^1A$ $L_o^1L_o^1L_o^1L_o^1L_o^1B$

$4A_aB_TR_cR_cR_cR_c$ $5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$ $\left\{\begin{array}{l} (7h_ah_ah_ah_a) \\ \text{or} \\ (7h_eh_eh_eh_e) \end{array}\right\}$

$(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$ $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

SECTION 2 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

SECTION 3 333 $GGggi_w$ (ddfff) (5nnnIS) $6XXXs_naa$

SECTION 4 444 $GGggi_w$ (Nddff) (00fff) $(1s_nTTT)$ $(2s_nT_dT_dT_d)$ $(3P_0P_0P_0P_0)$

$(6RRRt_R)$ (7wwW/) (80000 $0d_ad_ad_cd_c)$

SECTION 5 555 TTGGgg $4A_aB_TR_cR_cR_cR_c$ $5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$

$\left\{\begin{array}{l} (7h_ah_ah_ah_a) \\ \text{or} \\ (7h_eh_eh_eh_e) \end{array}\right\}$ $(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$ $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa) $122R_pI_n$

SECTION 6 666 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

SECTION 7 777 TTGGgg (Nddff) (00fff) $(1s_nTTT)$ $(6RRRt_R)$ (7ww//)

**Notes:**

(1) RADREP is the name of the code for reporting radiological data monitored on a routine basis and/or in case of an accident. A RADREP report may have a trend forecast appended.

(2) A RADREP report, or a bulletin of RADREP reports, is identified by the word RADREP.

(3) Relevant groups of Section 0, the first three groups and the group $6XXXs_naa$ of Section 2 are always included in a report of radiological data from a surface observing station. Section 1 is only included when data on accident notification is reported.

(4) Relevant groups of Section 0, the first two groups and the group $6XXXs_naa$ of Section 3 are always included in a report of radiological data from an airborne observing station.

---

* Included in a fixed land station report only.

** Included in a sea or mobile land station report only.

(5) The code form is divided into seven sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Identification and position data (ship's call sign/buoy identifier, date and reporting time, location and elevation/altitude), type of report and unit of reported radiological quantity |
| 1 | 111AA | Data on accident notification: activity or facility involved, date and time of accident, location of accident, early notification convention article applicable, type and composition of release, cause and evolution of incident, characteristics, state and evolution of release, possible health effect, protective measures taken with its radius, actual or effective release height, main transport in atmosphere and/or water, and discharge of receiving water body |
| 2 | 222 | Data on date and time of start and end of monitoring (when relevant, isotope mass and element name), observed radiological quantity, dose on land surface and density of deposits from a surface observing station |
| 3 | 333 | Data on time of monitoring, unit of wind speed, upper wind (when relevant, isotope mass and element name) and observed radiological quantity from an airborne observing station |
| 4 | 444 | Data on time of observed meteorological conditions, unit of wind speed, total cloud cover, surface wind, temperature, dew point, station pressure, precipitation and related duration, weather and variation of surface wind direction |
| 5 | 555 | Data on forecast trend of accident in next six hours: time or period of expected change, early notification convention article applicable, type and composition of release, cause and evolution of incident, characteristics, state and evolution of release, possible health effect, protective measures to be taken and its radius, actual or effective release height, main transport in atmosphere and/or water, discharge of receiving water body, and possibility that plume will encounter precipitation and/or change in wind |
| 6 | 666 | Data on forecast trend of radiological quantity in next six hours: date and time (when relevant, isotope mass and element name), expected radiological quantity, expected dose on land surface and density of deposits |
| 7 | 777 | Data on forecast trend in surface meteorological conditions in next six hours: time or period of expected change, total cloud cover, surface wind, temperature, precipitation and related duration, and weather |

**R E G U L A T I O N S :**

## 22.1 General

**22.1.1** **The code name RADREP shall be included at the beginning of an individual RADREP report. In the case of a bulletin, which may consist of more than one RADREP report, the code name RADREP shall be included in the first line of the text of the bulletin, and the identification, date, reporting time, type of report and position groups shall be included in every individual report.**

**Note: See Regulation 12.1.7.**

**22.1.2** *Groups* $\left\{\begin{array}{l}\mathrm{IIiii}^{*} \\ \text{or} \\ \mathrm{D\ .\ .\ .\ .\ D}^{**} \\ \text{or} \\ A_1b_wn_bn_bn_b\end{array}\right\}$ $Y_rY_rG_rG_ra_5$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$

**Note: See Regulation 18.2.3, Notes (1), (2) and (3).**

**The identification and position of a fixed land station shall be indicated by means of the group IIiii. The identification of a sea or mobile land station shall be indicated by the group D . . . . D or $A_1b_wn_bn_bn_b$. The position and elevation/altitude of fixed and mobile land stations, sea stations or airborne observing stations shall be indicated by the groups $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$.**

**22.1.3** *Use of sections*

**22.1.3.1** **Accident notification reports shall always contain at least Sections 0 and 1. When the report contains environmental (on site) radiological monitoring results and/or meteorological monitoring results, that report shall also include Sections 2 and/or 4, respectively.**

**22.1.3.2** **Environmental radiological data monitoring results reports from surface observing stations of a routine nature or activated following an accident shall always contain at least Sections 0 and 2. When in addition the report contains meteorological monitoring results, that report shall also include Section 4.**

**22.1.3.3** **In radiological data monitoring results reports of gamma dose in air along the main transport path (defined location and time period), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ $6XXXs_naa$.**

**22.1.3.4** **In radiological data monitoring results reports of air concentration (of named isotope type including gross beta), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS $6XXXs_naa$.**

**22.1.3.5** **In radiological data monitoring results reports of concentration in precipitation (of named isotope type), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS $6XXXs_naa$, and Section 4 at least the groups 444 $6RRRt_R$.**

**22.1.3.6** **When relevant forecast data are available, Sections 5, 6 and/or 7 shall be appended as appropriate to an accident notification report or an environmental radiological data monitoring report, to indicate expected changes in radiological and/or meteorological conditions in the next six hours.**

## 22.2 Section 1 – Data on accident notification

**22.2.1** *Group* **111AA**

**This group shall always be included in accident notification reports. AA shall be encoded in accordance with Code table 0177 – Activity or facility involved in incident.**

**22.2.2** *Groups* **MMJJJ** $Y_aY_aG_aG_ag_ag_a$ $L_a^1L_a^1L_a^1L_a^1A$ $L_o^1L_o^1L_o^1L_o^1L_o^1B$

**These groups shall always be included in accident notification reports to give the date, time and location of the accident: month, three last digits of year, day of the month, hours and minutes in UTC, latitude and longitude in degrees and minutes.**

---

* **Included in a fixed land station report only.**

** **Included in a sea or mobile land station report only.**

22.2.3 *Group* $4A_aB_TR_cR_cR_cR_c$

**This group shall always be included in accident notification reports. $A_a$ shall be encoded in accordance with Code table 0131 – Accident early notification – article applicable. $B_T$ shall be encoded in accordance with Code table 0324 – Type of release. $R_cR_cR_cR_c$ shall be encoded such that each $R_c$ is in accordance with Code table 3533 – Composition of release, so that a combination of up to four elements shall be reported in order of significance. If less than four elements are to be reported, the group shall be completed with solidi (/).**

22.2.4 *Group* $5A_cA_eE_cE_sE_e$

**This group shall always be included in accident notification reports. $A_c$ shall be encoded in accordance with Code table 0133 – Cause of incident; $A_e$ in accordance with Code table 0135 – Incident situation; $E_c$ in accordance with Code table 0933 – Characteristics of release; $E_s$ in accordance with Code table 0943 – State of current or expected release; and $E_e$ in accordance with Code table 0935 – Release behaviour over time.**

22.2.5 *Group* $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$

**This group shall always be included in accident notification reports. $R_e$ shall be encoded in accordance with Code table 3535 – Possibility of significant chemical toxic health effect; and $P_a$ in accordance with Code table 3131 – Countermeasures taken near border.**

Note: This group may be repeated as necessary, e.g. if more than one protective measure is to be indicated.

22.2.6 *Groups* $\left\{\begin{array}{l}(7h_ah_ah_ah_a)\\ \text{or}\\ (7h_eh_eh_eh_e)\end{array}\right\}$ $(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$

**If release is not ground-level release and relevant data are available, these groups shall be included in accident notification reports to give either the actual release height or the effective release height, in metres, the main transport direction in atmosphere, in degrees from north, and the main transport speed in atmosphere, in metres per second.**

22.2.7 *Groups* $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

**If release is to water and relevant data are available, these groups shall be included in accident notification reports to give the main transport direction in water, in degrees from north, and the main transport speed in water, in metres per second, and the discharge of the main receiving water body, in cubic metres per second, as appropriate.**

## 22.3 Section 2 – Radiological monitoring data from a surface observing station

22.3.1 *Groups* 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$

**These groups shall always be included in radiological data monitoring result reports or accident reports to give the day and time of start and day and time of end, in hours and minutes UTC, of monitoring operations or release.**

22.3.2 *Group* (5nnnIS)

22.3.2.1 **The group 5nnnIS shall be included in either radiological data monitoring result reports of air concentration of named isotope type including gross beta or to give the isotope mass and element name.**

Notes:

(1) This group may be repeated as necessary, e.g. if more than one isotope is to be included.

(2) See Regulation 22.1.3.5.

22.3.2.2 **The group 5nnnIS shall be omitted from the report in radiological data monitoring results of gamma dose in air along the main transport path for defined location and time.**

**22.3.3** *Group* **$6XXXs_naa$**

**This group shall always be included in radiological data monitoring results reports or accident reports to give the three most significant digits of the reported monitored radiological quantity or estimated release quantity followed, without a space, by the sign of the exponent ($s_n$) and the decimal exponent (aa). The type of report and the unit of the reported radiological quantity shall be indicated by $a_5$ in the group $Y_rY_rG_rG_ra_5$ of Section 0.**

**Note: See Note (1) to Regulation 22.3.2.1.**

**22.3.4** *Group* **($7XXXs_naa$)**

**If relevant data are available, this group shall be included in reports of radiological data monitoring results to give the dose of gamma radiation or the density of deposits (total beta activity) on land surface.**

## 22.4 Section 3 – Radiological monitoring data from an airborne observing station

**22.4.1 Inclusion of groups of Section 3 shall be determined by national decision.**

**22.4.2 Section 3 shall always be preceded by Section 0.**

**22.4.3** *Group* **(5nnnIS)**

**This group shall be included in radiological data monitoring results of air concentration of named isotope type followed by the group $6XXXs_naa$ (radiological quantity of the isotope).**

**Note: See Note (1) to Regulation 22.3.2.1.**

**22.4.4** *Group* **$6XXXs_naa$**

**Regulation 22.3.3 shall apply.**

## 22.5 Section 4 – Meteorological monitoring data

**22.5.1 If meteorological data are available, relevant groups of this section shall be included in a radiological data report.**

**Note: See Regulation 22.1.3.5.**

**22.5.2** *Group* **($6RRRt_R$)**

**22.5.2.1 When no precipitation occurred during the reference period, RRR shall be encoded 000.**

**22.5.2.2 When precipitation occurred during the reference period but the amount of precipitation has not been measured, RRR shall be encoded ///.**

**22.5.3** *Groups* **(80000 $0d_ad_ad_cd_c$)**

**If relevant data are available, these groups shall be included in addition to the group Nddff or the groups Nddff 00fff, as the case may be, to give the variation in wind direction.**

**Note: Variation and mean wind direction are measured over the 10-minute period immediately preceding the observation.**

## 22.6 Section 5 – Accident behaviour over time

**22.6.1** *Group* **TTGGgg**

**The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from) or AT (at), shall be used, as appropriate, to indicate the beginning (FM) of a forecast change, or the time (AT) at which specific forecast conditions are expected.**

**22.6.2** *Group* **$122R_pI_n$**

**This group shall be included to indicate the possibility that a plume will encounter precipitation in the State in which the incident occurred and whether the plume will encounter a change in wind direction and/or speed. $R_p$ shall be encoded in accordance with Code table 3548, and $I_n$ in accordance with Code table 1743.**

**FM 32–XI Ext. PILOT** — **Upper-wind report from a fixed land station**

**FM 33–XI Ext. PILOT SHIP** — **Upper-wind report from a sea station**

**FM 34–XI Ext. PILOT MOBIL** — **Upper-wind report from a mobile land station**

**CODE FORM:**

**Part A**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGa_4$ | | |
| | | $IIiii$* or $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$** | $h_0h_0h_0h_0i_m$*** |
| SECTION 2 | $44nP_1P_1$ or $55nP_1P_1$ | ddfff | ddfff | . . . . | etc. |
| SECTION 3 | $77P_mP_mP_m$ or $66P_mP_mP_m$ | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| | or | | | | |
| | $7H_mH_mH_mH_m$ or $6H_mH_mH_mH_m$ | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| | or | | | | |
| | 77999 | | | | |
| SECTION 5 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally | | | |
| SECTION 6 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally | | | |

**Part B**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGa_4$ | | |
| | | $IIiii$* or $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$** | $h_0h_0h_0h_0i_m$*** |

---

* Used in FM 32 only.

** Used in FM 33 and FM 34 only.

*** Used in FM 34 only.

| | | | | | |
|---|---|---|---|---|---|
| SECTION 4 | 9 or 8 | $t_nu_1u_2u_3$ | ddfff | ddfff | ddfff |
| | . . . . . | | . . . . . | . . . . . | . . . . . |
| | 9 or 8 | $t_nu_1u_2u_3$ | ddfff | ddfff | ddfff |
| | or | | | | |
| | 21212 | $n_0n_0P_0P_0P_0$ | $d_0d_0f_0f_0f_0$ | | |
| | | $n_1n_1P_1P_1P_1$ | $d_1d_1f_1f_1f_1$ | | |
| | | . . . . . | . . . . . | | |
| | | $n_nn_nP_nP_nP_n$ | $d_nd_nf_nf_nf_n$ | | |

| | | |
|---|---|---|
| SECTION 5 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| SECTION 6 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally |

**Part C**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | YYGG$a_4$ | | |
| | | IIiii*<br>or<br>$99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$** | $h_0h_0h_0h_0i_m$*** |
| SECTION 2 | $44nP_1P_1$<br>or<br>$55nP_1P_1$ | ddfff | ddfff | . . . . . | etc. |
| SECTION 3 | $77P_mP_mP_m$<br>or<br>$66P_mP_mP_m$ | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| | or | | | | |
| | $7H_mH_mH_mH_m$<br>or<br>$6H_mH_mH_mH_m$ | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| | or | | | | |
| | 77999 | | | | |

| | | |
|---|---|---|
| SECTION 5 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| SECTION 6 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally |

---

* Used in FM 32 only.

** Used in FM 33 and FM 34 only.

*** Used in FM 34 only.

**Part D**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGa_4$ | | |
| | | { IIiii* or | | | |
| | | $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$** | $h_0h_0h_0h_0i_m$*** |
| SECTION 4 | 9 (or 1) or 8 | $t_nu_1u_2u_3$ | ddfff | ddfff | ddfff |
| | . . . . . | | . . . . . | . . . . . | . . . . . |
| | 9 (or 1) or 8 | $t_nu_1u_2u_3$ | ddfff | ddfff | ddfff |
| | or | | | | |
| | 21212 | $n_1n_1P_1P_1P_1$ | $d_1d_1f_1f_1f_1$ | | |
| | | . . . . . | . . . . . | | |
| | | $n_nn_nP_nP_nP_n$ | $d_nd_nf_nf_nf_n$ | | |
| SECTION 5 | 51515 52525 . . . . . 59595 | Code groups to be developed regionally | | | |
| SECTION 6 | 61616 62626 . . . . . 69696 | Code groups to be developed nationally | | | |

**Notes:**

(1) PILOT is the name of the code for an upper-wind report from a fixed land station. PILOT SHIP is the name of the code for an upper-wind report from a sea station. PILOT MOBIL is the name of the code for an upper-wind report from a mobile land station.

(2) A PILOT report is identified by $M_iM_i$ = PP, a PILOT SHIP report is identified by $M_iM_i$ = QQ, and a PILOT MOBIL report is identified by $M_iM_i$ = EE.

(3) The code form consists of four parts as follows:

| *Part* | *Identifier letters* ($M_jM_j$) | *Isobaric surfaces* |
|---|---|---|
| A | AA | Up to and including the 100-hPa surface |
| B | BB | |
| C | CC | Above the100-hPa surface |
| D | DD | |

Each part can be transmitted separately.

* Used in FM 32 only.

** Used in FM 33 and FM 34 only.

*** Used in FM 34 only.

(4) The code form is divided into a number of sections as follows:

| *Section number* | *Indicator figures or symbolic figure groups* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data |
| 2 | 44 or 55 | Data for standard isobaric surfaces |
| 3 | 6, 7, 66 or 77 | Data for maximum wind level(s), with altitudes given in pressure units or tens of geopotential metres, and data for vertical wind shear |
| 4 | 8, 9 (or 1) or 21212 | Data for fixed regional levels and/or significant levels, with altitudes given either in geopotential units or in pressure units |
| 5 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| | | In parts A and C, identifier 55555 should not be used in Section 5. |
| 6 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally |
| | | In parts A and C, identifier 66666 should not be used in Section 6 |

**REGULATIONS:**

## 32.1 General

**32.1.1** **The code name PILOT, PILOT SHIP or PILOT MOBIL shall not be included.**

**32.1.2** **Parts A and B shall contain data, in so far as available, *only* for levels up to and including the 100-hPa level.**

**32.1.3** **Parts C and D shall contain data, in so far as available, *only* for levels above the 100-hPa level.**

**32.1.4** **For example, if data at or below 100 hPa are not included in either Part A or B, as appropriate, they shall *not* be included in Part C or D. In this instance the non-included data shall be transmitted separately in the form of a correction report.**

## 32.2 Parts A and C

**32.2.1** ***Section 1 – Identification and position***

**The identification of a sea station or a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the group IIiii for a fixed land station, or the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for a sea station or a mobile land station. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station (including units of elevation) and the accuracy of the elevation.**

**32.2.2** ***Section 2 – Standard isobaric surfaces***

**32.2.2.1** **Section 2 shall contain data, in ascending order with respect to altitude, for the standard isobaric surfaces of 850, 700, 500, 400, 300, 250, 200, 150 and 100 hPa in Part A and for the standard isobaric surfaces of 70, 50, 30, 20 and 10 hPa in Part C.**

**32.2.2.2** **When pressure measurements are not available, wind data shall be reported using geopotential approximations to the standard isobaric surfaces.**

32.2.2.3 **All standard isobaric surfaces within the sounding shall be represented in Section 2 of the report by either a data group or a group of solidi (/////).**

32.2.2.4 **Indicator figures 44 shall be used when the standard isobaric surfaces are located by means of pressure equipment. Indicator figures 55 shall be used for the reporting of winds at altitudes approximating the standard isobaric surfaces. If the pressure element failed during the ascent, indicator figures 55 shall replace the indicator figures 44 for the remaining standard isobaric surfaces to be reported.**

32.2.2.5 **In the report, no more than three wind groups shall follow a $44nP_1P_1$ or $55nP_1P_1$ group. The latter groups shall therefore be repeated as often as necessary.**

32.2.3 ***Section 3 – Maximum wind level(s) and vertical wind shear***

32.2.3.1 **For coding purposes, a maximum wind level:**

**(a) Shall be determined by consideration of the list of significant levels for wind speed, as obtained by means of the relevant recommended or equivalent national method (see Note under Regulation 32.3.1) and *not* by consideration of the original wind-speed curve;**

**(b) Shall be located above the 500-hPa isobaric surface and shall correspond to a speed of more than 30 metres per second.**

**Note: A maximum wind level is defined as a level at which the wind speed is greater than that observed immediately above and below that level.**

32.2.3.2 **Whenever more than one maximum wind level exists, these levels shall be reported as follows:**

**(a) The level of greatest maximum wind speed shall be transmitted first;**

**(b) The other levels shall be classified in descending order of speed and be transmitted only if their speed exceeds those of the two adjacent minimals by at least 10 metres per second;**

**(c) The levels of maximum wind with the same speed shall be encoded successively, beginning with the lowest one;**

**(d) Furthermore, the highest level attained by the sounding shall be transmitted, provided:**

**(i) It satisfies the criteria set forth in Regulation 32.2.3.1 above;**

**(ii) It constitutes the level of the greatest speed of the whole sounding.**

32.2.3.3 **When more than one level of maximum wind is observed, data for each level shall be reported by repeating Section 3.**

32.2.3.4 ***Indicator figures***

32.2.3.4.1 **When a maximum wind occurred within the sounding and its level was determined by means of pressure, the indicator figures 77 shall be used in the first group of Section 3, i.e. $77P_mP_mP_m$.**

32.2.3.4.2 **When a maximum wind occurred within the sounding and its altitude was expressed in tens of standard geopotential metres, the indicator figure 7 shall be used in the first group of Section 3, i.e. $7H_mH_mH_mH_m$.**

32.2.3.4.3 **When the greatest wind speed observed throughout the sounding occurred at the top of the sounding and the level of the greatest wind was determined by means of pressure, the indicator figures 66 shall be used in the first group of Section 3, i.e. $66P_mP_mP_m$.**

32.2.3.4.4 **When the greatest wind speed observed throughout the sounding occurred at the top of the sounding and the altitude of the greatest wind was expressed in tens of standard geopotential metres, the indicator figure 6 shall be used in the first group of Section 3, i.e. $6H_mH_mH_mH_m$.**

32.2.3.4.5 **When a maximum wind is not observed or not reported, the group 77999 shall be reported in lieu of the maximum wind section, i.e. Section 3.**

**32.2.3.5** *Group* **($4v_bv_bv_av_a$)**

**The group $4v_bv_bv_av_a$ shall be included only if data for vertical wind shear are computed and are required to be reported.**

**32.2.4** ***Section 5 – Regional groups***

**Inclusion of groups of Section 5 shall be determined by regional decision.**

**32.2.5** ***Section 6 – National groups***

**Inclusion of groups of Section 6 shall be determined by national decision.**

## 32.3 Parts B and D

**32.3.1** ***Section 4 – Fixed regional levels and/or significant levels***

**32.3.1.1** ***Significant levels***

**The reported significant data *alone* shall make it possible to reconstruct the wind profile with sufficient accuracy for practical use. Care shall be taken that:**

**(a) The direction and speed curves (in function of the log of pressure or altitude) can be reproduced with their prominent characteristics;**

**(b) These curves can be reproduced with an accuracy of at least 10° for direction and five metres per second for speed;**

**(c) The number of significant levels is kept strictly to a necessary minimum.**

**Note: To satisfy these criteria, the following method of successive approximations is recommended, but other methods of attaining equivalent results may suit some national practices better and may be used:**

**(1) The surface level and the highest level attained by the sounding constitute the first and the last significant levels.**

**The deviation from the linearly interpolated values between these two levels is then considered. If no direction deviates by more than 10° and no speed by more than five metres per second, no other significant level need be reported. Whenever one parameter deviates by more than the limit specified in paragraph (*b*) above, the level of greatest deviation becomes a supplementary significant level for *both* parameters.**

**(2) The additional significant levels so introduced divide the sounding into two layers. In each separate layer, the deviations from the linearly interpolated values between the base and the top are then considered. The process used in paragraph (1) above is repeated and yields other significant levels. These additional levels in turn modify the layer distribution, and the method is applied again until any level is approximated to the above-mentioned specified values.**

**For the purpose of computational work, it should be noted that the values derived from a PILOT report present two different resolutions:**

**(a) Winds at significant levels are reported to the resolution of 5° in direction and one metre per second in speed;**

**(b) Any interpolated wind at a level between two significant levels is *implicitly* reported to the resolution of ± 10° in direction and ± 5 metres per second in speed.**

**32.3.1.2** ***Fixed levels***

**32.3.1.2.1 The fixed levels reported in Section 4 shall be determined by regional decision.**

**32.3.1.2.2 In Section 4, the data groups for the fixed and significant levels within the sounding shall appear in ascending order with respect to altitude.**

**32.3.1.3** ***Indicator figures***

**32.3.1.3.1 When the altitudes of regional fixed levels and/or significant levels are given in units of 300 metres, the indicator figure 9 shall be used in Section 4 up to and including the height of 29 700 metres. Above that level, the indicator figure 1 shall be used to specify that 30 000 metres be added to the heights indicated by $t_nu_1u_2u_3$.**

**32.3.1.3.2** **When the altitudes of regional fixed levels and/or significant levels are given in units of 500 metres, the indicator figure 8 shall be used in Section 4.**

**32.3.1.3.3** **To indicate that the first wind group refers to station level, $u_1$ shall be coded / (solidus), and appropriate values shall be reported for $t_n$, $u_2$ and $u_3$.**

**32.3.1.4** ***Altitudes***

**The altitudes of fixed regional and significant levels shall be reported *either* in geopotential units *or* in pressure units. Only one of the units shall be used in a coded report.**

**32.3.1.5** ***Missing data***

**32.3.1.5.1** **If altitude is given in geopotential units in Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level in between with a height value somewhere in between the boundary heights and a group ddfff of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 1 500 geopotential metres thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. For example:**

| | | |
|---|---|---|
| **9226/** | **27025** | **28030** |
| **9329/** | **/////** | **29035** |

**where 28030 and 29035 are the boundary level winds in 7 800 and 11 700 gpm altitude. The fictitious altitude 9 600 gpm together with the group of solidi indicates the layer for which data are missing.**

**32.3.1.5.2** **If altitude is given in pressure units in Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 50 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:**

| | |
|---|---|
| $33P_3P_3P_3$ | $d_3d_3f_3f_3f_3$ |
| **44///** | **/////** |
| $55P_5P_5P_5$ | $d_5d_5f_5f_5f_5$ |

**where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.**

**32.3.2** ***Section 5 – Regional groups***

**Inclusion of groups of Section 5 shall be determined by regional decision.**

**32.3.3** ***Section 6 – National groups***

**Inclusion of groups of Section 6 shall be determined by national decision.**

| | |
|---|---|
| **FM 35–XI Ext. TEMP** | **Upper-level pressure, temperature, humidity and wind report from a fixed land station** |
| **FM 36–XI Ext. TEMP SHIP** | **Upper-level pressure, temperature, humidity and wind report from a sea station** |
| **FM 37–XI Ext. TEMP DROP** | **Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft** |
| **FM 38–XI Ext. TEMP MOBIL** | **Upper-level pressure, temperature, humidity and wind report from a mobile land station** |

**C O D E F O R M :**

**Part A**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGI_d$ | | |
| | | IIiii*<br>or<br>$99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$*** | $h_0h_0h_0h_0i_m$**** |
| SECTION 2 | $99P_0P_0P_0$<br>$P_1P_1h_1h_1h_1$<br>. . . . .<br>$P_nP_nh_nh_nh_n$ | $T_0T_0T_{a0}D_0D_0$<br>$T_1T_1T_{a1}D_1D_1$<br>. . . . .<br>$T_nT_1T_{an}D_nD_n$ | $d_0d_0f_0f_0f_0$<br>$d_1d_1f_1f_1f_1$<br>. . . . .<br>$d_nd_nf_nf_nf_n$ | | |
| SECTION 3 | $88P_tP_tP_t$<br>or<br>88999 | $T_tT_tT_{at}D_tD_t$ | $d_td_tf_tf_tf_t$ | | |
| SECTION 4 | $77P_mP_mP_m$<br>or<br>$66P_mP_mP_m$<br>or<br>77999 | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| SECTION 7 | 31313 | $s_rr_ar_as_as_a$ | 8GGgg | $(9s_nT_wT_wT_w)$ | |
| SECTION 9 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally | | | |
| SECTION 10 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally | | | |

* Used in FM 35 only.

** Used in FM 36 and FM 38 only.

*** Used in FM 36, FM 37 and FM 38 only.

**** Used in FM 38 only.

**Part B**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGa_4$ | | |
| | | IIiii* or $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$*** | $h_0h_0h_0h_0i_m$**** |
| SECTION 5 | $n_0n_0P_0P_0P_0$ | $T_0T_0T_{a0}D_0D_0$ | | | |
| | $n_1n_1P_1P_1P_1$ | $T_1T_1T_{a1}D_1D_1$ | | | |
| | . . . . . | . . . . . | | | |
| | $n_nn_nP_nP_nP_n$ | $T_nT_nT_{an}D_nD_n$ | | | |
| SECTION 6 | 21212 | $n_0n_0P_0P_0P_0$ | $d_0d_0f_0f_0f_0$ | | |
| | | $n_1n_1P_1P_1P_1$ | $d_1d_1f_1f_1f_1$ | | |
| | | . . . . . | . . . . . | | |
| | | $n_nn_nP_nP_nP_n$ | $d_nd_nf_nf_nf_n$ | | |
| SECTION 7 | 31313 | $s_rr_ar_as_as_a$ | 8GGgg | $(9s_nT_wT_wT_w)$ | |
| SECTION 8 | 41414 | $N_hC_LhC_MC_H$ | | | |
| SECTION 9 | 51515 52525 . . . . . 59595 | Code groups to be developed regionally | | | |
| SECTION 10 | 61616 62626 . . . . . 69696 | Code groups to be developed nationally | | | |

**Part C**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | D . . . . D** | $YYGGI_d$ | | |
| | | IIiii* or $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $MMMU_{La}U_{Lo}$*** | $h_0h_0h_0h_0i_m$**** |
| SECTION 2 | $P_1P_1h_1h_1h_1$ | $T_1T_1T_{a1}D_1D_1$ | $d_1d_1f_1f_1f_1$ | | |
| | . . . . . | . . . . . | . . . . . | | |
| | $P_nP_nh_nh_nh_n$ | $T_nT_nT_{an}D_nD_n$ | $d_nd_nf_nf_nf_n$ | | |
| SECTION 3 | $88P_tP_tP_t$ or 88999 | $T_tT_tT_{at}D_tD_t$ | $d_td_tf_tf_tf_t$ | | |
| SECTION 4 | $77P_mP_mP_m$ or $66P_mP_mP_m$ | $d_md_mf_mf_mf_m$ | $(4v_bv_bv_av_a)$ | | |
| | or 77999 | | | | |

* Used in FM 35 only.

** Used in FM 36 and FM 38 only.

*** Used in FM 36, FM 37 and FM 38 only.

**** Used in FM 38 only.

**Part C** *(continued)*

| | | | | |
|---|---|---|---|---|
| SECTION 7 | 31313 | $s_r r_a r_a s_a s_a$ | 8GGgg | ($9s_n T_w T_w T_w$) |

| | | |
|---|---|---|
| SECTION 9 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| SECTION 10 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally |

**Part D**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_i M_i M_j M_j$ | D . . . . D** | YYGG/ | | |
| | | $IIiii$*<br>or<br>$99L_a L_a L_a$ | $Q_c L_o L_o L_o L_o$ | $MMMU_{La}U_{Lo}$*** | $h_0 h_0 h_0 h_0 i_m$**** |
| SECTION 5 | $n_1 n_1 P_1 P_1 P_1$<br>. . . . .<br>$n_n n_n P_n P_n P_n$ | $T_1 T_1 T_{a1} D_1 D_1$<br>. . . . .<br>$T_n T_n T_{an} D_n D_n$ | | | |
| SECTION 6 | 21212 | $n_1 n_1 P_1 P_1 P_1$<br>. . . . .<br>$n_n n_n P_n P_n P_n$ | $d_1 d_1 f_1 f_1 f_1$<br>. . . . .<br>$d_n d_n f_n f_n f_n$ | | |
| SECTION 7 | 31313 | $s_r r_a r_a s_a s_a$ | 8GGgg | ($9s_n T_w T_w T_w$) | |

| | | |
|---|---|---|
| SECTION 9 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| SECTION 10 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally |

---

* Used in FM 35 only.

** Used in FM 36 and FM 38 only.

*** Used in FM 36, FM 37 and FM 38 only.

**** Used in FM 38 only.

**Notes:**

(1) TEMP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a fixed land station. TEMP SHIP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a sea station. TEMP DROP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a sonde released by a carrier balloon or aircraft equipped with dropsondes. TEMP MOBIL is the name of the code for an upper-level pressure, temperature, humidity and wind report from a mobile land station.

(2) A TEMP report is identified by $M_iM_i$ = TT, a TEMP SHIP report is identified by $M_iM_i$ = UU, a TEMP DROP report is identified by $M_iM_i$ = XX, and a TEMP MOBIL report is identified by $M_iM_i$ = II.

(3) The code form consists of four parts as follows:

| *Part* | *Identifier letters* ($M_jM_j$) | *Isobaric surfaces* |
|---|---|---|
| A | AA | Up to and including the 100-hPa surface |
| B | BB | |
| C | CC | Above the 100-hPa surface |
| D | DD | |

Each part can be transmitted separately.

(4) The code form is divided into a number of sections as follows:

| *Section number* | *Indicator figures or symbolic figure groups* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data |
| 2 | — | Data for standard isobaric surfaces |
| 3 | 88 | Data for tropopause level(s) |
| 4 | 66 or 77 | Data for maximum wind level(s) and data for vertical wind shear |
| 5 | — | Data for significant levels, with respect to temperature and/or relative humidity |
| 6 | 21212 | Data for significant levels, with respect to wind |
| 7 | 31313 | Data on sea-surface temperature and sounding system |
| 8 | 41414 | Cloud data |
| 9 | 51515<br>52525<br>. . . . .<br>59595 | Code groups to be developed regionally |
| 10 | 61616<br>62626<br>. . . . .<br>69696 | Code groups to be developed nationally<br>In parts A and C, identifier 66666 should not be used in Section 10. |

**REGULATIONS:**

## 35.1 General

**35.1.1** **The code names TEMP, TEMP SHIP, TEMP DROP or TEMP MOBIL shall not be included in the report.**

**35.1.2** **Parts A and B shall contain data, in so far as available, *only* for levels up to and including the 100-hPa level.**

**35.1.3** **Parts C and D shall contain data, in so far as available, *only* for levels above the 100-hPa level.**

**35.1.4** **The instructions regarding Parts A and B of the report with respect to the inclusion of data up to and including 100 hPa and regarding Parts C and D with respect to the inclusion of data above 100 hPa shall *not* be contravened. For example, if data at or below 100 hPa are not included in either Part A or B, as appropriate, they shall *not* be included in Part C or D. In this instance, the non-included data shall be transmitted separately in the form of a correction report.**

**35.1.5** **When during an ascent the pressure data can no longer be obtained but wind data can be obtained, the wind data so obtained shall *not* be reported in TEMP, TEMP SHIP and TEMP MOBIL reports.**

**Note: These wind data so obtained may be reported in PILOT, PILOT SHIP or PILOT MOBIL.**

**35.1.6** **Only wind data obtained from the radiosonde ascent by either visual or electronic means shall be included in the TEMP, TEMP SHIP and TEMP MOBIL reports. Wind data obtained by means other than a radiosonde-type ascent shall not be included in TEMP, TEMP SHIP and TEMP MOBIL reports.**

**35.1.7** **Only wind data obtained from the radiosonde descent by electronic means shall be included in the TEMP DROP reports. Wind data obtained by means other than a radiosonde-type descent shall not be included in TEMP DROP reports.**

## 35.2 Parts A and C

**35.2.1** ***Section 1 – Identification and position***

**The identification of a sea station or a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the group IIiii for a fixed land station, or the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for a sea station, aircraft or a carrier balloon, or a mobile land station. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station (including units of elevation) and the accuracy of the elevation.**

**35.2.2** ***Section 2 – Standard isobaric surfaces***

**35.2.2.1** **In section 2, the data groups for the surface level and the standard isobaric surfaces of 1 000, 925, 850, 700, 500, 400, 300, 250, 200, 150 and 100 hPa in Part A, and of 70, 50, 30, 20 and 10 hPa in Part C shall appear in ascending order with respect to altitude.**

**35.2.2.2** **When the geopotential of a standard isobaric surface is lower than the altitude of the reporting station, the air temperature-humidity group for that surface shall be included. Solidi (/////) shall be reported for these groups. The wind groups for these levels shall be included as specified by the value reported for symbol $I_d$.**

**35.2.2.3** **When wind data are available for all levels, the wind group shall be included for each level as indicated in the symbolic code form. If wind data are not available for all levels, the procedures given below shall be followed:**

**(a)** **When wind data are missing for one or more standard isobaric surfaces but are available for other standard isobaric surfaces below and above the level of missing wind data, the wind group(s), i.e. $d_nd_nf_nf_nf_n$, shall be coded by means of solidi (/////);**

**(b) When wind data are missing for a standard isobaric surface and are also missing for all succeeding standard isobaric surfaces up to the termination of the ascent, the wind group shall be omitted for all these levels and the symbol $I_d$ reported accordingly.**

**35.2.2.4 Whenever it is desired to extrapolate a sounding for the computation of the geopotential at a standard isobaric surface, the following rules shall apply:**

**(a) Extrapolation is permissible if, and only if, the pressure difference between the minimum pressure of the sounding and the isobaric surface for which the extrapolated value is being computed does not exceed one quarter of the pressure at which the extrapolated value is desired, provided the extrapolation does not extend through a pressure interval exceeding 25 hPa;**

**(b) For the purpose of geopotential calculation, and for this purpose only, the sounding will be extrapolated, using two points only of the sounding curve on a T-log p diagram, namely that at the minimum pressure reached by the sounding and that at the pressure given by the sum of this minimum pressure and the pressure difference, mentioned in (a) above.**

**35.2.3** ***Section 3 – Tropopause level(s)***

**35.2.3.1 When more than one tropopause is observed, each shall be reported by repeating section 3.**

Note: For a definition of tropopause, the *International Meteorological Vocabulary* (see WMO-No. 182).

**35.2.3.2 When no tropopause data are observed, the group 88999 shall be reported for section 3.**

**35.2.4** ***Section 4 – Maximum wind level(s) and vertical wind shear***

**35.2.4.1 When more than one maximum wind level is observed, each shall be reported by repeating section 4.**

Note: Criteria for determining maximum wind levels are given in Regulations 32.2.3.1 and 32.2.3.2.

**35.2.4.2 When no maximum wind level is observed, the group 77999 shall be reported for section 4.**

**35.2.4.3 Indicator figures 77 shall be used when the level(s) for which maximum wind data are reported does (do) not coincide with the top of the wind sounding. Indicator figures 66 shall be used in the opposite case, i.e. whenever the top of the wind sounding corresponds to the highest wind speed observed throughout the ascent.**

Note: For the purpose of the above regulation, the “top of the wind sounding” is to be understood as the highest level for which wind data are available.

**35.2.4.4** ***Group*** **($4v_bv_bv_av_a$)**

**Group $4v_bv_bv_av_a$ shall be included only if data for vertical wind shear are computed and required.**

**35.2.5** ***Section 7 – Sounding system indication, radiosonde, system status, launch time, sea-surface temperature groups***

**Section 7 is a mandatory section and shall always be reported. The groups $s_rr_ar_as_as_a$ and 8GGgg are mandatory for all TEMP reports: TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL. In TEMP SHIP reports, the group $9s_nT_wT_wT_w$ shall also be included.**

**35.2.6** ***Section 9 – Regional groups***

**Inclusion of groups of Section 9 shall be determined by regional decision.**

**35.2.7** ***Section 10 – National groups***

**Inclusion of groups of Section 10 shall be determined by national decision.**

## 35.3 Parts B and D

**35.3.1** ***Section 5 – Significant levels with respect to temperature and/or relative humidity***

**35.3.1.1** **If, in the determination of significant levels with respect to specified criteria for changes in air temperature and/or relative humidity, the criteria for either variable are satisfied at a particular point in altitude, data for both variables (as available) shall be reported for that level.**

**Dew-point data shall be derived using the function (or a near equivalent) for the relationship between saturation vapour pressure over water and air temperature (specified in the *Technical Regulations* (WMO-No. 49)). Dew-point data shall not be reported when the air temperature is outside the range stated by WMO for the application of the function; a lesser range may be used as a national practice.**

**The highest level for which a dew point is reported shall be one of the levels selected in accordance with Regulations 35.3.1.2 and 35.3.1.3.**

**The reported significant levels *alone* shall make it possible to reconstruct the air temperature and humidity profiles within the limits of the criteria specified.**

**35.3.1.2** **The following shall be included as “mandatory significant levels”:**

**(a) Surface level and the highest level of the sounding, or aircraft reference level and termination level for descent soundings;**

**(b) A level between 110 and 100 hPa;**

**(c) Bases and tops of inversions and isothermal layers which are at least 20 hPa thick, provided that the base of the layer occurs below the 300-hPa level or the first tropopause, whichever is the higher;**

**(d) Bases and tops of inversion layers which are characterized by a change in temperature of at least 2.5°C or a change in relative humidity of at least 20 per cent, provided that the base of the layer occurs below the 300-hPa level or the first tropopause, whichever is the higher.**

**Note: The inversion layers of (c) and (d) may be comprised of several thinner inversion layers separated by thin layers of temperature lapse. To allow for this situation, the tops of the inversion layers of (c) and (d) shall each be at a level such that no further inversion layers, whether thick or thin, shall occur for at least 20 hPa above the level.**

**35.3.1.3** **The following shall be included as “additional levels”. They shall be selected in the order given, thereby giving priority to representing the temperature profile. As far as possible, these additional levels shall be the actual levels at which prominent changes in the lapserate of air temperature occur:**

**(a) Levels which are necessary to ensure that the temperature obtained by linear interpolation (on a T-log P or essentially similar diagram) between adjacent significant levels shall not depart from the observed temperature by more than 1°C below the first significant level reported above the 300-hPa level or the first tropopause, whichever level is the lower, or by more than 2°C thereafter;**

**(b) Levels which are necessary to ensure that the relative humidity obtained by linear interpolation between adjacent significant levels shall not depart by more than 15 per cent from the observed values. (The criterion of 15 per cent refers to an amount of relative humidity and NOT to the percentage of the observed value, e.g. if an observed value is 50 per cent, the interpolated value shall lie between 35 per cent and 65 per cent.);**

**(c) Levels which are necessary to limit the interpolation error on diagrams other than T-log P. These levels shall be such that the pressure at one significant level divided by the pressure of the preceding significant level shall exceed 0.6 for levels up to the first tropopause and shall be determined by use of the method for selecting additional levels but with application of tighter criteria.**

**35.3.1.4** **When a significant level (with respect to air temperature and/or relative humidity) and a standard isobaric surface coincide, data for that level shall be reported in Parts A and B (or C and D, as appropriate).**

**35.3.1.5** **In Part B, the successive significant levels shall be numbered 00 (station level), the first level 11, the second level 22, . . . etc. . . . 99, 11, 22, . . . etc. In Part D, the first level above 100 hPa shall be numbered 11, the second 22, . . . etc. . . . 99, 11, 22, . . . etc. The code figure 00 for $n_0n_0$ in Part B shall never be used to indicate any level other than station level.**

**35.3.1.6** **In Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 20 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:**

| | |
|---|---|
| $33P_3P_3P_3$ | $T_3T_3T_{a3}D_3D_3$ |
| 44/// | ///// |
| $55P_5P_5P_5$ | $T_5T_5T_{a5}D_5D_5$ |

**where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.**

**35.3.2** ***Section 6 – Significant levels with respect to wind***

**35.3.2.1** **Significant levels shall be chosen so that the data from them *alone* shall make it possible to reconstruct the wind profile with sufficient accuracy for practical use.**

Note: Criteria for determining significant levels with respect to changes in wind speed and direction are given in Regulation 32.3.1.

**35.3.2.2** **In Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 50 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:**

| | |
|---|---|
| $33P_3P_3P_3$ | $d_3d_3f_3f_3f_3$ |
| 44/// | ///// |
| $55P_5P_5P_5$ | $d_5d_5f_5f_5f_5$ |

**where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.**

**35.3.3** ***Section 7 – Sounding system indication, radiosonde, system status, launch time, sea-surface temperature groups***

**Section 7 is a mandatory section and shall always be reported. The groups $s_rr_ar_as_as_a$ and 8GGgg are mandatory for all TEMP reports: TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL. In TEMP SHIP reports, the group $9s_nT_wT_wT_w$ shall also be included.**

**35.3.4** ***Section 8 – Cloud data***

**35.3.4.1** **In TEMP, TEMP SHIP and TEMP MOBIL reports, this section shall be used to report cloud data. $N_h$, h, $C_L$, $C_M$ and $C_H$ shall be coded in accordance with the regulations in FM 12 SYNOP (12.2.1.2, 12.2.7.2 and 12.2.7.3).**

**35.3.4.2** **This section shall not be included in TEMP DROP reports.**

**35.3.5** ***Section 9 – Regional groups***

**Inclusion of groups of Section 9 shall be determined by regional decision.**

**35.3.6** ***Section 10 – National groups***

**Inclusion of groups of Section 10 shall be determined by national decision.**

**FM 39–VI ROCOB** — **Upper-level temperature, wind and air density report from a land rocketsonde station**

**FM 40–VI ROCOB SHIP** — **Upper-level temperature, wind and air density report from a rocketsonde station on a ship**

**C O D E  F O R M :**

SECTION 1 $M_iM_iM_jM_j$ YYGGg MMJJJ $\left\{ \begin{array}{l} IIiii^* \\ \text{or} \\ 99L_aL_aL_a \quad Q_cL_oL_oL_oL_o \quad MMMU_{La}U_{Lo}^{**} \end{array} \right\}$

$a_1e_Te_Tc_Tm_r$ $r_me_we_wc_wm_r$

| | | | |
|---|---|---|---|
| SECTION 2 | $HHZ_TTT$ | ddfff | $(9d_pp_1p_1p_1)$ |
| | $HHZ_TTT$ | ddfff | $(9d_pp_1p_1p_1)$ |
| | . . . . . | . . . . . | |
| SECTION 3 | $(11Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $11Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n$ |
| | $22Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $22Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n$ |
| | $33Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $33Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n$ |
| | $44Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $44Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n$ |
| | $55Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $55Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n$ |
| | $66Z_TT_1T_1$ | $P_1P_1h_1h_1h_1$ | $d_1d_1f_1f_1f_1$ |
| | . . . . . | . . . . . | . . . . . |
| | $66Z_TT_nT_n$ | $P_nP_nh_nh_nh_n$ | $d_nd_nf_nf_nf_n)$ |

**Notes:**

(1) ROCOB is the name of the code for an upper-level (for altitudes greater than 20 km) temperature, wind and air density report of a rocketsonde observation from a land station. ROCOB SHIP is the name of the code of a rocket-sonde report from a ship.

(2) A ROCOB report is identified by = RRXX. A ROCOB SHIP report is identified by $M_iM_iM_jM_j$ = SSXX.

(3) The code form is divided into three sections as follows:

| *Section number* | *Contents* |
|---|---|
| 1 | Identification data |
| 2 | Data for specified geometric altitudes |
| 3 | Data for isobaric surfaces (optional) |

---

* Used in FM 39 only.

** Used in FM 40 only.

**REGULATIONS:**

## 39.1 General

**The code name ROCOB or ROCOB SHIP shall not be included in the report.**

## 39.2 Section 1 – Identification

**39.2.1** **The land rocketsonde station shall indicate its position by means of the group IIiii. The ship rocketsonde station shall indicate its position by means of the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$.**

**39.2.2** **Section 1 shall not be transmitted as a separate report.**

**39.2.3** **The group MMJJJ shall be used to indicate, together with the group YYGGg, the year (JJJ), month (MM), day (YY) and time (GGg) of the firing of the rocket.**

## 39.3 Section 2 – Specified geometric altitudes

**39.3.1** ***Mandatory levels***

**39.3.1.1** **Data shall be reported for each 5 km vertical interval, beginning at 20 km, up to the top of the ascent, and for the lowest level of the ascent for which data are available, provided its altitude is higher than 20 km.**

**39.3.1.2** **If data are not available for one or more of the mandatory altitudes specified in Regulation 39.3.1.1, the code groups for those levels shall be inserted in the report in their altitude sequence order with solidi (/, // or ///) reported for the missing elements.**

**39.3.2** ***Significant levels***

**39.3.2.1** **All data shall be reported for those non-mandatory levels at which significant changes in wind speed or direction or temperature occur. The mandatory and significant levels shall be intermixed in the report in ascending order with respect to altitude.**

**39.3.2.2** **The reported significant data shall make it possible to reconstruct the wind and temperature curves between consecutive mandatory levels with sufficient accuracy for practical use.**

**39.3.2.3** **The criteria for significant changes shall be as follows:**

**(a)** **A departure of the wind speed of 5 or more metres per second from a linear interpolation between any two consecutive levels selected to be reported;**

**(b)** **A departure of the wind direction from a linear interpolation between any two consecutive levels selected to be reported, thus:**

**60° or more – when the average wind speed for the layer is 8 to 15 metres per second;**

**30° or more – when the average wind speed for the layer is 16 to 30 metres per second;**

**20° or more – when the average wind speed for the layer is 31 metres per second or more;**

**(c)** **A temperature change of 3°C from a linear interpolation between any two consecutive levels selected to be reported.**

**Note: To satisfy these criteria, the following method of approximation is recommended:**

**(1)** **The bottom level and the top level of the 5 km stratum between two consecutive mandatory levels constitute the base lines for determining the significant levels in that stratum. If the wind and temperature criteria are not exceeded, no significant level need be reported. Whenever one of the parameters deviates by more than the limit specified in Regulation 39.3.2.3, the level of greatest deviation becomes a significant level, and data for all three parameters are reported for that level.**

**(2) The additional significant levels so introduced divide the stratum into several layers. In each separate layer, the deviations from the linearly interpolated values between the base and the top are then considered. The process used in paragraph (1) above is repeated and yields other significant levels. These additional levels in turn modify the layer distribution, and the method is applied again until any level is approximated to the specified criteria values.**

**39.3.3** ***Group* ddfff**

**The thickness of the layer through which wind direction and speed are determined shall be 2 km for both mandatory and significant levels, i.e. from 1 km below to 1 km above the altitude reported.**

**39.3.4** ***Group* ($9d_pp_1p_1p_1$)**

**Group $9d_pp_1p_1p_1$ shall be included only when data are available. If temperature data are missing for a stratum of more than 3 km in depth, the $9d_pp_1p_1p_1$ group shall be omitted for the remainder of the ascent.**

## 39.4 Section 3 – Isobaric surfaces

**39.4.1** **Section 3 shall be included only when data are available for any of the isobaric surfaces of 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, $7.10^{-1}$, $5.10^{-1}$, $4.10^{-1}$, $3.10^{-1}$, $2.10^{-1}$, $1.10^{-1}$, $7.10^{-2}$, $5.10^{-2}$, $3.10^{-2}$, $2.10^{-2}$, $1.10^{-2}$, $7.10^{-3}$, $5.10^{-3}$, $3.10^{-3}$, $2.10^{-3}$, $1.10^{-3}$, $7.10^{-4}$, $5.10^{-4}$, $3.10^{-4}$, $2.10^{-4}$, $1.10^{-4}$, $7.10^{-5}$, $5.10^{-5}$, $3.10^{-5}$, $2.10^{-5}$ and $1.10^{-5}$ hPa.**

**39.4.2** **In Section 3, indicator figures 11, 22, 33, 44, 55 and 66 specify the following values for PP and hhh:**

**Indicator figures 11 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in whole hectopascals and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;**

**Indicator figures 22 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in tenths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;**

**Indicator figures 33 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in hundredths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;**

**Indicator figures 44 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;**

**Indicator figures 55 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in ten-thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;**

**Indicator figures 66 shall be used when $P_1P_1$, $P_2P_2$, . . . $P_nP_n$ are reported in hundred-thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in thousands of standard geopotential metres.**

**FM 41–IV CODAR** **Upper-air report from an aircraft (other than weather reconnaissance aircraft)**

**C O D E F O R M :**

| | | | | |
|---|---|---|---|---|
| $M_iM_iM_jM_j$ | | | | |
| YYGGg | $99L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $P_aP_aP_aB_zS_h$ | $TTT_an_sn_m$ |
| $(40L_aL_aL_a$ | $Q_cL_oL_oL_oL_o)$ | ddfff | | |
| $(41L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | ddfff) | | |
| . . . . . | . . . . . | . . . . . | | |
| $(49L_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | ddfff) | | |
| (6HHHH) | | | | |

**Notes:**

(1) CODAR is the name of the code for an upper-air report from aircraft (other than weather reconnaissance aircraft) in figure code.

(2) A CODAR report is identified by $M_iM_iM_jM_j$ = LLXX.

**R E G U L A T I O N S :**

## 41.1 General

**41.1.1** **The code name CODAR shall not be included in the report.**

**41.1.2** **The identifier group $M_iM_iM_jM_j$ shall be included as the first line of the text of a meteorological bulletin of CODAR reports. Individual reports in the bulletin shall not contain the group $M_iM_iM_jM_j$.**

## 41.2 Wind data

**41.2.1** **If both spot and mean winds are available, spot winds shall always be reported first.**

**41.2.2** **If one spot wind only is reported, it shall refer to the position given at the beginning of the report. If more than one spot wind is reported, the positions of the points where the second and the following spot winds were measured shall be included immediately before the relevant ddfff group(s).**

**41.2.3** **In the case of mean wind, the position of the midpoint of the sector over which it was calculated shall always be included immediately before the relevant ddfff group.**

**CODE FORM:**

| | | | | | | |
|---|---|---|---|---|---|---|
| SECTION 1 | **AMDAR** | YYGG | | | | |
| SECTION 2 | $i_pi_pi_p$ | $I_A \ldots I_A$ | $L_aL_aL_aL_aA$ | $L_oL_oL_oL_oL_oB$ | YYGGgg | $S_hh_Ih_Ih_I$ |
| | $SST_AT_AT_A$ | $\left\{\begin{array}{l} SST_dT_dT_d \\ \text{or} \\ UUU \end{array}\right\}$ | ddd/fff | $\mathbf{TB}B_A$ | $\mathbf{S}s_1s_2s_3$ | |
| SECTION 3 | 333 | $\mathbf{F}h_dh_dh_d$ | $\mathbf{VG}f_gf_gf_g$ | | | |

**Notes:**

(1) AMDAR is the name of the code for an automatic meteorological report from an aircraft.

(2) Observations are made at specified levels, time intervals or when the highest wind is encountered, and shall be included in individual reports.

(3) Data transmitted from the aircraft are encoded in binary code and are translated into the quasi-AIREP format for the convenience of human users.

**REGULATIONS:**

## 42.1 General

**42.1.1** **In a bulletin of AMDAR reports, the contents of Section 1 (the code name AMDAR and the group YYGG) shall be included only as the first line of the bulletin.**

**42.1.2** ***Reporting data groups***

**42.1.2.1** **Subject to Regulation 42.1.2.2, an AMDAR report shall include Section 2 containing at least the phase of flight indicator, the aircraft identifier, its geographical location and the day and time of observation, as well as the observed temperature and wind.**

**42.1.2.2** **An AMDAR report from an ASDAR system shall include all data groups contained in Section 2 and shall not include Section 3.**

**42.1.2.3** **An AMDAR report from an ACARS system shall include Section 3.**

**42.1.2.4** ***Use of solidi***

**Data shall be encoded as solidi when not available, when the data collection platform cannot acquire correct data, or in the event of parity errors.**

**42.1.3** ***Frequency of observations***

**The frequency of observations shall vary according to the phase of the flight (ascent, level flight or descent).**

**42.1.3.1** ***Observations during ascent***

**During ascent, observations shall be made as the aircraft passes through certain pressure levels, as follows. The first level shall be the nearest multiple of 10 hPa less than pressure at take-off. The next nine observations shall be at intervals of 10 hPa. The eleventh level shall be the first multiple of 50 hPa less than the tenth level. Observations shall continue at 50-hPa intervals until ascent is completed.**

**Note: For example, if the pressure at take-off was 1 012 hPa, the first level to be reported would be 1 010 hPa.**

**42.1.3.2** ***Observations during level flight***

**42.1.3.2.1 Routine observations**

**Routine observations during level flight shall be made at set intervals of time. The first observation shall be made at the first integral minute after the level flight phase has been continuously occupied for at least 15 seconds. Subsequent observations shall be made at seven-minute intervals. If level flight is interrupted by unsteady flight, the timing sequence shall begin again upon resumption of level flight.**

**42.1.3.2.2 Highest wind encountered**

**Highest wind encountered shall be reported when the aircraft is in level flight at a pressure level less than 600 hPa, according to the following scheme. Smoothed wind speed shall be sampled at one-second intervals, and a wind speed maximum shall be reported if and only if the wind speed:**

**(a) Is greater than 60 knots;**

**(b) Exceeds the observed wind speed at the previous routine observation by 10 knots or more; and**

**(c) Exceeds the observed wind speed at the subsequent routine observation by 10 knots or more.**

**42.1.3.3** ***Observations during descent***

**During descent, observations shall be made as the aircraft passes through certain pressure levels, as follows. The first level shall be the nearest multiple of 50 hPa greater than the pressure at the last observation before descent. Subsequent observations shall be at intervals of 50 hPa, until a pressure level of 700 hPa is reached. From that level, observations shall continue at 50-hPa intervals, but supplemented by observations at intervals of 10 hPa.**

## 42.2 Section 2

**42.2.1** ***Phase of flight indicator*** $\mathbf{i_pi_pi_p}$

**42.2.1.1 An indicator shall be included in each report, to show both phase of flight (unsteady, level, ascent or descent) and, in the case of level flight, the type of observation (routine or maximum wind).**

**42.2.1.2 Whenever a predetermined roll threshold has been exceeded, the phase of flight shall be considered to be unsteady.**

**42.2.1.3 A routine observation in level flight shall be indicated by encoding the phase of flight indicator as LVR.**

**42.2.1.4 Highest wind encountered in level flight shall be indicated by encoding the phase of flight indicator as LVW.**

**42.2.1.5 An observation during ascent shall be indicated by encoding the phase of flight indicator as ASC.**

**42.2.1.6 An observation during descent shall be indicated by encoding the phase of flight indicator as DES.**

**42.2.1.7 An observation during an unsteady phase of flight shall be indicated by encoding the phase of flight indicator as UNS.**

**42.2.2** ***Meteorological data***

**42.2.2.1** ***Temperature***

**Each observation shall include the air temperature at the given pressure altitude. The precision of the temperature shall be indicated by $\mathbf{s_3}$. If observed, either dew-point temperature or relative humidity at the given pressure altitude shall be included.**

**42.2.2.2** ***Wind***

**Each observation shall include a value for the observed wind. Direction, relative to true north, shall be reported in whole degrees. Wind speed shall be reported in whole knots.**

**42.2.2.3** ***Turbulence***

**Each observation from an ASDAR system shall include a report of turbulence, encoded by the indicator letters TB followed by a single digit value for the turbulence.**

## 42.3 Section 3

**42.3.1** ***Group*** **$Fh_dh_dh_d$**

**This group shall be used in an AMDAR report from an ACARS system to report the pressure altitude.**

**Note: Reports up to and including 700 hPa are considered to be above the aerodrome with height derived from the QNH value and the elevation of the aerodrome concerned. Heights above 700 hPa are included in accordance with the ICAO standard atmosphere.**

**42.3.2** ***Group*** **$VGf_gf_gf_g$**

**This group shall be used in an AMDAR report from an ACARS system to report the maximum derived equivalent vertical gust.**

**Notes:**

**(1)** **The qualitative severity of turbulence can be related approximately to values of derived equivalent gust velocity as follows:**

| | | | | |
|---|---|---|---|---|
| **$U_{de}$** | **< 2 m $s^{-1}$** | **2–4.5 m $s^{-1}$** | **4.5–9 m $s^{-1}$** | **> 9 m $s^{-1}$** |
| **Severity** | **Nil** | **Light** | **Heavy** | **Severe** |

**(2)** **The derived equivalent vertical gust, $U_{de}$, is defined by aircraft design codes such as the US Federal Aviation Regulations – Part 25.341, or the Engineering Sciences Data Unit (London, United Kingdom) – Data Item 69023.**

## FM 44–V ICEAN Ice analysis

**C O D E  F O R M :**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | ICEAN | | | | |
| (Preamble 1) | 20002 | 33399 | $0YYG_cG_c$ | $(2Y_sY_sG_sG_s)$ | |
| | or | | | | |
| (Preamble 2) | 75557 | 33399 | $0YYG_cG_c$ | $(2Y_sY_sG_sG_s)$ | $000G_pG_p$ |

| | | | | |
|---|---|---|---|---|
| SECTION 2 | (44111 | $6L_iL_iL_jL_j$ | $Q_cL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_o$ |
| | $Q_cL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_o$ | . . . . . | . . . . . |
| | $CF_pC_pS_1C_1$ | $(2F_sC_sS_2C_2)$ | $(3F_eC_eS_3C_3)$ | $(4F_qC_qS_4C_4)$ |
| | $(5F_uC_uS_5C_5)$ | $(6T_1T_2R_eR_h)$ | $(7W_tD_wt_Em_s)$ | $(8a_lDr_ir_i)$ |
| | $(9n_Gn_Gn_Bn_B))$ | | | |
| SECTION 3 | (4422K | $Q_cL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_o$ | $Q_cL_aL_aL_aL_a$ |
| | $L_oL_oL_oL_oL_o$ | . . . . . | . . . . .) | |
| SECTION 4 | (4433K | $Q_cL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_o$ | $Q_cL_aL_aL_aL_a$ |
| | $L_oL_oL_oL_oL_o$ | . . . . . | . . . . .) | |
| | 19191 | | | |

**Notes:**

(1) ICEAN is the name of the code describing actual or predicted ice conditions.

(2) An ICEAN analysis or prognosis is identified by the word ICEAN.

(3) The code form is divided into four sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | 20002 or 75557 | Identification of time groups |
| 2 | 44111 | Description of ice conditions |
| 3 | 4422 | Areas with defined navigability |
| 4 | 4433 | Recommended track |

Sections 2, 3 and/or 4 are not transmitted separately.

**R E G U L A T I O N S :**

### 44.1 General

**44.1.1** **The code name ICEAN shall always appear as a prefix to an individual coded analysis or prognosis.**

**4.4.1.2** **When the position groups delineate an enclosed area, they shall appear in the coded analysis or prognosis in clockwise sequence. The first position group(s) shall be repeated as the last position group(s) to complete closure of the area.**

**44.1.3** **Each analysis or prognosis shall end with the group 19191.**

## 44.2 Section 1

**44.2.1** **The first preamble shall be used to begin an ice analysis. The second preamble shall be used to begin an ice prognosis.**

**44.2.2** **The appropriate preamble shall be included each time the analysis or prognosis is prepared from a different chart.**

**44.2.3** **When, in addition to conventional data, satellite information is used to prepare the analysis or prognosis, the date and time of the satellite information shall be indicated by means of the group $2Y_sY_sG_sG_s$.**

**44.2.4** **Positions shall be given in degrees and minutes or by using the group $L_aL_aL_oL_ok$ which gives the position to the nearest half-degree. If the group $L_aL_aL_oL_ok$ is used, the indicator group 33399 in the preamble shall be replaced by the group 33300 for positions in the northern hemisphere and by the group 33311 for positions in the southern hemisphere.**

## 44.3 Section 2

**44.3.1** **Section 2 shall be omitted from the coded analysis or prognosis which is intended to contain only information on the navigability of areas or on recommended shipping tracks.**

**44.3.2** **Section 2 shall be repeated as often as necessary to describe the ice conditions in the entire area covered by the analysis or prognosis.**

**44.3.3** **The groups $2F_sC_sS_2C_2$ . . . . . etc. . . . . . $9n_Gn_Gn_Bn_B$ shall be included, as required, to describe further the ice conditions indicated by the preceding groups $6L_iL_iL_jL_j$ etc. . . . . . $CF_pC_pS_1C_1$.**

**44.3.4** **Information on icebergs shall be included when available. The group $9n_Gn_Gn_Bn_B$ shall be used to provide information on the icebergs additional to that given by the group $6L_iL_iL_jL_j$.**

## 44.4 Section 3

**44.4.1** **When information on the navigability of an area is not available, or does not need to be included, Section 3 shall be omitted.**

**44.4.2** **Section 3 shall be repeated as often as necessary to describe the navigation conditions in the entire area covered by the analysis or prognosis.**

## 44.5 Section 4

**44.5.1** **When information on shipping tracks is not included, Section 4 shall be omitted.**

**44.5.2** **If the obstruction to navigation varies along a recommended track, Section 4 shall be repeated as often as necessary to delineate the various legs along the recommended track.**

**44.5.3** **If a recommended track is divided into legs, the position of the last point of the preceding leg shall be repeated as the first position point of the new leg.**

**C O D E  F O R M :**

| | | | | | | |
|---|---|---|---|---|---|---|
| PREAMBLES | 10001 | $333x_1x_1$ | $0YYG_cG_c$ | | | |
| | or | | | | | |
| | 10001 | $333x_1x_1$ | $0YYG_cG_c$ | $8x_2x_2x_28$ | $00x_3x_3x_3$ | |
| | or | | | | | |
| | 65556 | $333x_1x_1$ | $0YYG_cG_c$ | $000G_pG_p$ | | |
| | or | | | | | |
| | 65556 | $333x_1x_1$ | $0YYG_cG_c$ | $000G_pG_p$ | $8x_2x_2x_28$ | $00x_3x_3x_3$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECTION 0 | 99900 | | | | | | |
| | (9NNSS) | $8P_tP_cPP$ or $8h_th_ch_ah_a$ | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$) | |
| | . . . . . | . . . . .  . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | |
| Subsection 0–1 | ($000g_pg_p$ | $9P_tP_cPP$ or $9h_th_ch_ah_a$ | yyyyy | . . . . . | | | |
| | | or | | | | | |
| | | $7P_tP_cPP$ or $7h_th_ch_ah_a$ | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$)) | |
| | | . . . . .  . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECTION 1 | 99911 | | | | | | |
| | (9NNSS) | $66F_tF_iF_c$ | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$) | |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | |
| Subsection 1–1 | ($000g_pg_p$ | $69F_tF_iF_c$ | yyyyy | yyyyy | . . . . . | | |
| | | or | | | | | |
| | | $67F_tF_iF_c$ | yyyyy | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$)) |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | |
|---|---|---|---|---|
| SECTION 2 | 99922 | | | |
| | $4e_1uuu$ | yyyyy | . . . . . | ($00C_100$) |
| | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | |
|---|---|---|---|---|
| SECTION 3 | 99933 | | | |
| | $33M_hM_sM_t$ | yyyyy | . . . . . | ($00C_100$) |
| | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | | |
|---|---|---|---|---|---|
| SECTION 4 | 99944 | | | | |
| | $989w_ei$ | | | | |
| | or | | | | |
| | 988ww | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$) |
| | or | | | | |
| | $987w_sw_s$ | | | | |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SECTION 5 | 99955 | | | | | | | |
| | (9NNSS) | ($55T_tT_iT_c$) | (555PP) | ($5555T_i$) | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$) |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | | |
|---|---|---|---|---|---|
| SECTION 6 | 99966 | | | | |
| | $2C_sS_1S_2Z_1$ | yyyyy | . . . . . | ($md_sd_sf_sf_s$) | ($00C_100$) |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | ($9CH_bH_bH_b$ | $8NH_tH_tH_t$ | yyyy | . . . . . | . . . . .) |
| | or | | | | |
| | ($7CH_bH_bH_b$ | $6NH_tH_tH_t$ | yyyy | . . . . . | . . . . .) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SECTION 7 | 99977 | | | | | | | | | |
| | ($000g_pg_p$) | yyyyy | 8ddff | 7ddff | 5ddff | 4ddff | 3ddff | 2ddff | 1ddff | ($00C_100$) |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SECTION 8 | 99988 | | | | | | | | | |
| | $9i_jH_jH_jH_j$ | yyyyy | $d_jd_jf_jf_jf_j$ | yyyyy | $d_jd_jf_jf_jf_j$ | . . . . . | . . . . . | . . . . . | . . . . . | ($00C_100$) |
| | and/or | | | | | | | | | |
| | $9i_jP_sP_sP_s$ | yyyyy | $d_jd_jf_jf_jf_j$ | yyyyy | $d_jd_jf_jf_jf_j$ | . . . . . | . . . . . | . . . . . | . . . . . | ($00C_100$) |
| | and/or | | | | | | | | | |
| | $4e_1uuu$ | yyyyy | yyyyy | . . . . . | . . . . . | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| SECTION 9 | 99999 | | | | |
| | $4e_1uuu$ | (42uuu) | yyyyy | . . . . . | ($00C_100$) |
| | (00000 | 42uuu | yyyyy | . . . . . | . . . . .) |
| | (. . . . . | . . . . . | . . . . . | . . . . . | . . . . .) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SECTION 10 | 88800 | | | | | | | | |
| | $77e_2uu$ | ($9d_wd_wP_wP_w$) | yyyyy | ($9d_wd_wP_wP_w$) | yyyyy | . . . . . | . . . . . | ($00C_100$) | |
| Subsection 10-1 | ($000g_pg_p$ | { $79e_2uu$ or $76e_2uu$ } | ($9d_wd_wP_wP_w$) | yyyyy | ($9d_wd_wP_wP_w$) | yyyyy | . . . . . | ($00C_100$) | |
| | | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | ) |

| | | | | |
|---|---|---|---|---|
| SECTION 11 | 88822 | | | |
| | 44vvv | yyyyy | yyyyy | . . . . . |
| | or | | | |
| | 444vvv | yyyyy | yyyyy | . . . . . |

| | | | |
|---|---|---|---|
| SECTION 12 | 77744 | . . . . . . . . . . . . . . . . . . . . . . . . Vocabulary groups . . . . . . . . . . . . . . . . . . . . . . . | 44777 |
| | 19191 | | |

**Notes:**

(1) IAC is the name of the code comprising a set of the International Analysis Codes.

(2) The code form consists of a set of alternative preambles and a number of sections as follows:

(a) Alternative preambles

| *Line* | *To be used for* |
|---|---|
| First line | Surface analysis |
| Second line | Analysis other than surface |
| Third line | Surface prognosis |
| Fourth line | Prognosis other than surface |

(b) Sections

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | 99900 | Pressure or topography systems |
| 1 | 99911 | Frontal systems |
| 2 | 99922 | Isopleth values |
| 3 | 99933 | Air-mass particulars |
| 4 | 99944 | Weather |
| 5 | 99955 | Tropical systems |
| 6 | 99966 | Cloud systems |
| 7 | 99977 | Upper winds |
| 8 | 99988 | Jet-stream characteristics |
| 9 | 99999 | Tropopause characteristics |
| 10 | 88800 | Sea temperature and waves |
| 11 | 88822 | Vertical wind shear |
| 12 | 77744 | Vocabulary groups |

A section cannot be transmitted without the appropriate preamble.

(3) Sections 0, 1 and 10 each contain a subsection which can be used when greater detail is required about past or future positions and characteristics of any pressure, front or wave system or sea-temperature configuration. Whereas the section itself refers to the time indicated in the preamble of the message, the past or future times of the subsection are indicated by means of the group $000g_pg_p$. A subsection can be repeated, with insertion of the appropriate group $000g_pg_p$, when information on both past and future conditions is to be included.

(4) The Sections 0 to 11 and the subsections each describe delineations, by means of the position groups yyyyy, of given values of a parameter or given states of an element. The section thus consists of a regular succession of sets of groups, each set starting with a group giving the new value of the parameter or element. The position groups of each set may be followed by additional information in the optional groups $md_sd_sf_sf_s$ and $00C_100$ on the movement of systems or fronts and about the confidence of the preceding information, as specified in the code form.

(5) Section 6 provides for the inclusion of reported conditions by means of groups with indicator figures 9 and 8, and forecast conditions by groups with indicator figures 7 and 6.

(6) Section 7 provides for the coding of upper winds in vertical profile for selected standard isobaric surfaces, at each position yyyyy and either at the time given in the preamble of the message or at a later time indicated by the group $000g_pg_p$.

(7) Section 8 provides for the coding of actual or forecast winds for a number of positions along the jet-stream core or along the line of maximum wind speed on the standard constant-pressure charts immediately above or below the jet core. This section will be restricted normally to winds exceeding 60 knots or 30 m $s^{-1}$ or 100 km $h^{-1}$ (depending on the value selected for $i_j$).

(8) Section 9 provides for the coding of tropopause temperature data in relation to isopleths of the level of the tropopause. The $4e_1uuu$ group gives the value of the isobar or the isohypse described by all the yyyyy groups which follow up to the next $4e_1uuu$ group in the message. Along a given isobar or isohypse, each of the 42uuu groups gives the temperature at the points indicated by the following yyyyy groups. When the temperature changes along the tropopause isopleth, an indicator group 00000 is included, followed by a 42uuu group and the yyyyy groups. In the 42uuu group, uuu gives the temperature in whole degrees Celsius.

(9) Section 10 provides for indicating, as an optional feature, direction and period of waves for each point of a sea-surface isotherm. Each group $9d_wd_wP_wP_w$ refers to the position yyyyy which follows.

(10) Section 11 provides for the coding of vertical wind shear in knots per 1 000 metres, by using the group 44vvv, and for the coding of vertical wind shear in knots per 300 metres by using the group 444vv.

(11) Section 12 provides for the addition of information in plain language, for instance to emphasize the existence of a line squall.

**R E G U L A T I O N S :**

## 45.1 General

**The code name IAC shall not be included in the coded analysis or prognosis.**

## 45.2 Preamble

**45.2.1** **The appropriate preamble shall be included each time the analysis or prognosis is made up from a different chart, whether it be for sea level or any other level, and for each different type.**

**45.2.2** **Each analysis or prognosis defined in Regulation 45.2.1 shall end with the group 19191.**

**45.2.3** **Additional groups shall be inserted in the preambles under the following conditions, as described in Code table 4892:**

**(a) When $x_2x_2x_2$ = 555, the group 85558 shall be followed by two $00x_3x_3x_3$ groups;**

**(b) When $x_2x_2x_2$ = 666, the group 86668 shall be followed by either the 81118 or the 82228 group, as appropriate.**

## 45.3 Sections

**45.3.1 Each section shall be identified by its symbolic figure group. If the same type of data is given in two separate portions of the message, each portion constitutes a section and shall be preceded by the appropriate symbolic figure group.**

**Note: The symbolic figure groups are primarily designated for use at analysis centres where different sections or portions of sections may be prepared at varying times and may be communicated in a varying order.**

### 45.3.2 *Position groups*

**45.3.2.1 The position groups yyyyy shall be given in the form specified by the symbol $x_1x_1$.**

**45.3.2.2 When the method of indicating positions is changed part-way through an analysis, the change shall be indicated by the insertion of the appropriate indicator group $333x_1x_1$, except as stipulated in Regulation 45.3.2.3.**

**45.3.2.3 When positions in equatorial regions are given in the form $L_aL_aL_oL_ok$ and the key group 33322 (for $333x_1x_1$) is used, southern latitudes from 0°S to 30°S shall be indicated by subtraction from 100 (13°S = 87, 29°S = 71, etc.).**

**45.3.2.4 When positions are given in the form $QL_aL_aL_oL_o$ and a more precise location of the positions is required, the group $000L_aL_o$ shall be added after the appropriate $QL_aL_aL_oL_o$ group, with $L_a$ and $L_o$ giving the required tenths of a degree latitude and longitude, respectively.**

**45.3.2.5 When positions are given in the form $iiiD_1s_1$ and the distance to be indicated by $s_1$ is 110 kilometres or more, the group $00s_200$ shall precede the $iiiD_1s_1$ group which it modifies, with $s_2$ indicating the hundreds of kilometres to be added to the value of $s_1$.**

### 45.3.3 *Subsections of Sections 0, 1 and 10*

**45.3.3.1 To indicate positions and characteristics of a system or set of parameters at times *prior* to the time given in the preamble, the groups $9P_tP_cPP$ or $9h_th_ch_ah_a$ in Subsection 0–1, or the group $69F_tF_iF_c$ in Subsection 1–1, or the group $79e_2uu$ in Subsection 10–1 shall be used. In these cases the number of hours reported for $g_pg_p$ shall be *subtracted* from the time given in the preamble (i.e. $G_cG_c$ or $G_cG_c + G_pG_p$ as appropriate), to obtain the *prior* time.**

**Note: A subsection may be repeated, as required, to give information on various *prior* positions of the system or parameters.**

**45.3.3.2 To indicate positions and characteristics of a system or set of parameters at times *after* the time given in the preamble, the groups $7P_tP_cPP$ or $7h_th_ch_ah_a$ in Subsection 0–1, or the group $67F_tF_iF_c$ in Subsection 1–1, or the group $76e_2uu$ in Subsection 10–1 shall be used. In these cases the number of hours reported for $g_pg_p$ shall be *added* to the time given in the preamble (i.e. $G_cG_c$ or $G_cG_c + G_pG_p$, as appropriate), to obtain the *future* time.**

**Note: A subsection may be repeated, as required, to give information on various *future* positions of the system or parameters.**

### 45.3.4 *Section 3 – Air mass*

**The $33M_hM_sM_t$ group shall be followed by a second $33M_hM_sM_t$ group when necessary to indicate that two air masses are involved and they have become mixed, that one air mass is above the other, or that the air mass is in a state of transition and acquiring new characteristics.**

### 45.3.5 *Section 6 – Clouds*

**Groups with indicator figures 9 and 8 shall be used to indicate reported conditions, those with indicator figures 7 and 6 to indicate forecast conditions.**

**45.3.6** ***Section 7 – Upper winds***

**45.3.6.1** **Wind data for the standard isobaric surfaces of 850, 700, 500, 400, 300, 200 and 100 hPa, or a selection of these surfaces, shall be given in the ddff groups with indicator figures 8, 7, 5, 4, 3, 2 and 1, respectively. The number of hours given for $g_pg_p$ shall be added to the time given for $G_cG_c$ to specify the time of forecast winds.**

**45.3.6.2** **Wind speeds of 100 knots or more shall be encoded as follows:**

**(a) Wind speeds of 100 knots or more, but not exceeding 199 knots, shall be reported as follows:**

- **(i) 50 shall be added to dd;**
- **(ii) The number of knots in excess of 100 shall be indicated for ff;**

**(b) Wind speeds of 200 knots or more, but not exceeding 299 knots, shall be reported as follows:**

- **(i) The code group 00200 shall be inserted after the group to which it refers;**
- **(ii) The number of knots in excess of 200 shall be indicated for ff;**

**(c) Wind speeds of 300 knots or more, but not exceeding 399 knots, shall be reported as follows:**

- **(i) The code group 00300 shall be inserted after the group to which it refers;**
- **(ii) The number of knots in excess of 300 shall be indicated for ff.**

## 45.4 Additional groups and supplementary information

**If additional supplementary sections of the analysis code are used for national purposes, the above code form shall be used in so far as it is applicable and the supplementary sections shall be placed at the end of the coded analysis and prognosis or sent separately from each other.**

## 45.5 Correction

**When it is necessary to send a correction to the analysis or prognosis, the correction shall commence with the groups 11133 $0YYG_cG_c$. The corrections shall follow, preceded by the key group indicators pertinent to the sections, and the coded analysis or prognosis shall end with the 19191 group.**

**C O D E F O R M :**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PREAMBLES | 10001 | 33388 | $0YYG_cG_c$ | | | | | |
| | or | | | | | | | |
| | 65556 | 33388 | $0YYG_cG_c$ | $000G_pG_p$ | | | | |
| SECTION 0 | 99900 | | | | | | | |
| | $8P_tP_cPP$ | $QL_aL_aL_oL_o$ | . . . . . | $md_sd_sf_sf_s$ | | | | |
| Subsection 0–1 | $(000g_pg_p$ | $9P_tP_cPP$ | $QL_aL_aL_oL_o$ | . . . . . | | | | |
| | | or | | | | ) | | |
| | | $7P_tP_cPP$ | $QL_aL_aL_oL_o$ | . . . . . | $md_sd_sf_sf_s$ | | | |
| SECTION 1 | 99911 | | | | | | | |
| | $66F_tF_iF_c$ | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | $md_sd_sf_sf_s$ | | | |
| Subsection 1–1 | $(000g_pg_p$ | $69F_tF_iF_c$ | $QL_aL_aL_oL_o$ | . . . . . | | | | |
| | | or | | | | ) | | |
| | | $67F_tF_iF_c$ | $QL_aL_aL_oL_o$ | . . . . . | $md_sd_sf_sf_s$ | | | |
| SECTION 2 | 99922 | | | | | | | |
| | 44PPP | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | | | | |
| SECTION 3 | (Reserved) | | | | | | | |
| SECTION 4 | 99944 | | | | | | | |
| | $987w_sw_s$ | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | | | | |
| SECTION 5 | 99955 | | | | | | | |
| | $(55T_tT_iT_c)$ | (555PP) | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | $md_sd_sf_sf_s$ | | |
| SECTION 6 | 88800 | | | | | | | |
| | $77e_2uu$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | . . . . . | . . . . . | $(00C_100)$ |
| Subsection 6–1 | $(000g_pg_p$ | $79e_2uu$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | . . . . . | |
| | | or | | | | | | |
| | | $76e_2uu$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | $(9d_wd_wP_wP_w)$ | $QL_aL_aL_oL_o$ | . . . . . | |
| | | . . . . . | $(00C_100))$ | | | | | |
| SECTION 7 | 77744 | . . . . . . . . . . . . . . . . . . . . . . . . Vocabulary groups . . . . . . . . . . . . . . . . . . . . . | 44777 | | | | | |
| | 19191 | | | | | | | |

**Notes:**

(1) IAC FLEET is the name of the abbreviated code of the International Analysis Code used for marine purposes.

(2) The code form consists of a set of alternative preambles and a number of sections as follows:

(a) Alternative preambles

| *Line* | *To be used for* |
|---|---|
| First line | Surface analysis |
| Second line | Surface prognosis |

(b) Sections

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | 99900 | Pressure systems |
| 1 | 99911 | Frontal systems |
| 2 | 99922 | Isobar values |
| 3 | — | (Reserved) |
| 4 | 99944 | Weather |
| 5 | 99955 | Tropical systems |
| 6 | 88800 | Sea temperature and waves |
| 7 | 77744 | Vocabulary groups |

(3) Each analysis or prognosis section may be repeated as many times as necessary. Any section may be omitted from the code form.

(4) The basic code forms for Sections 0, 1 and 6 give details on pressure systems, fronts, waves and sea-surface temperatures at the time specified in the preamble. Each of these sections contains a subsection which can be used when greater detail is required on past and future positions and characteristics of those systems or parameters. These subsections are identified by the group $000g_pg_p$; hence, they can be repeated within the section as often as necessary in order to provide information on either past or future conditions, or both.

(5) Sections 0 to 6 and the subsections each describe delineations, by means of the position groups $QL_aL_aL_oL_o$ (or variants thereof), of given values of a parameter or given states of an element. The section thus consists of a regular succession of sets of groups, each beginning with an indicator group giving the new value of the parameter or element. In some cases the position groups of each set are followed by the movement group $md_sd_sf_sf_s$ and the optional group $00C_100$ which contains the confidence factor for the preceding information.

(6) The use of Section 5 (tropical section) does not preclude the use in the same general area of other sections, where applicable.

(7) Section 6 provides for indicating, as an optional feature, direction and period of waves for each point of a sea-surface isotherm. Each group $9d_wd_wP_wP_w$ refers to the position $QL_aL_aL_oL_o$ which follows.

(8) Section 7 provides for the inclusion of amplifying phrases from a vocabulary code within the message. Section 7 also provides for including plain-language remarks at the end of the analysis or of the prognosis when this is considered necessary to emphasize the existence of a line squall.

**REGULATIONS:**

## 46.1 General

**The code name IAC FLEET shall not be included in the coded analysis or prognosis.**

## 46.2 Preamble

**46.2.1** **The appropriate preamble shall be included each time the analysis or prognosis is made up from a different chart for each different type.**

**46.2.2** **Each analysis or prognosis as defined in Regulation 46.2.1 shall end with the indicator group 19191.**

**Note: See Regulation 46.4.3 regarding the use of replacement groups for group 33388 in the preambles.**

## 46.3 Sections

**46.3.1** **Each section shall be identified by its symbolic figure group. If the same type of data is given in two separate portions of the message, each portion constitutes a section and it shall be preceded by the appropriate symbolic figure group.**

**Note: When different sections, or portions of sections, are prepared at varying times, it may be necessary for an analysis centre to issue more than one coded analysis or prognosis in order to include all of the data required for its area of responsibility.**

**46.3.2** **When included, the sections shall be given in the following order of sequence: Sections 0, 1, 2, 4, 5, 6 and 7.**

**46.3.3** **In coding Sections 0, 1, 2, 4 and 5, the sequence order of the data, in so far as practicable, shall be as follows:**

**Section 0 – *Pressure systems:* to be given in order of occurrence from west to east.**

**Section 1 – *Frontal information:* to be given in a general run, in so far as possible, from west to east.**

**Section 2 – *Isobar delineation:* points on an isobar encircling a LOW shall be given first and progressively in cyclonic direction. Points on an isobar encircling a HIGH shall be given last and progressively in an anticyclonic direction.**

**Section 4 – *Areas of weather:* to be given in order of occurrence from west to east.**

**Section 5 – *Tropical systems:* to be given in the same order as pressure systems or frontal information, according to which one the tropical system more closely resembles.**

## 46.4 Position groups

**46.4.1** **When the group 33388 is used in the preamble, point position groups shall be given in the form $QL_aL_aL_oL_o$ for all sections included.**

**46.4.2** **When point positions are given in the $QL_aL_aL_oL_o$ and a more precise location of the positions is required, the group $000L_aL_o$ shall be added after the appropriate $QL_aL_aL_oL_o$ group, with $L_a$ and $L_o$ giving the required tenths of a degree of latitude and longitude, respectively.**

**46.4.3** **When point positions are given to the nearest half-degree of latitude and longitude, the group 33300, 33311 or 33322, as appropriate, shall be used instead of the group 33388 in the preamble. In these cases, the group $L_aL_aL_oL_ok$ shall be substituted for the group $QL_aL_aL_oL_o$ in the code form of all the sections included.**

**46.4.4** **When positions in equatorial areas are given in the form $L_aL_aL_oL_ok$ (i.e. group 33322 is used), southern latitudes from 0°S to 30°S shall be indicated by subtraction from 100 (13°S = 87, 29°S = 71, etc.).**

**46.4.5** **The position group for each pressure system (Section 0) shall be repeated, when required. Position points on fronts (Section 1), isobars (Section 2), boundaries of areas of significant weather (Section 4) and tropical systems resembling fronts (Section 5) shall be given only once.**

**46.4.6** **If a pressure (Section 0) or tropical (Section 5) system is elongated and open, two or more position points shall be given to locate the axis of the system. The first position point and the pressure (when given in Section 5) shall refer to the vortex of the system.**

**Note: The position points delineating the axis of the system may be repeated, if required.**

## 46.5 Movement groups

**46.5.1** **The movement group shall be given for each pressure (Section 0), frontal (Section 1) or tropical (Section 5) system included in the message. When the system is stationary, the $md_sd_sf_sf_s$ group shall be coded 10000.**

**46.5.2** **When the pressure (Section 0) or tropical (Section 5) system is elongated and open, the $md_sd_sf_sf_s$ group shall refer to the axis of the system.**

**46.5.3** **When fronts (Section 1) or tropical systems resembling fronts (Section 5) are given, the $md_sd_sf_sf_s$ group shall refer to the central portion of the type indicated. When two or more $md_sd_sf_sf_s$ groups are required to indicate the movement, the front or system shall be subdivided into segments by repeating the group $66F_tF_iF_c$ or $55T_tT_iT_c$, as appropriate.**

**46.5.4** **The $md_sd_sf_sf_s$ group shall always indicate the movement of the system or front from the last given position.**

## 46.6 Subsections of Sections 0, 1 and 6

**46.6.1** **To indicate positions and characteristics of a system or set of parameters at times *prior* to the time given in the preamble, the group $9P_tP_cPP$ in Subsection 0–1, or the group $69F_tF_iF_c$ in Subsection 1–1, or the group $79e_2uu$ in Subsection 6–1 shall be used. In these cases the number of hours coded for $g_pg_p$ shall be s*ubtracted* from the time given in the preamble (i.e. $G_cG_c$ or $G_cG_c + G_pG_p$, as appropriate), to obtain the *prior* time.**

**Note: A subsection may be repeated, as required, to give information on various *prior* positions of the system or parameters.**

**46.6.2** **To indicate positions and characteristics of a system or set of parameters at times *after* the time given in the preamble, the group $7P_tP_cPP$ in Subsection 0–1, or the group $67F_tF_iF_c$ in Subsection 1–1, or the group $76e_2uu$ in Subsection 6–1 shall be used. In these cases the number of hours coded for $g_pg_p$ shall be *added* to the time given in the preamble (i.e. $G_cG_c$ or $G_cG_c + G_pG_p$, as appropriate), to obtain the *future* time.**

**Note: A subsection may be repeated, as required, to give information on various *future* positions of the system or parameters.**

## 46.7 Section 6

**When included in Section 6 and Subsection 6–1, the group $9d_wd_wP_wP_w$ shall give the direction and period of the waves at the position specified by the $QL_aL_aL_oL_o$ group which follows.**

## 46.8 Additional groups and supplementary information

**46.8.1** **Amplifying phrases from a vocabulary code shall be preceded and terminated by the appropriate indicator groups 77744 and 44777, respectively.**

**Note: These amplifying phrases may be inserted within the message as required.**

**46.8.2** **If additional supplementary sections of the IAC FLEET are used for national purposes, the above code form shall be used in so far as it is applicable and the supplementary sections shall be placed at the end of the coded analysis or prognosis or sent separately.**

## 46.9 Correction

**When it is necessary to send a correction to the analysis or the prognosis, the correction shall commence with the groups 11133 $0YYG_cG_c$. The corrections which follow shall be preceded by the appropriate indicators (8. . . ., 66. . ., 44. . ., etc.) and end with the 19191 group.**

**FM 47–IX Ext. GRID** **Processed data in the form of grid-point values**

**CODE FORM:**

SECTION 0 GRID $F_1F_2NNN$ $1nnn_tn_t$ $(2n_Tn_Ta_1a_2)$

SECTION 1 111 $1a_1a_1a_2a_2$ $(2p_1p_1p_2p_2)$ $(3H_1H_1H_1H_1)$ $(4H_2H_2H_2H_2)$ $(5b_1b_1b_2b_2)$ 6JJMM
$7YYG_cG_c$ $(8u_tttt)$ $(9u_bt_bt_bt_b)$ $(0mmg_rg_r)$

SECTION 2 (222 $1n_in_in_jn_j$ $\left\{\begin{array}{lllll} 2Q_cL_aL_aL_a & 3L_oL_oL_oL_o & 4Q_cL_aL_aL_a & 5L_oL_oL_oL_o & \\ 6Q_cL_oL_oL_o & (7iiii & s_xjjjj) & (88L_aL_aL_a & Q_cL_oL_oL_oL_o) \end{array}\right\}$
$9d_id_id_id_i$ $0d_jd_jd_jd_j)$

SECTION 3 333 $1n_an_an_pi_s$ $2n_1n_2q_1q_2$ $(3us_nrr$ rrrrr) $(4us_nrr$ rrrrr)
$(5Q_cL_aL_aL_a$ $6L_oL_oL_oL_o)$
$(999I_0I_0)$
$k_1k_1n_gn_g$ $i_ai_ai_aj_aj_aj_a$ $(s_x)II \ldots I$ $(s_x)II \ldots I$ . . . . . . . . . . $(s_x)II \ldots I$
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
$(999I_0I_0)$
$k_1k_1n_gn_g$ $i_ai_ai_aj_aj_aj_a$ $(s_x\ II \ldots I$ $(s_x)II \ldots I$ . . . . . . . . . . $(s_x)II \ldots I$
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

SECTION 4 (444 $1C_sC_sC_sC_s$ $2C_sC_sC_sC_s$ $3C_sC_sC_sC_s$ $4C_sC_sC_sC_s$ $5C_sC_sC_sC_s$ $6C_sC_sC_sC_s)$

SECTION 5 555 $F_1F_2NNN$ $1nnn_tn_t$ $(2n_Tn_Ta_1a_2)$ $\left\{\begin{array}{l} 666 \\ 777 \end{array}\right.$

**Notes:**

(1) GRID is the name of the code for the transmission of processed data (analyses and forecasts of meteorological and other geophysical parameters) in the form of numerical values given for a set of regularly spaced points on a chart. The code is suitable for computer use and also for decoding by manual handling.

(2) A GRID coded analysis or forecast is identified by the word GRID.

(3) The code form is divided into six sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Identification of the coded analysis or forecast |
| 1 | 111 | Identification of the processed data included in the coded analysis or forecast |
| 2 | 222 | Geometry of grids not published in *Weather Reporting* (WMO-No. 9), Volume B (optional) |
| 3 | 333 | Data format specification and data content |
| 4 | 444 | Check sums (optional) |
| 5 | 555 | Redundant identification of the coded analysis or forecast and indicator figures 666 or 777 (see Regulation 47.1.4) |

(4) Definitions

*Data field:* The horizontal distribution of one (or several) parameter(s) and/or of the occurrence of weather phenomena described by means of grid-point values for a given geographical area.

*Data group:* Group that contains only meteorological or other geophysical information relative to one grid point or several consecutive grid points of a data line.

*Data line:* Set of *consecutive* grid points on a grid line for which data are reported. A grid line may contain several data lines.

*Data location groups relative to a data line:* Groups which indicate the serial number of the data line, the number of associated data groups and the coordinates of the grid point from which the scanning of the data line starts.

*Grid line:* Line connecting all grid points having the same latitude in a geographical grid or the same ordinate value in a cartesian grid (when normal scanning mode is used).

*Mesh width values:*

(a) Constant amount of grid-point spacing along the grid lines (on the map);

(b) Constant amount of grid-line spacing in the grid itself (on the map).

$d_id_id_id_i$ and $d_jd_jd_jd_j$ represent the actual distances corresponding on the Earth's surface to the mesh-width values when taken at a latitude of true scale. In Cartesian grids, both values are generally identical, which results in using only one mesh-width value. In geographical grids, however, these values may differ from one another. (Example: 10° spacing of longitude along parallels and 5° spacing of latitude along meridians.)

*Normal scanning mode:* Occurs when the sequence of grid points in the message is organized as follows:

(a) The data line(s) which correspond(s) to the smallest "j" coordinate (or to the smallest latitude difference with the reference point) within the data field (or part of it) is (are) considered first;

(b) The grid points of this (these) data line(s) are examined in the order of increasing "i" coordinate (or of increasing longitude difference with the reference point; in the special case of a geographical grid covering a circumpolar area, the longitude difference with the reference point is taken to be increasing when moving from the meridian of the reference point to the east);

(c) The grid points of the remaining data line(s) within the data field (or part of it) are examined as in (b) above, taking into account that data lines are dealt with one after the other in increasing order of their "j" coordinates (or of their latitude differences with the reference point).

*Reference point in a geographical grid:* Point which serves as the origin for grid-point coordinates. It is chosen in such a way as to prevent these coordinates from being negative.

(5) Section 0 is used for the identification of the coded analysis or forecast. In addition to the identifier word GRID, it contains an indication of the data-processing centre ($F_1F_2$) originating the product, of the number of parts into which the complete analysis or prognosis has been split up for transmission purposes ($n_tn_t$), as well as of the serial number of that part which is included in the coded analysis or forecast (nn), and an indication ($n_Tn_T$) whether the type of parameter of the following analysis or prognosis is given by the international Code table 0291 or by a national code table. The section provides, furthermore, a reference to the grid system used (NNN). The grid identifier NNN will normally refer to *Weather Reporting* (WMO-No. 9), Volume B, in which full details of the grid system used will be given. It is, however, possible to provide a complete description of the grid system within the GRID message itself. Section 2 of the code form serves this purpose but it is stressed that the use of Section 2 should be reserved for the rare cases when a new grid is being introduced (e.g. for special purposes) before its complete description is published in the appropriate WMO publication.

(6) Section 1 contains information relating to the processed data transmitted in the coded analysis or forecast. This consists of:

– Meteorological or other geophysical parameters ($a_1a_1a_1$, $a_2a_2a_2$);

– The level(s) or layer to which the parameters refer ($p_1p_1$, $p_2p_2$, $H_1H_1H_1H_1$, $H_2H_2H_2H_2$, $b_1b_1$, $b_2b_2$);

– Time identifiers relating to the product (JJ, MM, YY, $G_cG_c$);

– The validity of prognoses ($u_t$, ttt) and the period of data averaging or data change, as the case may be ($u_b$, $t_bt_bt_b$);

– The procedure or model used to generate the data field (mm);

– A very general description of the grid used ($g_rg_r$).

(7) Section 2 is devoted entirely to the detailed description of the grid system used, whenever that description cannot be found in the appropriate WMO publication. In the GRID code, two different types of grid may be used: either geographical or cartesian. In both cases a reference point is identified and grid points are set up which are defined with respect to the reference point and to known mesh-width values. The values of the parameter(s) given in Section 3 refer to the grid points so determined. Section 2 provides for the indication of the size of the grid system ($n_in_i$, $n_jn_j$), the mesh widths of the grid ($d_id_id_id_i$, $d_jd_jd_jd_j$), the boundaries of the grid system (groups with indicator figures 2, 3, 4 and 5), the coordinates of the reference point which serves for the determination of the position of the other grid points in the case of a geographical grid (groups with indicator figures 2 and 3), the origin of the cartesian coordinate system (groups $88L_aL_aL_a$, $Q_cL_oL_oL_oL_o$ or groups 7iiii $s_x$jjjj with group $6Q_cL_oL_oL_o$), and the direction of the axes of the cartesian coordinate system (group $6Q_cL_oL_oL_o$).

(8) Section 3 includes the actual data content of the coded analysis or forecast, symbolized by the data groups ($s_x$)II . . . I. There is normally a spacing between these data groups for the convenience of manual decoding; but the spacing between these groups may be omitted if the data are exchanged only between computer centres. The characteristics of the form of the data groups, their number and the way they are arranged in the coded analysis or forecast are indicated by the first two groups of this section. It should be noted that, while the length of the data groups may vary in different coded analyses or forecasts, it remains the same within any given coded analysis or forecast.

(9) The code provides for the possibility of reporting data for grid points spaced at larger intervals than the mesh widths $d_id_id_id_i$ and $d_jd_jd_jd_j$. An increase in the mesh width $d_id_id_id_i$ is indicated by the factor $l_0l_0$, while in the other direction the spacing may be increased by simply not including data for some grid lines.

(10) Furthermore, values of a parameter may not exist, may be missing or may not need to be reported at each point of a grid. For instance, the data field of sea temperatures in a grid which also covers islands in an ocean shows an empty spot (hole) at the place of an island. To avoid the inclusion of meaningless data groups for a number of grid points in such cases, the concept of "data line" was introduced. The data lines are numbered (by the symbol $k_1k_1$) and the data groups ($s_x$)II . . . I are arranged per data line. The number of data lines per grid line and the number of data groups per data line are generally fixed if data for all grid points are reported. They may vary greatly if only parts of a data field are coded.

(11) The position of the first grid point of a data line is given by its coordinates ($i_ai_ai_aj_aj_aj_a$) with respect to an initial point of reference. The initial point of reference in a cartesian grid is fixed. The initial point of reference in a geographical grid, as contained in Section 2 or in the appropriate WMO publication, may change in another part of the data field. For geographical grids therefore this change can be indicated by means of the groups with indicator figures 5 and 6 in Section 3.

(12) A method to reduce as much as possible the length of data groups consists in the elimination of the sign indicator of the parameters concerned. Negative signs can be eliminated by selecting another reference value as the new zero ($s_n$, rrrrrrr), for example, when temperatures in the data field fluctuate between –20° and +20°C, the addition of 30°C to these temperatures would make them all positive. Another possibility to reduce the length of the data groups is to include the sign of the parameter(s), if necessary, in the values of the parameter(s) by a proper rule. The sign indicator may also be excluded if all values of the parameter(s) are negative. The symbolic letter $i_s$ in the group with indicator 1 in Section 3 provides for these possibilities.

(13) The reporting of parameter values is generally based on the use of conventional units as indicated in the $a_1a_1a_1/a_2a_2a_2$ code table. A departure from these units can be realized, however, by using the scale factor (u) as follows: modified unit = conventional unit multiplied by the scale factor. For example, a scale factor of 0.1 can be applied to the unit for geopotential height of an isobaric topography, changing it into the standard geopotential metre.

(14) Section 4 is relevant only to computer operations. It provides numerical checks of the different sections and of the whole coded analysis or prognosis, with the object of detecting errors.

(15) Section 5 gives a redundant identification of the coded analysis or forecast.

**R E G U L A T I O N S :**

## 47.1 General

**47.1.1** **The groups GRID $F_1F_2NNN$ $1nnn_tn_t$ ($2n_Tn_Ta_1a_2$) shall be included as the first line of the text of the coded meteorological analysis or forecast.**

Note: When, in the optional group $2n_Tn_Ta_1a_2$, $n_Tn_Ta_1a_2$ is 0000, the group shall be omitted.

**47.1.2** **If the complete analysis or prognosis described by the grid has to be transmitted in a number of parts separately, the text of each coded analysis or forecast shall contain Sections 0, 1, 3, 4 and 5 (see Regulations 47.2 and 47.5.1 below). The truncation shall be made in Section 3 after a suitable data line.**

Note: In the case of geographical grids, the data location groups $k_1k_1n_gn_g$ $i_ai_ai_aj_aj_aj_a$ can be preceded by the groups with indicator figures 5 and 6 when a change of reference point is needed and by the group $999I_0I_0$ as necessary.

**47.1.3** **If several complete analyses or forecasts are transmitted one after another in the same bulletin, each of them shall contain Sections 0, 1, 3 and 5. Sections 2 and 4 shall also be included, as required.**

**47.1.4** **Each coded analysis or forecast shall end with the group 666 if further parts are to follow and with the group 777 if all parts have been transmitted.**

## 47.2 Section 1 – Identification of the processed data included in the coded analysis or forecast

**47.2.1** **The groups with indicator figures 1, 6 and 7 shall always be included in the coded analysis or forecast; the groups with indicator figures 2, 3, 4, 5, 8, 9 and 0 are optional in the sense that none of them is necessarily included in the coded analysis or forecast. One of the groups $2p_1p_1p_2p_2$, $3H_1H_1H_1H_1$, $5b_1b_1b_2b_2$ or the pair of groups ($3H_1H_1H_1H_1$ $4H_2H_2H_2H_2$) shall, however, always be included in the coded analysis or forecast to indicate the level(s) or the layer to which the parameter(s) given in the data content refer(s). When parameters $a_1a_1a_1/a_2a_2a_2$ = 080 to 090 are reported, the indication of the level(s) or layer is not mandatory.**

**47.2.2** **If the parameter(s) given in the data content refer(s) to a pressure level or to a layer between two pressure levels, the group $2p_1p_1p_2p_2$ shall be used to identify this (these) pressure level(s). If the parameter(s) refer(s) to a height level, the group $3H_1H_1H_1H_1$ shall be used to identify this height level. If the parameter(s) refer(s) to a layer between two height levels, the groups $3H_1H_1H_1H_1$ and $4H_2H_2H_2H_2$ shall be used to identify these height levels. If the parameter(s) refer(s) to special level(s), the group $5b_1b_1b_2b_2$ shall be used to identify this/these special level(s).**

**47.2.3** **If only one constant pressure surface is indicated by the group $2p_1p_1p_2p_2$, $p_2p_2$ shall be coded 99 and $p_1p_1$ shall specify the pressure surface concerned.**

**47.2.4** **The group $4H_2H_2H_2H_2$ shall be included only when data are transmitted for a layer between two levels of given altitude.**

**47.2.5** **If only one special level is indicated by the group $5b_1b_1b_2b_2$, $b_2b_2$ shall be coded 00 and $b_1b_1$ shall specify the special level concerned.**

**47.2.6** **The group $8u_tttt$ shall be included only in the case of a forecast, the group $9u_bt_bt_bt_b$ shall be included in the case of an analysis of a mean data field or of a data-field change and in the case of a forecast of a mean data field or of a data-field change.**

Note: Quantity accumulation (for instance, accumulation of precipitation) over a certain period of time is interpreted as a data-field change where the initial value is equal to zero.

**47.2.7** **If both mm and $g_rg_r$ correspond to code figure 99, the group $0mmg_rg_r$ shall not be included in the coded analysis or forecast.**

**47.3 Section 2 – Geometry of grids not published in *Weather Reporting* (WMO-No. 9), Volume B**

**47.3.1 Section 2 shall be included only if the grid geometry used is not defined in *Weather Reporting* (WMO-No. 9), Volume B.**

**47.3.2 Code figure 99 shall be used for $g_rg_r$ in Section 1 to indicate that Section 2 is not included.**

**47.3.3 If the complete analysis or forecast is transmitted in separate parts and Section 2 is used in the first part, this section shall not be repeated in the other parts.**

**47.3.4 To define a geographical grid the groups with indicator figures 1, 2, 3, 4, 5, 9 and 0 shall be used.**

**47.3.5 To define a cartesian grid on Mercator projection with true scale at 22°30´, the groups with indicator figures 1, 2, 3, 4, 5, 9 and 0 shall be used.**

**47.3.6 To define a cartesian grid, on polar stereographic projection with true scale at 60°, or on Lambert conformal projection with true scale at 30° and 60°, or at 10° and 40°, the groups with indicator figures 1, 6, 9 and 0, and the groups 7iiii $s_x$jjjj shall be used if the origin is specified by means of the cartesian coordinates of the Pole; whenever the origin is specified by means of its geographical coordinates, the groups with indicator figures 1, 6, 9 and 0, and the groups $88L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ shall be used.**

**47.3.7 In the case of a geographical grid when the area covered does not include the Pole, and in the case of a cartesian grid on Mercator projection, the groups $2Q_cL_aL_aL_a$ and $3L_oL_oL_oL_o$ shall define the northern and western borders of the grid, and the groups $4Q_cL_aL_aL_a$ and $5L_oL_oL_oL_o$ the southern and eastern borders of the grid. The point defined by the groups $2Q_cL_aL_aL_a$ and $3L_oL_oL_oL_o$ shall be the origin of the coordinate system in the case of a cartesian grid on Mercator projection; the same point shall be the reference point in the case of a geographical grid.**

**47.3.8 In the case of a geographical grid covering a circumpolar area around the North Pole, the group $2Q_cL_aL_aL_a$ shall be coded as 21900 or 27900 and the group $3L_oL_oL_oL_o$ shall be used to define the reference point together with the group $4Q_cL_aL_aL_a$; the group $4Q_cL_aL_aL_a$ shall define also the southern border of the grid, and the group $5L_oL_oL_oL_o$ shall be coded as 59999. In the case of a geographical grid covering a circumpolar area around the South Pole, the group $2Q_cL_aL_aL_a$ shall define the northern border of the grid; the group $3L_oL_oL_oL_o$ shall be used, together with the group $2Q_cL_aL_aL_a$, to define the reference point; the group $4Q_cL_aL_aL_a$ shall be coded as 43900 or 45900; and the group $5L_oL_oL_oL_o$ shall be coded as 59999.**

**47.3.9 In the case of a cartesian grid on polar stereographic or Lambert conformal projection, the group $6Q_cL_oL_oL_o$ shall define the quadrant and longitude in degrees of the meridian which is parallel to the j-axis of the grid, the j-axis being positive in the direction from North Pole to South Pole along this meridian. The actual longitude value should be coded for $L_oL_oL_o$ to indicate that the cartesian coordinate system is left-handed.* The actual longitude value increased by 500 shall be coded for $L_oL_oL_o$ to indicate that the cartesian coordinate system is right-handed.***

**47.3.10 In the case of a cartesian grid on polar stereographic or Lambert conformal projection, the groups 7iiii and $s_x$jjjj shall define respectively the "i" and the "j" coordinate of the Pole in grid units and tenths. The origin of the coordinate system i, j shall be placed at a corner of the rectangle, with sides parallel to the grid lines to be scanned, which encompasses all possible points in the grid.**

**47.3.11 The group $9d_id_id_id_i$ shall define the grid spacing in a cartesian grid along the i-axis at the latitude of true scale in km, and in a geographical grid along the latitude circles, in tenths of a degree. The group $0d_jd_jd_jd_j$ shall similarly define the grid spacing, in a cartesian grid along the j-axis, and in a geographical grid along the meridians.**

---

* **When moving in the positive direction of the j-axis, positive "i" coordinates are situated to the left in a left-handed coordinate system. They are found to the right in a right-handed system.**

## 47.4 Section 3 – Data format specification and data content

**47.4.1 If the complete analysis or forecast described by the grid has to be transmitted in several parts by means of several coded meteorological analyses or forecasts of optimum length each, the groups $1n_an_an_pi_s$ and $2n_1n_2q_1q_2$ and, if required, the groups with indicator figures 3 and 4 shall be included in each part.**

**(a) Groups $3us_nrr$ rrrrr shall be used to indicate the scaled unit and reference value of the parameter indicated by $a_1a_1a_1$ and shall be included only if the scaled unit and/or reference value used are different from those specified in Code table $a_1a_1a_1/a_2a_2a_2$ (0291).**

**(b) Groups $4us_nrr$ rrrrr shall be used to indicate the scaled unit and reference value of the parameter indicated by $a_2a_2a_2$ and shall be included only if the scaled unit and/or reference value used are different from those specified in Code table $a_1a_1a_1/a_2a_2a_2$ (0291).**

**47.4.2 When $a_1a_1a_1/a_2a_2a_2$ represent weather phenomena (code figures 080–090 of Code table 0291), the code figure for $n_1/n_2$ shall be 1, and the data content for each grid point and for each phenomenon reported shall contain one digit chosen out of (0, 1) or (0, 1 and 2) as specified in Code table 0291, to indicate the occurrence and/or the intensity of the phenomenon.**

**47.4.3 Whenever a change of mesh width $d_id_id_id_i$ is required, a group $999I_0I_0$ shall be inserted before the data-location groups $k_1k_1n_gn_g$ $i_ai_ai_aj_aj_aj_a$ of the data line where the change is required. In a printout of the coded analysis or forecast, the group $999I_0I_0$ shall be printed on a separate line.**

**47.4.4 The values reported in the data groups II . . . I for each grid point may refer to one or two parameters and to one or two levels or to one layer. The various possible combinations and the manner in which the parameter(s) is (are) coded and the level(s) or layer defined are listed in the table on the opposite page.**

## 47.5 Section 4 – Check sums

**47.5.1 Check sum groups shall be included only by centres using computers for coding.**

**47.5.2 Group $1C_sC_sC_sC_s$ shall indicate the check sum of all digits appearing in Section 1, including the indicator figures 111.**

**47.5.3 Group $2C_sC_sC_sC_s$ shall indicate the check sum of all digits of Section 2, including the indicator figures 222.**

**47.5.4 Group $3C_sC_sC_sC_s$ shall indicate the check sum of all digits of groups 333 $1n_an_an_pi_s$ together with the groups with indicator figures 2 to 6 of Section 3.**

| | *Number of parameters reported* | *Number of levels to which the parameters reported refer* | *Number of layers to which the parameters reported refer* | *Significance of the values given in the data groups II . . . I for each grid point* |
|---|---|---|---|---|
| **1.** | **1 (defined by $a_1a_1a_1$)** | **1 (defined by $p_1p_1$ or $H_1H_1H_1H_1$ or $b_1b_1$)** | **—** | **The value of the parameter for the level is given by $n_1$ digits** |
| **2.** | **1 (defined by $a_1a_1a_1$)** | **—** | **1 (defined by $p_1p_1$ and $p_2p_2$ or $H_1H_1H_1H_1$ and $H_2H_2H_2H_2$)** | **The value of the parameter for the layer is given by $n_1$ digits** |
| **3.** | **1 (defined by $a_1a_1a_1$)** | **2 (defined by $b_1b_1$ and $b_2b_2$)** | **—** | **The value of the parameter for the level defined by $b_1b_1$ is given by $n_1$ digits, followed by the value of the parameter for the level defined by $b_2b_2$, by $n_2$ digits** |
| **4.** | **2 (defined by $a_1a_1a_1$ and $a_2a_2a_2$)** | **1 (defined by $p_1p_1$ or $H_1H_1H_1H_1$ or $b_1b_1$)** | **—** | **The value of the parameter defined by $a_1a_1a_1$ for the level is given by $n_1$ digits, followed by the value of the parameter defined by $a_2a_2a_2$ for the level, by $n_2$ digits** |
| **5.** | **2 (defined by $a_1a_1a_1$ and $a_2a_2a_2$)** | **—** | **1 (defined by $p_1p_1$ and $p_2p_2$ or $H_1H_1H_1H_1$ and $H_2H_2H_2H_2$)** | **The value of the parameter defined by $a_1a_1a_1$ for the layer is given by $n_1$ digits, followed by the value of the parameter defined by $a_2a_2a_2$ for the layer, by $n_2$ digits** |
| **6.** | **2 (defined by $a_1a_1a_1$ and $a_2a_2a_2$)** | **2 (defined by $b_1b_1$ and $b_2b_2$)** | **—** | **The value of the parameter defined by $a_1a_1a_1$ for the level defined by $b_1b_1$ is given by $n_1$ digits, followed by the value of the parameter defined by $a_2a_2a_2$ for the level defined by $b_2b_2$, by $n_2$ digits** |

**47.5.5** **Group $4C_sC_sC_sC_s$ shall indicate the check sum of the digits of all groups $999I_0I_0$, $k_1k_1n_gn_g$ and $i_ai_ai_aj_aj_aj_a$ which appear in Section 3.**

**47.5.6** **Group $5C_sC_sC_sC_s$ shall indicate the check sum of the digits of all data groups $(s_x)$II . . . I which appear in Section 3.**

**47.5.7** **Group $6C_sC_sC_sC_s$ shall indicate the check sum of all digits which precede this group in Section 4.**

## 47.6 Section 5 – Redundant identification of the coded analysis or forecast and indicator figures 666 or 777

**Section 5 shall always be included in the coded analysis or forecast or in parts thereof.**

**FM 49–IX Ext. GRAF** **Processed data in the form of grid-point values (abbreviated code form)**

**C O D E  F O R M :**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECTION 0 | GRAF | $F_1F_2NNN$ | $1nnn_tn_t$ | $(2n_Tn_Ta_10)$ | | | |
| SECTION 1 | 111 | $1a_1a_100$ | $(2p_1p_1p_2p_2)$ | $(3H_1H_1H_1H_1)$ | $(5b_1b_100)$ | 6JJMM | |
| | | $7YYG_cG_c$ | (81ttt) | | | | |
| SECTION 3 | 333 | $1n_an_a12$ | $2n_10q_1q_2$ | $3us_nrr$ | rrrrr | | |
| | | $k_1k_1(n_gn_g)$ | $(i_ai_ai_aj_aj_aj_a)$ | II . . . I | II . . . I | . . . . . | . . . . . | II . . . I |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | | $k_1k_1(n_gn_g)$ | $(i_ai_ai_aj_aj_aj_a)$ | II . . . I | II . . . I | . . . . . | . . . . . | II . . . I |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| SECTION 5 | 555 | $F_1F_2NNN$ | $1nnn_tn_t$ | $(2n_Tn_Ta_10)$ | $\left\{\begin{matrix}666\\777\end{matrix}\right.$ | | |

**Notes:**

(1) GRAF is the name of the abbreviated code for the transmission of processed data (analyses and prognoses of meteorological and other geophysical parameters) in the form of numerical values given for a set of regularly spaced points on a chart. The code is suitable for computer use and also for decoding by manual handling.

(2) The GRAF code form is derived from the GRID code form (FM 47) by means of a series of simplifying assumptions, i.e.:

(a) To include data for one parameter only;

(b) To relate these data to one pressure surface, or to one height level or to one special level, or to a layer between two pressure levels;

(c) Each data group refers to one grid point only;

(d) To include grids that are published in *Weather Reporting* (WMO-No. 9), Volume B;

(e) The terms *data line* and *grid line* are used interchangeably in the code.

(3) A GRAF coded analysis or prognosis is identified by the word GRAF.

(4) The code form is divided into four sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Identification of the coded analysis or prognosis |
| 1 | 111 | Identification of the processed data included in the coded analysis or prognosis |
| 3 | 333 | Data format specification and data content |
| 5 | 555 | Redundant identification of the coded analysis or prognosis and indicator figures 666 or 777 (see Regulation 49.1.4) |

(5) Definitions – See Note (4) under FM 47 GRID.

(6) Section 0 is used for the identification of the coded analysis or prognosis. In addition to the identifier word GRAF, it contains an indication of the data-processing centre ($F_1F_2$) originating the product, of the number of parts into which the complete analysis or prognosis has been split for transmission purposes ($n_tn_t$), as well as of the serial number of that part which is included in the coded analysis or prognosis (nn), and an indication ($n_Tn_T$) whether the type of parameter of the following analysis or prognosis is given by the

international Code table 0291 or by a national code table. The section provides, furthermore, a reference to the grid system used (NNN). The grid identifier NNN will normally refer to *Weather Reporting* (WMO-No. 9), Volume B, in which full details of the grid system used will be given.

(7) Section 1 contains information relating to the processed data transmitted in the coded analysis or prognosis. This consists of:

– One meteorological or other geophysical parameter ($a_1a_1a_1$);
– The level or layer to which the parameter refers ($p_1p_1$, $p_2p_2$, $H_1H_1H_1H_1$, $b_1b_1$);
– Time identifiers relating to the product (JJ, MM, YY, $G_cG_c$);
– The time of validity of prognoses that is (ttt) hours after $G_cG_c$.

(8) Section 3 includes the actual data content of the coded analysis or prognosis, symbolized by the data groups II . . . I. There is normally a space between these data groups for the convenience of manual decoding; but the space between these groups may be omitted. The characteristics of the form of the data groups and the way they are arranged in the coded analysis or prognosis are indicated by the first two groups of this section. It should be noted that, while the length of the data groups may vary in different coded analyses or prognoses, it remains the same within any given coded analysis or prognosis.

(9) The data lines are numbered (by the symbol $k_1k_1$) and the data groups II . . . I are arranged in the sequence for normal scanning.

(10) In the case of a non-rectangular grid, the position of the first grid point of a data line is given by its coordinates ($i_ai_ai_aj_aj_aj_a$) with respect to a point of reference. The point of reference in a cartesian grid is fixed. In the case of the GRAF code, the point of reference in a geographical grid, as contained in the appropriate WMO publication, is assumed to remain fixed throughout the whole message.

(11) The reporting of parameter values is generally based on the use of conventional units as indicated in the $a_1a_1a_1$ code table. A departure from these units can be realized, however, by using the scale factor (u) as follows: modified unit = conventional unit multiplied by the scale factor. For example, a scale factor of 0.1 can be applied to the conventional unit for geopotential height of an isobaric topography, changing it into the standard geopotential metre.

(12) Section 5 gives a redundant identification of the coded analysis or prognosis.

**R E G U L A T I O N S :**

## 49.1 General

**49.1.1** **The groups GRAF $F_1F_2$NNN 1nnn$_t$n$_t$ (2n$_T$n$_T$a$_1$0) shall be included as the first line of the text of the coded meteorological analysis or prognosis.**

**Note: When, in the optional group $2n_Tn_Ta_10$, $n_Tn_Ta_10$ is 0000, the group shall be omitted.**

**49.1.2** **If the complete analysis or prognosis described by the grid has to be transmitted in a number of parts separately, the text of each coded analysis or prognosis shall contain Sections 0, 1, 3 and 5. The truncation shall be made in Section 3 at the end of a suitable data line.**

**49.1.3** **If several complete analyses or prognoses are transmitted one after the other in one meteorological bulletin, each of them shall contain Sections 0, 1, 3 and 5.**

**49.1.4** **Each coded analysis or prognosis shall end with the group 666 if further parts are to follow, and with the group 777 if all parts have been transmitted.**

## 49.2 Section 1 – Identification of the processed data included in the coded analysis or prognosis

**49.2.1** **The groups with indicator figures 1, 6 and 7 shall always be included in the coded analysis or prognosis. One of the groups $2p_1p_1p_2p_2$, $3H_1H_1H_1H_1$ or $5b_1b_100$ shall always be included in the coded analysis or prognosis to indicate the level or the layer to which the parameter given in the data content refers. When parameters $a_1a_1a_1$ = 080 to 090 are reported, the indication of the level can be meaningless and therefore is not mandatory.**

**49.2.2** **If the parameter given in the data content refers to a pressure level, the group $2p_1p_1p_2p_2$ shall be used; $p_1p_1$ shall indicate the level and $p_2p_2$ shall be coded 99.**

**49.2.3** **If the parameter given in the data content refers to a layer between two pressure levels, the group $2p_1p_1p_2p_2$ shall be used. The upper level shall be indicated by $p_1p_1$ and the lower level by $p_2p_2$.**

**49.2.4** **If the parameter given in the data content refers to a special level, the group $5b_1b_100$ shall be used and $b_1b_1$ shall indicate the special level.**

**49.2.5** **The group 81ttt shall be included only in the case of a prognosis.**

## 49.3 Section 3 – Data format specification and data content

**49.3.1** **If the complete analysis or prognosis described by the grid has to be transmitted in several parts by means of several coded meteorological analyses or prognoses of optimum length each, the four groups $1n_an_a12$, $2n_10q_1q_2$, $3us_nrr$ and rrrrr shall be included in each part.**

**49.3.2** **Each data group shall refer to one grid point only. As a result, the fourth figure of the group with indicator figure 1 shall always be 1.**

**49.3.3** **The grid points shall always be scanned in the normal mode, and $q_1$ shall only take values 0 (spaces included between data groups) or 2 (no spaces included).**

**49.3.4** **For a rectangular grid, each data line shall begin with $k_1k_1$ immediately followed, as the case may be, by one of the following:**

**(a) The data groups ($q_2$ shall be encoded by means of code figure 2); or**

**(b) The number of data groups per data line, and the data groups ($q_2$ shall be encoded by means of code figure 4); or**

**(c) The number of data groups per data line, the coordinates of the first grid point on the data line, and the data groups ($q_2$ shall be encoded by means of code figure 5).**

**49.3.5** **When $a_1a_1a_1$ represents a weather phenomenon (code figures 080–090 of Code table 0291), the code figure for $n_1$ shall be 1, and the data content for each grid point and for each phenomenon reported shall contain one digit chosen out of (0, 1) or (0, 1 and 2) as specified in Code table 0291, to indicate the occurrence and/or the intensity of the phenomenon.**

**49.3.6** **The groups $3us_nrr$ rrrrr shall always be included; u indicates the scaled unit of the parameter indicated by $a_1a_1a_1$ and $s_nrr$ rrrrr are used for the reference value. All values in the data content shall always be positive. As a result, the last figure of the group with indicator figure 1 shall always be 2. Negative values shall be eliminated by selecting an appropriate reference value. The reference values shall be chosen in order to minimize the number of digits in the data content.**

**Note: To illustrate this regulation, consider a temperature field in which values vary between –27°C and +11°C. The reference value can be chosen between –27°C and –88°C, inclusive. The choice of a lower temperature value would increase the number of digits to be reported (for example, –89°C, as a reference value, would convert 11°C into 100°C). For practical reasons, the choice of –30°C would be made in this case, and values to be reported would range between +3 and +41.**

## 49.4 Section 5 – Redundant identification of the coded analysis or prognosis and indicator figures 666 or 777

**Section 5 shall always be included in the coded analysis or prognosis or in parts thereof.**

**FM 50–XIII WINTEM** **Forecast upper wind and temperature for aviation**

**CODE FORM:**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 0 | WINTEM | $Y_FY_FG_FG_Fg_Fg_F$ $\left\{\begin{array}{l}\text{KMH or}\\ \text{KT or}\\ \text{MPS}\end{array}\right.$ | | | |
| SECTION 1 | $L_a^1L_a^1l_a^1A$ | $L_o^1L_o^1L_o^1l_o^1B$ | $L_o^2L_o^2L_o^2l_o^2B$ | . . . . . | $L_o^iL_o^iL_o^il_o^iB$ |
| | (TROP | $n_tn_tn_t$ | $n_tn_tn_t$ | . . . . . | $n_tn_tn_t$) |
| | (MAXW | $n_mn_mn_md_md_mf_mf_mf_m$ | $n_mn_mn_md_md_mf_mf_mf_m$ | . . . . . | $n_mn_mn_md_md_mf_mf_mf_m$) |
| | $Fn_1n_1n_1$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | $Fn_2n_2n_2$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | $Fn_kn_kn_k$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | $L_a^2L_a^2l_a^2A$ | | | | |
| | (TROP | $n_tn_tn_t$ | $n_tn_tn_t$ | . . . . . | $n_tn_tn_t$) |
| | (MAXW | $n_mn_mn_md_md_mf_mf_mf_m$ | $n_mn_mn_md_md_mf_mf_mf_m$ | . . . . . | $n_mn_mn_md_md_mf_mf_mf_m$) |
| | $Fn_1n_1n_1$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | $Fn_2n_2n_2$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | $Fn_kn_kn_k$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | $L_a^jL_a^jl_a^jA$ | | | | |
| | (TROP | $n_tn_tn_t$ | $n_tn_tn_t$ | . . . . . | $n_tn_tn_t$) |
| | (MAXW | $n_mn_mn_md_md_mf_mf_mf_m$ | $n_mn_mn_md_md_mf_mf_mf_m$ | . . . . . | $n_mn_mn_md_md_mf_mf_mf_m$) |
| | $Fn_1n_1n_1$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | $Fn_2n_2n_2$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |
| | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | $Fn_kn_kn_k$ | ddfffSTT | ddfffSTT | . . . . . | ddfffSTT |

**Notes:**

(1) WINTEM is the name of the code used to provide forecast upper wind and temperature for aviation.

(2) The forecast data are valid at the points of a rectangular geographical grid.

(3) A WINTEM message is identified by the word WINTEM.

(4) The code form is divided in two sections as follows:

| *Section number* | *Contents* |
|---|---|
| 0 | Identification and time of validity of forecast data |
| 1 | Grid-point coordinates and data groups for tropopause height, level of maximum wind and specified flight levels |

(5) No aeronautical requirement for this code form is stated by ICAO for international air navigation in ICAO Annex 3/WMO *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

**R E G U L A T I O N S :**

## 50.1 General

**50.1.1** **The code name WINTEM shall always be included in the message.**

**50.1.2** **When in printed form, the format of the WINTEM message shall present the characteristics of a direct reading data table.**

## 50.2 Section 0

**50.2.1** **The groups of this section shall constitute the first line of the message.**

**50.2.2** **The group $Y_FY_FG_FG_Fg_Fg_F$ shall be immediately followed, with a space, by the unit of wind speed used and indicated by one of the letter code indicators KMH, KT or MPS, as the case may be.**

**Notes:**

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided – subject to a decision which is currently under review by ICAO.

## 50.3 Section 1

**50.3.1** **The geographical grid used shall be rectangular, i.e. its boundaries shall be delineated by means of two meridians and two parallel circles.**

**50.3.2** **In the message, the latitudes of grid points shall always be included at the beginning of a line and they shall follow each other in a regular sequence, starting with the northernmost grid-point latitude.**

**50.3.3** **The longitudes of the grid points shall be included only in the first line of Section 1 and they shall be ordered from left to right in a continuous sequence corresponding to an eastward direction.**

**50.3.4** **The $n^{th}$ figure group of a given line of the message, which contains forecast data, shall always refer to the grid point determined by:**

**(a)** **The latitude included in the nearest preceding line of the data group;**

**(b)** **The $n^{th}$ longitude included on the first line of Section 1.**

**50.3.5** **The maximum number of grid-point longitudes included in the first line of Section 1 (i.e. index i of $L_o^iL_o^iL_o^il_o^iB$) shall not exceed seven.**

Note: There is no limitation to the number of grid-point latitudes included in the message, except for telecommunication reasons.

**50.3.6** **Whenever the need arises to include more than seven grid-point longitudes in the first line of Section 1, the message shall be split up in parts, each one satisfying Regulation 50.3.5 above.**

**50.3.7** **The data associated with a given grid point shall be included in the following order:**

**(a)** **Tropopause height;**

**(b)** **Maximum wind level;**

**(c)** **Specified flight levels arranged in decreasing order.**

**50.3.8** **Tropopause height and/or maximum wind-level data shall be omitted whenever these data are not required for operational purposes.**

**50.3.9** **The number of specified flight levels to be included shall be determined by the issuing centre on the basis of operational requirements.**

C O D E F O R M :

$$\left\{\begin{array}{l}\textbf{TAF AMD}\text{ or}\\ \textbf{TAF COR}\text{ or}\\ \textbf{TAF}\end{array}\right\}\quad \mathrm{CCCC}\quad \mathrm{YYGGgg}\mathbf{Z}\quad \left\{\begin{array}{l}\textbf{NIL}\\ \text{or}\\ Y_1Y_1G_1G_1/Y_2Y_2G_2G_2\end{array}\right.\quad \left\{\begin{array}{l}\mathrm{dddff}\mathbf{G}f_mf_m\ \left\{\begin{array}{l}\textbf{KT}\\ \text{or}\\ \textbf{MPS}\end{array}\right\}\\ \text{or}\\ \textbf{CNL}\end{array}\right.$$

$$\left\{\begin{array}{l}\mathrm{VVVV}\quad w'w'\quad \left\{\begin{array}{l}N_sN_sN_sh_sh_sh_s\\ \text{or }\mathbf{VV}h_sh_sh_s\\ \text{or }\textbf{NSC}\end{array}\right\}\\ \text{or}\\ \textbf{CAVOK}\end{array}\right\}$$

$$(\mathbf{TX}T_FT_F/Y_FY_FG_FG_F\mathbf{Z}\qquad \mathbf{TN}T_FT_F/Y_FY_FG_FG_F\mathbf{Z})$$

$$\left\{\begin{array}{l}\left\{\begin{array}{l}\textbf{PROB}\ C_2C_2\text{ or}\\ \textbf{PROB}\ C_2C_2\ \mathrm{TTTTT}\\ \text{or TTTTT}\end{array}\right\}\quad \mathrm{YYGG}/Y_eY_eG_eG_e\\ \text{or}\\ \mathrm{TTYYGGgg}\end{array}\right\}\quad \mathrm{dddff}\mathbf{G}f_mf_m\left\{\begin{array}{l}\textbf{KT}\\ \text{or}\\ \textbf{MPS}\end{array}\right\}\ \left\{\begin{array}{l}\mathrm{VVVV}\quad \left\{\begin{array}{l}w'w'\\ \text{or}\\ \textbf{NSW}\end{array}\right\}\left\{\begin{array}{l}N_sN_sN_sh_sh_sh_s\\ \text{or }\mathbf{VV}h_sh_sh_s\\ \text{or }\textbf{NSC}\end{array}\right\}\\ \text{or}\\ \textbf{CAVOK}\end{array}\right.$$

**Notes:**

(1) TAF is the name of the code for an aerodrome forecast.

(2) Owing to the variability of meteorological elements in space and time, to limitations of forecasting techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast shall be understood by the recipient to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time shall be understood to be the most probable time.

(3) The groups enclosed in brackets are used in accordance with regional air navigation agreements.

(4) Aerodrome forecasts are dealt with in the *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

(5) The code words “AMD”, “CNL”, “COR” and “NIL” shall be included, as appropriate, for amended, cancelled, corrected and missing forecasts, respectively.

R E G U L A T I O N S :

## 51.1 General

**51.1.1** **The code name TAF shall be included at the beginning of each individual aerodrome forecast.**

**51.1.2** **The group YYGGgg$\mathbf{Z}$ shall be included in each individual forecast to report the date and time of origin of forecast.**

**51.1.3** **The description of forecast conditions shall contain at least information about wind, visibility, weather and cloud or vertical visibility.**

**51.1.4** **The forecast shall cover the period $Y_1Y_1G_1G_1$ to $Y_2Y_2G_2G_2$. The forecast period may be divided into two or more self-contained parts by the use of the time indicator group TTYYGGgg in the form of FMYYGGgg. A complete description of the forecast prevailing conditions shall be given at the beginning of the forecast or the self-contained parts designated by FMYYGGgg. If any element is expected to change significantly during the forecast period or a self-contained part thereof, one or more sets of change groups TTTTT YYGG/$Y_eY_eG_eG_e$ shall be added after the complete description of the conditions prevailing before the change. Each change group shall be followed by the modified elements subject to Regulation 51.1.5.**

**Notes:**

**(1) The governing criteria for inclusion of change groups are specified in the *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.**

**(2) See Regulation 51.8.1.**

**51.1.5** **The group w´w´ and/or the group $N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ shall be omitted if the corresponding element(s) is (are) expected to be absent or not significant. After change groups TTTTT $YYGG/Y_eY_eG_eG_e$, elements shall be omitted if they are not expected to differ significantly from the preceding values they possessed in the coded forecast (see Regulations 51.5.2 and 51.6.3). However, in case of significant change of the clouds, all cloud groups, including any significant layer(s) or masses not expected to change, shall be given.**

## 51.2 Group CCCC

**51.2.1** **ICAO location indicators shall be used.**

**51.2.2** **When the same forecast in a TAF bulletin applies to more than one aerodrome, a separate forecast shall be issued for each aerodrome concerned. Only one indicator CCCC shall prefix each coded forecast.**

## 51.3 Group $dddffGf_mf_m$ $\left\{\begin{array}{l}\textbf{KT}\\ \textbf{or}\\ \textbf{MPS}\end{array}\right.$

**51.3.1** **The mean direction and speed of the forecast wind shall be indicated by dddff immediately followed, without a space, by one of the letter code indicators KT or MPS, as the case may be.**

**Notes:**

**(1) KT and MPS are the standard ICAO abbreviations for knots and metre per second, respectively.**

**(2) The primary unit prescribed in ICAO Annex 5 for wind speed is the metre per second (MPS), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided.**

**51.3.2** **Regulations 15.5.2 and 15.5.4 shall apply.**

**51.3.3** **ddd shall normally be encoded as VRB only when the mean wind speed is less than 1.5 m $s^{-1}$ (3 knots). A variable wind at higher speeds shall be indicated only when it is impossible to forecast a single wind direction.**

**51.3.4** **When it is forecast that the maximum wind speed will exceed the mean speed by 5 m $s^{-1}$ (10 knots) or more, the maximum wind speed shall be indicated by adding $Gf_mf_m$ immediately after dddff.**

**Note: If after a change group the wind is reported again, $Gf_mf_m$ should be included, or not, in accordance with these same criteria.**

**51.3.5** **Regulation 15.5.6 shall apply.**

## 51.4 Group VVVV

**Note: The coding of visibility is based on the use of the metre and kilometre, in accordance with the units specified in ICAO Annex 5.**

**51.4.1** **When the horizontal visibility is forecast not to be the same in different directions, the prevailing visibility shall be given for VVVV. When the prevailing visibility cannot be forecast, the group VVVV shall be used to forecast the minimum visibility.**

**51.4.2** **Regulation 51.7 shall apply.**

**51.4.3** **Values to indicate forecast visibility shall be in conformity with those set out in Regulation 15.6.3.**

**51.5 Group** $\left\{\begin{array}{l}\mathbf{w'w'} \\ \text{or} \\ \mathbf{NSW}\end{array}\right.$

**51.5.1** **Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.8, shall be restricted to indicate the occurrence and, where appropriate, the intensity of:**

- **Freezing precipitation;**
- **Moderate or heavy precipitation (including showers);**
- **Duststorm;**
- **Sandstorm;**
- **Thunderstorm;**
- **Freezing fog;**
- **Low drifting dust, sand or snow;**
- **Blowing dust, sand or snow;**
- **Squall;**
- **Funnel cloud (tornado or waterspout);**
- **Other weather phenomena – given in Code table 4678 shall be included as agreed by the meteorological authority with the air traffic services authority and operators concerned.**

**51.5.2** **To indicate the end of significant weather phenomena w´w´, the abbreviation NSW (Nil Significant Weather) shall replace the group w´w´.**

**Note: See Regulation 51.8.3.**

**51.5.3** **Regulation 51.7 shall apply.**

**51.6 Group** $\left\{\begin{array}{l}\mathbf{N_sN_sN_sh_sh_sh_s} \\ \text{or} \\ \mathbf{VVh_sh_sh_s} \\ \text{or} \\ \mathbf{NSC}\end{array}\right.$

**51.6.1** ***Cloud amount and cloud height*** $N_sN_sN_sh_sh_sh_s$

**51.6.1.1** **The cloud amount $N_sN_sN_s$ shall be given as few (1 to 2 oktas), scattered (3 to 4 oktas), broken (5 to 7 oktas) or overcast (8 oktas), using the three-letter abbreviations FEW, SCT, BKN and OVC followed, without a space, by the height of the base of the cloud layer (mass) $h_sh_sh_s$.**

**51.6.1.2** **Subject to Regulation 51.6.1.4, in any cloud group, $N_sN_sN_s$ shall be the total amount of cloud that the forecaster expects to be at the level given by $h_sh_sh_s$.**

**51.6.1.3** **The cloud group shall be repeated to indicate different layers or masses of cloud forecast. The number of groups shall not exceed three, except that cumulonimbus clouds and/or towering cumulus clouds, when forecast, shall always be included.**

**51.6.1.4** **The selection of forecast layers or masses of cloud to be included shall be made in accordance with the following criteria:**

| | |
|---|---|
| **1st group:** | **the lowest individual layer (mass) of any amount, to be indicated as FEW, SCT, BKN or OVC;** |
| **2nd group:** | **the next individual layer (mass) covering more than two oktas, to be indicated as SCT, BKN or OVC;** |
| **3rd group:** | **the next higher individual layer (mass) covering more than four oktas, to be indicated as BKN or OVC;** |
| **Additional groups:** | **Cumulonimbus clouds (CB) and/or towering cumulus clouds when forecast, if not already included in one of the three groups above.** |

**The order of inclusion of the groups shall be from lower to higher levels.**

**51.6.1.5** **The height of the base of forecast cloud layer (mass) shall be coded in units of 30 metres (100 ft) in the form $h_sh_sh_s$.**

**51.6.1.6** **Types of forecast clouds other than cumulonimbus clouds and towering cumulus clouds shall not be given. Cumulonimbus clouds and towering cumulus clouds when expected shall be indicated by appending the letter abbreviations CB and TCU, respectively, to the cloud group without a space. In case CB and TCU are forecast with the same height of cloud base, the cloud amount shall be the sum of the CB and TCU amounts and the cloud type given as CB.**

**51.6.2** ***Vertical visibility*** **$VVh_sh_sh_s$**

**When the sky is expected to be obscured and clouds cannot be forecast and information on vertical visibility is available, the group $VVh_sh_sh_s$ shall be used in lieu of $N_sN_sN_sh_sh_sh_s$, where $h_sh_sh_s$ shall be the vertical visibility in units of 30 metres (hundreds of feet).**

**Note: See Note (1) to Regulation 15.9.2.**

**51.6.3** **Cloud information shall be limited to cloud of operational significance, i.e. cloud below 1 500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and cumulonimbus and/or towering cumulus whenever forecast. In applying this limitation, when no cumulonimbus and no towering cumulus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast, and CAVOK is not appropriate, the abbreviation NSC shall be used.**

**51.6.4** **Regulation 51.7 shall apply.**

## 51.7 Code word CAVOK

**When it is expected that the following conditions will apply simultaneously, the code word CAVOK shall be included in place of the groups VVVV, w´w´ and $N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$:**

**(a) Visibility: 10 km or more;**

**(b) No cloud below 1 500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus;**

**(c) No significant weather phenomena (see Code table 4678).**

**Note: See note under Regulation 15.10.**

## 51.8 Groups $\left\{ \begin{array}{l} \text{TTTTT YYGG/}Y_eY_eG_eG_e \\ \text{or} \\ \text{TTYYGGgg} \end{array} \right.$

**51.8.1** **These groups shall be used when, during the period $Y_1Y_1G_1G_1$ to $Y_2Y_2G_2G_2$, a change in some or all of the elements forecast is expected to occur at some intermediate time YYGGgg or during the period YYGG to $Y_eY_eG_eG_e$. Such groups shall not be introduced until all the data groups necessary to describe the elements forecast in the period $Y_1Y_1G_1G_1$ to $Y_2Y_2G_2G_2$ or YYGGgg have been given.**

**Notes:**

**(1) If the end of the forecast period is midnight, $Y_eY_e$ should be the date before midnight and $G_eG_e$ should be indicated as 24.**

**(2) See Note (1) to Regulation 51.1.4.**

**51.8.2** **The time indicator group TTYYGGgg in the form of FMYYGGgg (from YYGGgg) shall be used to indicate the beginning of a self-contained part of the forecast indicated by YYGGgg. When the group FMYYGGgg is used, all forecast conditions given before the group FMYYGGgg are superseded by the conditions indicated after the group.**

51.8.3 **The change groups TTTTT $YYGG/Y_eY_eG_eG_e$ in the form of BECMG $YYGG/Y_eY_eG_eG_e$ shall indicate a change in forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period YYGG to $Y_eY_eG_eG_e$. The duration of the period YYGG to $Y_eY_eG_eG_e$ shall normally not exceed two hours and in any case shall not exceed four hours. The change groups shall be followed by a description of all the elements for which a change is forecast. When an element is not described in data groups which follow the change groups, the description of this element for the period between $Y_1Y_1G_1G_1$ and $Y_2Y_2G_2G_2$ shall be considered to remain valid subject to Regulation 51.1.5.**

Note: The conditions described after the groups BECMG $YYGG/Y_eY_eG_eG_e$ are those expected to prevail from $Y_eY_eG_eG_e$ until $Y_2Y_2G_2G_2$, unless a further change is expected, in which case a further set of change groups BECMG $YYGG/Y_eY_eG_eG_e$ or FMYYGGgg must be used.

51.8.4 **The change groups TTTTT $YYGG/Y_eY_eG_eG_e$ in the form of TEMPO $YYGG/Y_eY_eG_eG_e$ shall indicate frequent or infrequent temporary fluctuations in forecast meteorological conditions which are expected to last less than one hour in each instance and, in the aggregate cover, less than half of the period indicated by $YYGG/Y_eY_eG_eG_e$.**

Notes:

(1) If the modified forecast condition is expected to last one hour or more, Regulation 51.8.2 or 51.8.3 applies, i.e. the change groups BECMG $YYGG/Y_eY_eG_eG_e$ or FMYYGGgg must be used at the beginning and end of the period during which conditions are expected to depart from those forecast prior to YYGG or YYGGgg.

(2) To keep forecasts clear and unambiguous, the use of change indicators should be carefully considered and kept to a minimum. In particular, the overlapping of change periods should be avoided. At any time during the period of validity of the TAF, only one possible variation in the prevailing forecast conditions should normally be indicated. The subdivision of the forecast period by FMYYGGgg should be used to avoid too complex forecasts in cases where many significant changes in weather conditions are expected to occur throughout the forecast period.

## 51.9 Groups **PROB**$C_2C_2$ $YYGG/Y_eY_eG_eG_e$

51.9.1 **In order to indicate the probability of occurrence of alternative value(s) of forecast element(s) during a defined period of time, the groups PROB$C_2C_2$ $YYGG/Y_eY_eG_eG_e$ shall be placed directly before the alternative value(s). For $C_2C_2$, only the values 30 and 40 shall be used to indicate the probabilities 30 and 40%, respectively.**

Note: A probability of less than 30% of actual values deviating from those forecast is not considered to justify the use of the group PROB. When the possibility of an alternative value is 50% or more, this should be indicated by the use of BECMG, TEMPO or FM as appropriate.

51.9.2 **A probability statement may also be related to the occurrence of temporary fluctuations. In this case, the group PROB$C_2C_2$ shall be placed immediately before the change group TEMPO and the group $YYGG/Y_eY_eG_eG_e$ shall be placed after TEMPO (for example PROB30 TEMPO 2922/3001).**

51.9.3 **The group PROB$C_2C_2$ shall not be used in combination with the change indicator group BECMG or the time indicator group FMYYGGgg.**

## 51.10 Group (**TX**$T_FT_F/Y_FY_FG_FG_F$**Z** **TN**$T_FT_F/Y_FY_FG_FG_F$**Z**)

51.10.1 **To indicate forecast maximum and minimum temperatures expected to occur at the time indicated by $Y_FY_FG_FG_F$Z, the letter indicator TX for the maximum forecast temperature and TN for the minimum forecast temperature shall precede $T_FT_F$ without a space. Up to a maximum of four temperatures shall be included, i.e., two maximum temperatures and two minimum temperatures.**

51.10.2 **Temperatures between –9°C and +9°C shall be preceded by 0; temperatures below 0°C shall be preceded by the letter M, that is, minus.**

## 51.11 Amended aerodrome forecast

**An amended aerodrome forecast in code form shall be identified by the use of the prefix TAF AMD in place of TAF, and it shall cover the whole remaining validity period of the original TAF.**

## FM 53–X Ext. ARFOR Area forecast for aviation

**C O D E F O R M :**

| | | | | | | |
|---|---|---|---|---|---|---|
| SECTION 1 | **ARFOR** | (YYGGgg**Z**) | $Y_1Y_1G_1G_1G_2G_2$ | $\left\{\begin{array}{l}\textbf{KMH}\text{ or}\\ \textbf{KT}\text{ or}\\ \textbf{MPS}\end{array}\right\}$ | AAAAA | (VVVV) |
| | $(w_1w_1w_1)$ | $\left(\left\{\begin{array}{l}N_sN_sN_sh_sh_sh_s\\ \text{or}\\ \textbf{VV}\ h_sh_sh_s\\ \text{or}\\ \textbf{SKC}\ (\text{or}\ \textbf{NSC})\end{array}\right\}\right)$ | $7h_th_th_th_th_fh_f$ | $6I_ch_ih_ih_it_L$ | $5Bh_Bh_Bh_Bt_L$ | |
| | $(4h_xh_xh_xT_hT_h$ | $d_hd_hf_hf_hf_h)$ | $(2h'_Ph'_PT_PT_P)$ | | | |
| SECTION 2 | (11111 | $QL_aL_aL_oL_o$ | $h'_jh'_jf_jf_jf_j)$ | | | |
| SECTION 3 | (22222 | $h'_mh'_mf_mf_mf_m$ | $(d_md_mvv))$ | | | |
| SECTION 4 | $9i_3nnn$ | | | | | |

**Notes:**

(1) ARFOR is the name of the code for an aviation forecast in figure code prepared for a specific area.

(2) See Notes (2) and (3) under FM 51 TAF.

(3) The code form is divided into four sections as follows:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Code identification and time groups; area forecast |
| 2 | 11111 | Jet-stream data (optional) |
| 3 | 22222 | Data of maximum wind and vertical wind shear (optional) |
| 4 | — | Supplementary phenomena |

Sections 2, 3 and 4 are not transmitted separately.

(4) No aeronautical requirement for this code form is stated by ICAO for international air navigation in ICAO Annex 3/WMO *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

**R E G U L A T I O N S :**

### 53.1 Section 1

**53.1.1** **The code name ARFOR shall appear as a prefix to individual coded area forecasts, followed by the group YYGGggZ, if required.**

**Note: See Regulation 51.1.2.**

**53.1.2** **The group $Y_1Y_1G_1G_1G_2G_2$ shall be immediately followed, with a space, by the unit of wind speed used and indicated by one of the letter code indicators KMH, KT or MPS, as the case may be.**

**Notes:**

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided - subject to a decision which is currently under review by ICAO.

**53.1.3** Regulations 51.1.3 and 51.1.4 shall apply.

**53.1.4** *Group* AAAAA

If, instead of plain language, a code is used for AAAAA, this code shall be subject to regional agreements.

**53.1.5** *Group* (VVVV)

**53.1.5.1** This group shall be omitted when visibility is not forecast.

**53.1.5.2** Regulation 51.4 shall apply.

**53.1.6** *Group* ($w_1w_1w_1$)

**53.1.6.1** This group shall be used when any of the following phenomena are forecast: tropical cyclone, severe line squall, hail, thunderstorm, marked mountain waves, widespread sandstorm or duststorm, or freezing rain.

**53.1.6.2** When corresponding equivalents in the form of letter abbreviations (Code table 4691) are added in accordance with regional air navigation agreements, the letter abbreviations shall immediately follow the $w_1w_1w_1$ figures without the insertion of any space.

**53.1.7** *Group* $\left( \begin{Bmatrix} N_sN_sN_sh_sh_sh_s \\ \text{or} \\ \mathbf{VV}h_sh_sh_s \\ \text{or} \\ \mathbf{SKC} \text{ (or } \mathbf{NSC}\text{)} \end{Bmatrix} \right)$

Regulations 51.6.1 to 51.6.3 inclusive shall apply.

**53.1.8** *Group* $7h_th_th_th_fh_fh_f$

**53.1.8.1** When the heights above mean sea level of both the base and top of a number of layers are forecast, the cloud and 7-groups shall be used in pairs for each layer.

**53.1.8.2** When the 0°C isotherm is forecast but no forecast is made for top of clouds, the 7-group shall have the form $7///h_fh_fh_f$. If two cloud groups are given but only one 0°C isotherm is forecast, the order of the groups shall be cloud group, 7-group, cloud group, 7-group, as indicated in Regulation 53.1.8.1, and the second 7-group shall be given as $7h_th_th_t///$. If one cloud group and two 0°C isotherms are forecast, the groups shall be given as cloud group, 7-group, 7-group, with the second 7-group given as $7///h_fh_fh_f$.

**53.1.9** *Group* $6I_ch_ih_ih_it_L$

**53.1.9.1** If required, this group shall be repeated as often as necessary to indicate more than one type or more than one layer of icing.

**53.1.9.2** If the thickness of the layer for any one type of icing is greater than 2 700 metres, the group shall be repeated and the base indicated in the second group shall coincide with the top of the layer given in the preceding group.

**53.1.10** *Group* $5Bh_Bh_Bh_Bt_L$

Regulation 53.1.9.1 and 53.1.9.2 regarding icing shall equally apply to turbulence.

**53.1.11** *Groups* **($4h_xh_xh_xT_hT_h$ $d_hd_hf_hf_hf_h$)**

**These groups shall always be used together and repeated for each level for which temperature and wind are forecast.**

**53.1.12** *Group* **($2h'_Ph'_PT_PT_P$)**

**This group shall be omitted when tropopause data are not forecast.**

## 53.2 Section 2

**53.2.1** **Section 2 shall be omitted when jet-stream data are not forecast.**

**53.2.2** **The groups $QL_aL_aL_oL_o$ $h'_jh'_jf_jf_jf_j$ shall be repeated as often as necessary to indicate the position of the jet core and the wind to be encountered in the core of a jet which extends through a large portion of the area or through several zones.**

## 53.3 Section 3

**53.3.1** **When the maximum wind is forecast but no forecast is made for the vertical wind shear, the last group of the section shall have the form $d_md_m$//.**

**53.3.2** **When only information for vertical wind shear is to be provided, the group $h'_mh'_mf_mf_mf_m$ is omitted from the coded forecast and the group $d_md_m$vv shall have the form //vv.**

## 53.4 Section 4 – Group $9i_3nnn$

**53.4.1** **The groups $91P_2P_2P_2$, $92F_tL_aL_a$, $93F_tL_oL_o$, $94F_tGG$, if required, shall always be placed at the end of the relevant part of the message. The groups $92F_tL_aL_a$, $93F_tL_oL_o$, $94F_tGG$ shall only be used to indicate the type of front, together with the position or time of passage. The type of weather during the frontal passage shall be indicated separately, e.g. by separating the forecasts into different periods, or by using the groups $96GGG_p$ and $97GGG_p$, or by a combination of both methods.**

**53.4.2** **A forecast shall cover the period extending from $G_1G_1$ to $G_2G_2$. A change group $96GGG_p$ or $97GGG_p$ shall be introduced when a change in some or all of the elements forecast is expected to occur at some intermediate time GG. Such a change group shall not be introduced until all the data groups necessary to describe the elements forecast in the period $G_1G_1$ to GG have been given. The change group shall be followed by a description of all the elements for which a change is forecast during the period $G_p$ beginning at GG. When an element is not described in the data groups which follow the change group, the description of this element for the period between $G_1G_1$ and GG shall be considered to remain valid. When a group $96GGG_p$ is used, the conditions described in the data groups which follow shall be considered to remain valid after the expiration of the time $G_p$. When necessary, a second change group referring to conditions at a later time GG shall be used.**

**Note: Plain-language equivalents which are used for the change group $9i_3nnn$, in accordance with regional air navigation agreements, shall be those specified in Code table 1864.**

**53.4.3** *Group* **$96GGG_p$**

**53.4.3.1** **The group $96GGG_p$, with $G_p$ set to zero (96GG0), shall be used to indicate the beginning of a self-contained part of the forecast indicated by GG. In this case, all forecast conditions given before the group 96GG0 are superseded by the conditions indicated after the group.**

**53.4.3.2** **The group $96GGG_p$, with $G_p$ coded 1 to 4, shall be used to indicate a change in forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period beginning at GG and indicated by $G_p$. The duration of the period $G_p$ shall normally not exceed two hours and in any case shall not exceed four hours.**

**53.4.4** ***Group*** **$97GGG_p$**

**The group $97GGG_p$, with $G_p$ coded 1 to 9, shall be used to indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than one hour in each instance and, in the aggregate cover, less than half of the period indicated by $G_p$. If there is a requirement for $G_p$ greater than GG plus nine hours, the forecast period shall be divided.**

Notes:

(1) If the modified forecast condition is expected to last one hour or more, Regulation 53.4.3.1 or 53.4.3.2 applies: i.e. the change group $96GGG_p$ must be used at the beginning and end of the period during which conditions are expected to depart from those forecast prior to GG.

(2) To keep forecasts clear and unambiguous, the use of change indicators should be carefully considered and kept to a minimum. In particular, the overlapping of change periods should be avoided. At any time during the validity of the ARFOR, only one possible variation to the prevailing forecast conditions should normally be indicated. The subdivision of the forecast period by 96GG0 should be used to avoid too complex forecasts in cases where many significant changes to weather conditions are expected to occur throughout the forecast period.

**53.4.5** ***Group*** **$9999C_2$**

**53.4.5.1** **The group $9999C_2$ shall be used to indicate the probability of either the occurrence of an alternative value of a forecast element or the occurrence of temporary fluctuations.**

Note: A probability of less than 30% of actual values deviating from those forecast is not considered to justify the use of the group $9999C_2$. When the possibility of an alternative value is 50% or more, this should be indicated by the use of a group $96GGG_p$ as appropriate.

**53.4.5.2** **When used to indicate the probability of occurrence of an alternative value of a forecast element, the group $9999C_2$ shall be followed immediately by an associated time group $99GGG_p$. The groups $9999C_2$ $99GGG_p$, directly placed after the forecast element concerned, shall be followed immediately by the alternative value of that element.**

Note: See Regulation 53.4.6.

**53.4.5.3** **When used to indicate the probability of occurrence of temporary fluctuations, the group $9999C_2$ shall be placed immediately before the change group $97GGG_p$.**

**53.4.5.4** **The group $9999C_2$ shall not be used in combination with the change group $96GGG_p$.**

**53.4.6** ***Group*** **$99GGG_p$**

**The group $99GGG_p$, used in combination with the probability group $9999C_2$, shall indicate the time period $G_p$ beginning at GG that the alternative value of a forecast element may occur.**

**53.4.7** **Plain-language equivalents which are used for change group $9i_3nnn$, in accordance with regional air navigation agreements, shall be those specified in Code table 1864.**

## 53.5 Amended area forecast

**An amended area forecast in code form shall be identified by the use of the prefix ARFOR AMD in place of ARFOR, and it shall cover the whole remaining validity period of the original ARFOR.**

## FM 54–X Ext. ROFOR  Route forecast for aviation

**CODE FORM:**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | **ROFOR** | (YYGGgg**Z**) | $Y_1Y_1G_1G_1G_2G_2$ | $\left\{\begin{array}{l}\textbf{KMH}\text{ or}\\ \textbf{KT}\text{ or}\\ \textbf{MPS}\end{array}\right\}$ | |
| | CCCC | $(QL_aL_aL_oL_o)$ | CCCC | $0i_2zzz$ | |
| | (VVVV) | $(w_1w_1w_1)$ | $N_sN_sN_sh_sh_sh_s$ | $7h_th_th_th_fh_fh_f$ | $6I_ch_ih_ih_it_L$ |
| | $5Bh_Bh_Bh_Bt_L$ | $(4h_xh_xh_xT_hT_h$ | $d_hd_hf_hf_hf_h)$ | | $(2h'_Ph'_PT_PT_P)$ |
| SECTION 2 | (11111 | $QL_aL_aL_oL_o$ | $h'_jh'_jf_jf_jf_j)$ | | |
| SECTION 3 | (22222 | $h'_mh'_mf_mf_mf_m$ | $(d_md_mvv))$ | | |
| SECTION 4 | $9i_3nnn$ | | | | |

**Notes:**

(1) ROFOR is the name of the code for an aviation forecast in figure code prepared for a route between two specified aerodromes.

(2) See Notes (2) and (3) under FM 51 TAF.

(3) The code form is divided into four sections as follows:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Code identification and time groups; route forecast |
| 2 | 11111 | Jet-stream data (optional) |
| 3 | 22222 | Data of maximum wind and vertical wind shear (optional) |
| 4 | — | Supplementary phenomena |

Sections 2, 3 and 4 are not transmitted separately.

(4) No aeronautical requirement for this code is stated by ICAO for international air navigation in ICAO Annex 3/WMO *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II.

**REGULATIONS:**

### 54.1 Section 1

**54.1.1** **The code name ROFOR shall appear as a prefix to individual coded route forecasts, followed by the group YYGGggZ, if required.**

**Note: See Regulation 51.1.2.**

**54.1.2** **The forecast shall be considered as valid between the hours $G_1G_1$ and $G_2G_2$ at all points or in all sections along the route.**

**54.1.3** **The group $Y_1Y_1G_1G_1G_2G_2$ shall be immediately followed, with a space, by the unit of wind speed used and indicated by one of the letter code indicators KMH, KT or MPS, as the case may be.**

**Notes:**

**(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.**

**(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided – subject to a decision which is currently under review by ICAO.**

**54.1.4 Regulations 51.1.3 and 51.1.4 shall apply.**

**54.1.5 In describing forecast conditions, one of the two following methods shall be used:**

**(a) By dividing the route into sections ($i_2$ = 0 to 5 inclusive) and giving the details of conditions expected during the period over the extent of each section. Five-degree zones ($i_2$ = 5) may be combined if weather elements are sufficiently uniform;**

**(b) By selecting series of points along the route ($i_2$ = 6 to 9 inclusive) and forecasting the conditions at these points. Sufficient points must be selected to provide an adequate sampling of the various weather and wind conditions expected along the route.**

**54.1.6 *Route designation***

**54.1.6.1 The route to which the forecast applies shall be given by the international four-letter location indicators CCCC of the aerodromes at either end of the route. Where it is desirable to specify the route in greater detail, group(s) $QL_aL_aL_oL_o$ shall be included between CCCC groups to identify a sufficient number of additional points.**

**54.1.6.2 The forecast detail shall be given starting from the aerodrome of departure indicated by the first CCCC group.**

**54.1.6.3 The group $0i_2zzz$ shall be used at the beginning of the forecast for each section or point.**

**54.1.6.4 Regulation 51.2.1 shall apply.**

**54.1.7 *Forecast elements***

**Relevant aspects of Regulations 53.1.5 to 53.1.12 inclusive shall apply.**

## 54.2 Section 2

**Regulations 53.2.1 and 53.2.2 shall apply.**

## 54.3 Section 3

**Regulations 53.3.1 and 53.3.2 shall apply.**

## 54.4 Section 4 – Group $9i_3nnn$

**54.4.1 Regulation 53.4.1 shall apply.**

**54.4.2 In addition to Regulation 53.4, the groups 951//, $952L_aL_a$, $953L_aL_a$, $954L_oL_o$, $955L_oL_o$, or the corresponding plain-language alternative terminology (see Code table 1864), shall be used if it is necessary to indicate changes along the route.**

**54.4.3 Regulations 53.4.2 to 53.4.7 inclusive shall apply.**

## 54.5 Amended route forecast

**An amended route forecast in code form shall be identified by the use of the prefix ROFOR AMD in place of ROFOR, and it shall cover the whole remaining validity period of the original ROFOR.**

## FM 57–IX Ext. RADOF — Radiological trajectory dose forecast (defined time of arrival and location)

**C O D E   F O R M :**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 0 | RADOF | $F_1F_2Y_rY_rG_rG_r$ | $Y_0Y_0G_0G_0$ | $Y_1Y_1G_1G_1G_pG_p$ | { IIiii* or D . . . . D** } |
| | | AAMMJJJ<br>$h_rh_rh_rh_ri_h$ | $Y_aY_aG_aG_ag_ag_a$ | $L_aL_aL_aL_aA$ | $L_oL_oL_oL_oL_oB$ |
| SECTION 1 | 11101 | $Y^1Y^1G^1G^1g^1g^1$<br>(5nnnIS) | $L_a{}^1L_a{}^1L_a{}^1L_a{}^1A$<br>$6XXXs_naa$ | $L_o{}^1L_o{}^1L_o{}^1L_o{}^1L_o{}^1B$<br>($7XXXs_naa$) | $h^1h^1h^1h^1$ |
| | 11102 | $Y^2Y^2G^2G^2g^2g^2$<br>(5nnnIS) | $L_a{}^2L_a{}^2L_a{}^2L_a{}^2A$<br>$6XXXs_naa$ | $L_o{}^2L_o{}^2L_o{}^2L_o{}^2L_o{}^2B$<br>($7XXXs_naa$) | $h^2h^2h^2h^2$ |
| | . . . . . | . . . . .<br>. . . . . | . . . . .<br>. . . . . | . . . . .<br>. . . . . | . . . . . |
| | 111jj | $Y^jY^jG^jG^jg^jg^j$<br>(5nnnIS) | $L_a{}^jL_a{}^jL_a{}^jL_a{}^jA$<br>$6XXXs_naa$ | $L_o{}^jL_o{}^jL_o{}^jL_o{}^jL_o{}^jB$<br>($7XXXs_naa$) | $h^jh^jh^jh^j$ |
| SECTION 2 | 22201 | $Y^1Y^1G^1G^1g^1g^1$<br>$i_zs_ns_is_is_p$) | $L_a{}^1L_a{}^1L_a{}^1L_a{}^1A$ | $L_o{}^1L_o{}^1L_o{}^1L_o{}^1L_o{}^1B$ | ($h_mh_mh_mh_mh_m$ |
| | 22202 | $Y^2Y^2G^2G^2g^2g^2$<br>$i_zs_ns_is_is_p$) | $L_a{}^2L_a{}^2L_a{}^2L_a{}^2A$ | $L_o{}^2L_o{}^2L_o{}^2L_o{}^2L_o{}^2B$ | ($h_mh_mh_mh_mh_m$ |
| | . . . . . | . . . . .<br>. . . . . | . . . . . | . . . . . | . . . . . |
| | 222jj | $Y^jY^jG^jG^jg^jg^j$<br>$i_zs_ns_is_is_p$) | $L_a{}^jL_a{}^jL_a{}^jL_a{}^jA$ | $L_o{}^jL_o{}^jL_o{}^jL_o{}^jL_o{}^jB$ | ($h_mh_mh_mh_mh_m$ |

**Notes:**

(1) RADOF is the name of the code used to provide forecast radiological trajectory dose for defined expected time of arrival and location.

(2) A RADOF message is identified by the word RADOF.

(3) The code form is divided into three sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Indications of the data-processing centre originating the forecast and time of issue, initial time of analyses/forecasts used to produce the trajectory, period of validity of radiological trajectory forecast data, and identification of incident (activity or facility involved, time and location) to which trajectory is associated |
| 1 | 111jj | Definition of arrival times of radiological contamination and trajectory locations (when relevant, isotope mass and element name), associated forecast radiological quantity, and data on radioactive substance concentration (total beta activity) in surface layer for each location |
| 2 | 222jj | Definition of times and trajectory locations, associated mixing height, stability index and category for each location |

---

* Included in a fixed land station report only.

** Included in a sea or mobile land station report only.

**REGULATIONS:**

## 57.1 General

**57.1.1** **The code name RADOF shall always be included at the beginning of a RADOF message.**

**57.1.2** **When in printed form, the format of the RADOF message shall present the characteristics of a direct reading data table.**

**57.1.3** ***Use of sections***

**57.1.3.1** **Radiological trajectory forecasts shall always contain at least Section 0 and the first five groups of Section 1.**

**57.1.3.2** **In radiological trajectory forecasts of gamma dose in air, Section 1 shall in addition to the first five groups include the group 6XXX$s_n$aa to give the expected radiological quantity at the forecast time and point position, in millisieverts (mSv).**

**57.1.3.3** **In radiological trajectory forecasts of air concentration of named isotope type including gross beta, Section 1 shall in addition to the first five groups include the groups 5nnnIS 6XXX$s_n$aa to give the isotope mass and element name and the expected radiological quantity at the forecast time and point position, in becquerels per cubic metre (Bq $m^{-3}$).**

**57.1.3.4** **When relevant data are available, the group 7XXX$s_n$aa shall also be included to give the radioactive substance concentration (total beta activity) in the surface layer, in becquerels per cubic metre (Bq $m^{-3}$).**

**57.1.3.5** **When relevant forecast data are available, Section 2 shall be included in radiological trajectory forecasts to give the mixing height and/or stability index and category, as appropriate, for defined times and trajectory locations.**

**Note: Since the density of information required to be given on mixing height and stability index and category is generally more widespread, the sequence of times and forecast point positions to be included in Section 2 is not necessarily the same as in Section 1.**

## 57.2 Section 0

**57.2.1** **The groups of this section shall constitute the first line of the text of the message.**

**57.2.2** ***Groups*** **$F_1F_2Y_rY_rG_rG_r$ $Y_0Y_0G_0G_0$**

**The data-processing centre originating the forecast shall be indicated by $F_1F_2$ and is followed by the date and time of issue of the forecast ($Y_rY_rG_rG_r$) and the initial date and time of analyses/forecasts used to produce the trajectory ($Y_0Y_0G_0G_0$) respectively.**

**57.2.3** ***Group*** **$Y_1Y_1G_1G_1G_pG_p$**

**The trajectory forecast shall cover the period $G_pG_p$ beginning at $Y_1Y_1G_1G_1$.**

**57.2.4** **Groups** $\left\{\begin{array}{l}\text{IIiii*}\\ \text{or}\\ \text{D . . . . D**}\end{array}\right\}$ **AAMMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$**

**These groups shall be included to identify the incident (activity or facility involved, time and location) to which the trajectory forecast is associated.**

---

* **Included in a fixed land station report only.**

** **Included in a sea or mobile land station report only.**

## 57.3 Section 1

**57.3.1** **The indicator of group 111jj, the expected time of arrival of contamination $Y^jY^jG^jG^jg^jg^j$ and the forecast point position groups in the form $L_a{}^jL_a{}^jL_a{}^jL_a{}^jA$ $L_o{}^jL_o{}^jL_o{}^jL_o{}^jL_o{}^jB$ $h^jh^jh^jh^j$ giving the latitude and longitude, in degrees and minutes, and the height above mean sea level, in metres, shall be included as the first five groups in the subsequent lines of the text of the message.**

**Note: Sequence number jj = 01–99 indicates the data line(s) of subsequent forecast point positions given.**

**57.3.2** **The forecast radiological quantity $6XXXs_naa$, when relevant preceded by the isotope mass and element name (5nnnIS) and followed by data on radioactive substance concentration (total beta activity) in the surface layer ($7XXXs_naa$), shall be included in the same data line following the point position groups.**

**57.3.3** **If several isotopes are forecast for the same time and point position, groups 5nnnIS $6XXXs_naa$ shall be repeated as required.**

**Note: In order to keep the characteristics of a direct reading data table, in that case the time and position groups should not be repeated and be replaced by blank spaces.**

**57.3.4** **A data line consisting of relevant groups of this section shall be repeated for different forecast trajectory point positions, as required.**

## 57.4 Section 2

**57.4.1** **When relevant data are available, the indicator group 222jj, the expected time of arrival of contamination and the forecast point position groups shall be included as the first four groups in the subsequent lines of the text of the message.**

**Note: See note to Regulation 57.3.1.**

**57.4.2** **Data on mixing height ($h_mh_mh_mh_m$) and/or stability index and category ($i_zs_ns_is_is_p$) shall be included in the same data line following the point position groups. $i_z$ shall be encoded in accordance with Code table 1859 – Stability index, which forecast value is given by $s_is_i$ modified by $s_n$ for the sign of the value; $s_p$ shall be encoded in accordance with Code table 3847 – Pasquill–Gifford stability category.**

**57.4.3** **Regulation 57.3.4 shall apply.**

## FM 61–IV MAFOR Forecast for shipping

**C O D E F O R M :**

MAFOR

| | | | | |
|---|---|---|---|---|
| $YYG_1G_1/$ | $0AAAa_m$ | $GDF_mW_m$ | $(2VST_xT_n)$ | $(3D_KP_wH_wH_w)$ |

**Note:** MAFOR is the name of the code for a forecast for shipping.

**R E G U L A T I O N S :**

### 61.1 Section 1

**61.1.1** **The code name MAFOR shall appear as a prefix to individual coded forecasts for shipping.**

**61.1.2** **The code name MAFOR shall be included as the first line of the text of a meteorological bulletin of MAFOR forecasts. Individual coded forecasts in the bulletin shall not contain the code name MAFOR.**

### 61.2 Group $YYG_1G_1/$

**This group, indicating the date (day of month) and time (UTC) of the beginning of the period for which the whole forecast or set of forecasts is valid, shall not be repeated if forecasts for several areas (AAA) are given in the one message.**

### 61.3 Group $0AAAa_m$

**61.3.1** **This group shall indicate the maritime area to which the whole forecast or set of forecasts refers.**

**61.3.2** **If the geographical name for the forecast region is used instead of the indicator $AAAa_m$, it shall be inserted at the place of this group.**

### 61.4 Groups $1GDF_mW_m$ $(2VST_xT_n)$ $(3D_KP_wH_wH_w)$

**61.4.1** **This set of groups shall be repeated as many times as necessary to describe the changes in the meteorological conditions forecast in a given area, due attention being given to the need for strict economy in the number of groups used. The first group $1GDF_mW_m$ in which G = 1–8, and the following optional group(s), if used, then shall refer to the forecast weather commencing at the time given in the group $YYG_1G_1/$ and continuing through the period indicated by G. Subsequent groups $1GDF_mW_m$ (G = 1–8) shall give the period of time that the described weather is forecast to persist commencing at the end of the period covered by the preceding group $1GDF_mW_m$ (G = 1–8). If a phenomenon is forecast to occur occasionally in the same period, any set $1GDF_mW_m$ $(2VST_xT_n)$ $(3D_KP_wH_wH_w)$ (G = 1–8) shall be followed by a group $1GDF_mW_m$ (G = 9).**

**Note: The specific value of any of the elements given in the forecast should be understood to be necessarily approximate and the value of the element in question should accordingly be interpreted as representing the most probable mean of a range of values which the element may assume during the period of the forecast concerned and over the area concerned.**

**61.4.2** ***Group*** **$1GDF_mW_m$**

**This group shall indicate the period of time covered by the forecast, the direction and the force of the forecast wind and the forecast weather.**

**61.4.3** ***Group*** **$(2VST_xT_n)$**

**This optional group shall indicate the forecasts of visibility, state of sea and extreme air temperatures.**

**61.4.4** *Group* **($3D_KP_wH_wH_w$)**

**61.4.4.1** **This group shall indicate, as an optional feature, the direction, the period and the height of the forecast waves.**

**61.4.4.2** **The direction from which the wave of longest period is travelling shall be given when waves from several directions are forecast.**

## FM 62–VIII Ext. TRACKOB Report of marine surface observation along a ship's track

**C O D E   F O R M :**

| | | | |
|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYMMJ | |
| SECTION 2 | GGgg/<br>$4m_Tm_Sm_ci_c$<br>$(9d_0d_0c_0c_0)$ | $Q_cL_aL_aL_aL_a$<br>$(6s_nT_wT_wT_w)$ | $L_oL_oL_oL_oL_o$<br>$(8S_0S_0S_0S_0)$ |
| SECTION 3 | D . . . . D | | |

**Notes:**

(1) TRACKOB is the name of the code for reporting consecutive marine surface observations along a ship's track.

(2) A TRACKOB report containing observations taken on the same date along a ship's track during one day is identified by $M_iM_iM_jM_j$ = NNXX and the group YYMMJ, and terminated by the ship's call sign D . . . . D.

(3) A bulletin may contain several TRACKOB reports.

(4) The code is divided into three sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Data for reporting identification and date |
| 2 | — | Data for reporting time, location, averaging periods, and marine surface parameters |
| 3 | — | Ship's call sign |

**R E G U L A T I O N S :**

### 62.1 General

**The code name TRACKOB shall not be included in the report.**

### 62.2 Section 1

**Section 1 shall be included as the first line of the text in every individual report.**

### 62.3 Section 2

**62.3.1** **The groups GGgg/ $Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$ shall always be included in each individual observation within a report. The ship's position shall refer to its position at mid-point of beginning and end of observation.**

**62.3.2** **In a TRACKOB report, the group $4m_Tm_Sm_ci_c$ shall be included only for the first observation and omitted for subsequent observations for which the averaging procedures are the same. Whenever any subsequent change occurs in the averaging procedures, the first observation using the subsequent averaging procedures shall include this group.**

**62.3.3** **When data are available, the group $9d_0d_0c_0c_0$ shall be encoded 90000 if the sea-surface current speed is less than 0.05 metre per second (0.1 knot).**

**62.3.4** **Section 2 shall be repeated as often as observations are available for a given date.**

## 62.4 Section 3

**The ship's call sign D . . . . D shall be entered at the end of a TRACKOB report and shall terminate an individual report. In the absence of a ship's call sign, the word SHIP shall be used for D . . . . D.**

## 62.5 A bulletin of TRACKOB reports

**In a bulletin of several TRACKOB reports from either the same ship or different ships, every individual TRACKOB report shall always include Sections 1, 2 and 3, and Section 2 shall conform to Regulation 62.3.4.**

## FM 63–XI Ext. BATHY Report of bathythermal observation

**C O D E  F O R M :**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYMMJ | GGgg/ | $Q_cL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_o$ | $(i_uddff)$ | $(4s_nTTT)$ |
| SECTION 2 | $8888k_1$ | $I_XI_XI_XX_RX_R$ | $z_0z_0T_0T_0T_0$<br>999zz<br>(00000) | $z_1z_1T_1T_1T_1$<br>$z_1z_1T_1T_1T_1$ | . . . .<br>. . . . | $z_nz_nT_nT_nT_n$<br>$z_nz_nT_nT_nT_n$ | |
| SECTION 3 | (66666 | $(1Z_dZ_dZ_dZ_d)$ | $(k_5D_cD_cV_cV_c))$ | | | | |
| SECTION 4 | D . . . . D<br>or<br>99999 | <br><br>$A_1b_wn_bn_bn_b$ | | | | | |

**Notes:**

(1) BATHY is the name of the code for reporting bathythermal observations.

(2) A BATHY report, or a bulletin of BATHY reports, is identified by $M_iM_iM_jM_j$ (See Code table 2582).

(3) The code form is divided into four sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data. Wind and air temperature (optional) |
| 2 | 8888 | Type of instrumentation and temperatures at either significant or selected depths |
| 3 | 66666 | Total water depth and surface current (optional) |
| 4 | —<br>or<br>99999 | Ship's call sign or station identification group $A_1b_wn_bn_bn_b$ |

**R E G U L A T I O N S :**

**63.1** **The code name BATHY shall not be included in the report.**

### 63.2 Section 1

**63.2.1** **Each individual BATHY report, even if included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$.**

**63.2.2** ***Groups*** **$Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$**

**Position shall be reported in tenths, hundredths or thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the groups shall be encoded as $Q_cL_aL_aL_a$// $L_oL_oL_oL_o$//. When the position is in hundredths of a degree, the groups shall be encoded as $Q_cL_aL_aL_aL_a$/ $L_oL_oL_oL_oL_o$/.**

**63.2.3** **For the reporting of the value of the direction and speed of the wind, regulations for FM 13 SHIP shall apply.**

**Note: The unit of wind speed is indicated by $i_u$ (Code table 1853).**

**63.3 Section 2**

**63.3.1 The group $I_XI_XI_XX_RX_R$ is mandatory and shall follow immediately after the $8888k_1$ group.**

**63.3.2 If temperatures are reported at significant depths, the values shall:**

**(a) Be sufficient to reproduce basic features of the temperature profile;**

**(b) Define the top and the bottom of isothermal layers;**

**(c) In the upper 500 metres, never be more and usually less than 20 in number, even at the cost of loss of detail.**

**63.3.3 The group 00000 shall be included only when the temperature at the lowest depth of the sounding, which is reported in the last temperature group, is actually the bottom layer temperature.**

**63.4 Section 3**

**63.4.1 The inclusion of this section shall be determined by national decision.**

**63.4.2 Group $1Z_dZ_dZ_dZ_d$ shall be omitted when group 00000 is included in Section 2.**

**63.5 Section 4**

**The ship's call sign D . . . . D, or identifier group 99999 together with the station identification group $A_1b_wn_bn_bn_b$ if not already included in the report, shall be added by the coastal radio station receiving the report, or by the national collecting centre when preparing the report for inclusion in bulletins, as appropriate and required.**

**Notes:**

**(1) See Regulation 12.1.7.**

**(2) See Regulation 18.2.3, Notes (1), (2) and (3).**

**C O D E F O R M :**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYMMJ | GGgg/ | $Q_cL_aL_aL_aL_aL_a$ | $L_oL_oL_oL_oL_oL_o$ | ($i_u$ddff) | ($4s_n$TTT) |
| SECTION 2 | $888k_1k_2$ | $I_XI_XI_XX_RX_R$ | $2z_0z_0z_0z_0$<br>$2z_1z_1z_1z_1$<br>. . . .<br>$2z_nz_nz_nz_n$ | $3T_0T_0T_0T_0$<br>$3T_1T_1T_1T_1$<br>. . . .<br>$3T_nT_nT_nT_n$ | $4S_0S_0S_0S_0$<br>$4S_1S_1S_1S_1$<br>. . . .<br>$4S_nS_nS_nS_n$ | (00000) | |
| SECTION 3 | $(66k_6k_4k_3$ | $2z_0z_0z_0z_0$<br>$2z_1z_1z_1z_1$<br>. . . .<br>$2z_nz_nz_nz_n$ | $d_0d_0c_0c_0c_0$<br>$d_1d_1c_1c_1c_1$<br>. . . . .<br>$d_nd_nc_nc_nc_n)$ | | | | |
| SECTION 4 | (55555 | $1Z_dZ_dZ_dZ_d)$ | | | | | |
| SECTION 5 | D . . . . D<br>or<br>99999 | <br><br>$A_1b_wn_bn_bn_b$ | | | | | |

**Notes:**

(1) TESAC is the name of the code for reporting observations of temperature, salinity and current from a sea station.

(2) A TESAC report, or a bulletin of TESAC reports, is identified by $M_iM_iM_jM_j$ (See Code table 2582).

(3) The code form is divided into five sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data. Wind and air temperature (optional) |
| 2 | 888 | Temperatures and salinity at either significant or selected depths |
| 3 | 66 | Current at selected and/or significant depths (optional) |
| 4 | 55555 | Total water depth (optional) |
| 5 | — or 99999 | Ship's call sign or station identification group $A_1b_wn_bn_bn_b$ |

**R E G U L A T I O N S :**

**64.1** **The code name TESAC shall not be included in the report.**

## 64.2 Section 1

**64.2.1** **Each individual TESAC report, even if included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$.**

**64.2.2** ***Groups*** **$Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$**

**Position shall be reported in tenths, hundredths or thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the groups shall be encoded as $Q_cL_aL_aL_a$// $L_oL_oL_oL_o$//. When the position is in hundredths of a degree, the groups shall be encoded as $Q_cL_aL_aL_aL_a$/ $L_oL_oL_oL_oL_o$/.**

64.2.3 **For the reporting of the value of the direction and speed of the wind, regulations for FM 13 SHIP shall apply.**

**Note: The unit of wind speed is indicated by $i_u$ (Code table 1853).**

## 64.3 Section 2

64.3.1 *Group* **$I_XI_XI_XX_RX_R$**

**This group is mandatory and shall follow immediately after the 888$k_1k_2$ group.**

64.3.2 **If temperatures and salinity are reported at significant depths, the values shall:**

**(a) Be sufficient to reproduce basic features of the temperature and salinity profile;**

**(b) Define the top and the bottom of isothermal/isohaline layers;**

**(c) In the upper 500 metres, never be more and usually less than 20 in number, even at the cost of loss of detail.**

64.3.3 **Both temperature and salinity shall be reported for each significant depth selected. The criteria for selecting a significant depth may be based on the characteristics of the temperature profile or the characteristics of the salinity profile. When the measurement of one of the elements at any particular depth is not available, the corresponding group shall be omitted from the report.**

64.3.4 **The group 00000 shall be included only when the temperature (salinity) at the lowest depth of the sounding, which is (are) reported in the last groups of the section, is (are) actually the bottom layer temperature (salinity).**

## 64.4 Section 3

**The inclusion of this section shall be determined by national decision.**

## 64.5 Section 4

64.5.1 **The inclusion of this section shall be determined by national decision.**

64.5.2 **This section shall be omitted when group 00000 is included in Section 2.**

## 64.6 Section 5

**The ship's call sign D . . . . D, or identifier group 99999 together with the station identification group $A_1b_wn_bn_bn_b$ if not already included in the report, shall be added by the coastal radio station receiving the report, or by the national collecting centre when preparing the report for inclusion in bulletins, as appropriate and required.**

**Notes:**

**(1) See Regulation 12.1.7.**

**(2) See Regulation 18.2.3, Notes (1), (2) and (3).**

**C O D E  F O R M :**

SECTION 0 $M_iM_iM_jM_j$ $\left\{\begin{array}{l} D\ldots.D \\ \text{or} \\ A_1b_wn_bn_bn_b \\ \text{or} \\ I_6I_6I_6// \end{array}\right\}$** YYMMJ GGgg/ $\left\{\begin{array}{l} IIiii^* \\ \text{or} \\ Q_cL_aL_aL_aL_a \quad L_oL_oL_oL_oL_o^{**} \end{array}\right\}$

$00I_aI_mI_p$ 1hhhh $2H_sH_sH_sH_s$ $3P_pP_pP_pP_p$ $(4H_mH_mH_mH_m)$ $(5P_aP_aP_aP_a)$
$(6H_{se}H_{se}H_{se}H_{se})$ $(7P_{sp}P_{sp}P_{sp}P_{sp})$ $(8P_{sa}P_{sa}P_{sa}P_{sa})$ $(9d_dd_dd_sd_s)$

SECTION 1 $(111B_TB_T$ SSSS/ D´D´D´D´/ BB/// $1f_1f_1f_1x$ $1f_df_df_dx$ . . . . . BB/// $nf_nf_nf_nx$ $nf_df_df_dx)$

SECTION 2 (2222x $C_mC_mC_mn_mn_m$ $1c_1c_1c_2c_2$ $3c_3c_3c_4c_4$ . . . . . $n–1c_{n–1}c_{n–1}c_nc_n$ (or $nc_nc_n//$)

SECTION 3 (3333x $C_{sm}C_{sm}C_{sm}n_{sm}n_{sm}$ $1c_{s1}c_{s1}c_{s2}c_{s2}$ $3c_{s3}c_{s3}c_{s4}c_{s4}$ . . . . . $n–1c_{sn–1}c_{sn–1}c_{sn}c_{sn}$ (or $nc_{sn}c_{sn}//$))

SECTION 4 (4444 $1d_{a1}d_{a1}d_{a2}d_{a2}$ $1r_1r_1r_2r_2$ $2d_{a1}d_{a1}d_{a2}d_{a2}$ $2r_1r_1r_2r_2$ . . . . . $nd_{a1}d_{a1}d_{a2}d_{a2}$ $nr_1r_1r_2r_2)$

SECTION 5 $(5555I_b$ $1A_1A_1A_1x$ $(1d_1d_1d_sd_s)$ $2A_2A_2A_2x$ $(2d_2d_2d_sd_s)$ . . . . . $nA_nA_nA_nx$ $(nd_nd_nd_sd_s))$

**Notes:**

(1) WAVEOB is the name of the code for reporting spectral wave data from a sea station, or from an aircraft or satellite platform.

(2) A WAVEOB report is identified by $M_iM_iM_jM_j$ = MMXX.

(3) The code form is divided into six sections (Sections 1 to 5 are optional). However, if any of Sections 2, 3, 4 or 5 are present, Section 1 must be present:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Data for reporting identification (type, buoy identifier, date, time, location), indication of frequency or wave number, method of calculation, type of station, water depth, significant wave height and spectral peak period, or wave length, and optional wave parameters |
| 1 | 111 | Sampling interval and duration (or length) of record, and description of measurement system bands |
| 2 | 2222 | Maximum non-directional spectral density from heave sensor, and ratios of individual spectral densities to the maximum value |
| 3 | 3333 | Maximum non-directional spectral density from slope sensor, and ratios of individual spectral densities to the maximum value |
| 4 | 4444 | Directional wave functions. Mean and principle wave directions and first and second normalized polar Fourier coefficients, for bands described in Section 1 |
| 5 | 5555 | Directional or non-directional spectral estimates by frequency or wave number, as indicated, and direction with directional spread |

* Included in a fixed sea station report only.

** Included in a sea station or remote platform report only.

**R E G U L A T I O N S :**

## 65.1 General

**65.1.1** **The code name WAVEOB shall not be included in the report.**

**65.1.2** ***Use of groups*** **$M_iM_iM_jM_j$** $\left\{\begin{array}{l}\mathbf{D \ldots D}\\ \text{or}\\ \mathbf{A_1b_wn_bn_bn_b}\\ \text{or}\\ \mathbf{I_6I_6I_6//}\end{array}\right\}$** **YYMMJ** **GGgg/** $\left\{\begin{array}{l}\mathbf{IIiii^*}\\ \text{or}\\ \mathbf{Q_cL_aL_aL_aL_a \quad L_oL_oL_oL_oL_o^{**}}\end{array}\right.$

**Note: See Regulation 18.2.3, Notes (1), (2) and (3).**

**65.1.2.1** **Each individual WAVEOB report, whether or not included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$.**

**65.1.2.2** **A sea station shall be indicated by either the group D . . . . D or $A_1b_wn_bn_bn_b$. The position of a sea station shall be indicated by the groups $Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$. A satellite shall be indicated by the group $I_6I_6I_6$// and an aircraft shall report ///// for $I_6I_6I_6$//. A fixed sea station (other than an ocean weather station and a moored buoy), which is considered by the Member operating it to be in the same category as a land station, shall report its identification and position by means of the group IIiii.**

**Note: Data may be transmitted from a sea station or from a remote platform (aircraft or satellite).**

**65.1.2.3** **In a report from a sea station (including an ocean weather station and a moored buoy), the latitude and longitude shall be encoded with the actual location of the station. In a satellite or aircraft report, the latitude and longitude shall indicate the (approximate) centre of the area observed.**

**65.1.3** ***Use of Sections 0 and 1***

**65.1.3.1** **The first three data groups in Section 0, after the location, shall contain indicators showing if data are expressed as frequency or wave number, the method of calculation of data and type of platform, data on the water depth in metres, significant wave height in centimetres (or tenths of a metre) and spectral peak period in tenths of a second or spectral peak wave length in metres. Optional groups, when included, shall contain data on the maximum wave height, average wave period or average wave length, estimate of significant wave height from slope sensors, spectral peak wave period or peak wave length derived from slope sensors, average wave period or average wave length derived from slope sensors, and dominant wave direction and directional spread.**

**65.1.3.2** **When used, Section 1 shall contain the section identifier, the total number of bands described in the section, the sampling interval (in tenths of a second or in metres), the duration in seconds of record of the wave or the length in tens of metres, the number (BB) of bands described in the next two groups, the first centre frequency (Hz) or first centre wave number (metres)$^{-1}$, and the increment added to obtain the next centre frequency (Hz) or the next centre wave number (metres)$^{-1}$ and their associated exponents.**

**Note: In deriving the value of the first centre frequency or wave number and increment from the groups $nf_nf_nf_nx$ $nf_df_df_dx$, decimal points are assumed at the left of the numeric values. For example, for centre frequency, the groups 13004 11004 would be interpreted as a first centre frequency of 0.300 x $10^{-1}$ Hz and an increment of 0.100 x $10^{-1}$ Hz. (The maximum spectral density value $C_mC_mC_m$ in Section 2, or $C_{sm}C_{sm}C_{sm}$ in Section 3, is coded in a similar fashion.)**

**65.1.3.3** **Except when BB = 00, the two groups for the first centre frequency or first centre wave number, and the increment added to obtain the next centre frequency or the next centre wave number (each time preceded by BB) shall be repeated (n) times as required to describe band distribution.**

**Note: If sets of data groups are greater than 9, the group identifier (n) for the tenth set will be 0, the group identifier for the eleventh will be 1, etc.**

---

* Included in a fixed sea station report only.

** Included in a sea station or remote platform report only.

65.1.3.4 **BB shall be encoded BB = 00 when no increments are given and the following (n) groups are actual centre frequencies or actual centre wave numbers.**

**Note: The note under Regulation 65.1.3.3 applies if data groups are greater than 9.**

65.1.4 ***Use of Sections 2 and 3***

65.1.4.1 **When used, Section 2 shall contain the section identifier, an exponent associated with the first data group on the maximum value for non-directional spectra ($C_mC_mC_m$) in $m^2$ $Hz^{-1}$ for frequencies or $m^3$ for wave numbers from wave heave sensors, given as a three-digit number. The band number ($n_mn_m$) in which the maximum value for non-directional spectra occurs shall be included in the same group as the value. Subsequent groups shall contain ratios of individual spectra to the maximum ($c_1c_1$ to $c_nc_n$) as a percentage (00–99), with 00 meaning either zero or 100 per cent.**

**Notes:**

**(1) See note under Regulation 65.1.3.2.**

**(2) Confusion between a zero ratio and the maximum ratio (100 per cent) should not arise since the band number ($n_mn_m$) for the maximum has already been identified.**

65.1.4.2 **Each group containing ratios shall begin with an odd number representing the unit value of the first band in the group. Thus, the number 1 shall identify values for the first and second or eleventh and twelfth or twenty-first and twenty-second, etc., bands. The last group shall contain two ratios for even numbers of bands and one ratio for odd numbers of bands. In the case of odd numbers of bands, the last two characters in the group shall be encoded as //.**

65.1.4.3 **When used, Section 3 shall contain the section identifier, and non-directional spectral data derived from wave slope sensors, analogous to Section 2. Regulations 65.1.4.1, with the exception of the section identifier, and 65.1.4.2 shall apply.**

65.1.5 ***Use of Section 4***

**When used, Section 4 shall contain the section identifier and pairs of data groups of mean direction and principal direction from which waves are coming for the band indicated, relative to true north, in units of 4 degrees, and the first and second normalized polar coordinates derived from Fourier coefficients. The pairs of groups shall be repeated (n) times as required to describe the total number of bands given in Section 1.**

**Notes:**

**(1) The note under Regulation 65.1.3.3 applies if pairs of data groups are greater than 9.**

**(2) The mean direction and principal direction from which waves are coming will range from 00 (actual value 358° to less than 2°) to 89 (actual value from 354° to less than 358°). A value of 99 indicates the energy for the band is below a given threshold.**

**(3) Placing $d_{a1}d_{a1}$ and $d_{a2}d_{a2}$ for each band in the same group, with $r_1r_1$ and $r_2r_2$ for the same band in the next group, allows a quick visual check of the state of the sea.**

**(4) If $d_{a1}d_{a1} \approx d_{a2}d_{a2}$ and $r_1r_1 > r_2r_2$, there is a single wave train in the direction given by the common value of $d_{a1}d_{a1}$ and $d_{a2}d_{a2}$.**

**(5) If the coded value of $| d_{a1}d_{a1} - d_{a2}d_{a2} | > 2$ and $r_1r_1 < r_2r_2$, a confused sea exists and no simple assumption can be made about the direction of the wave energy.**

65.1.6 ***Use of Section 5***

**When used, this section shall contain the section identifier, an indicator ($I_b$) indicating whether the section includes directional or non-directional data, pairs of data groups of spectral estimates of the first to the $n^{th}$ frequencies or wave numbers and the direction from which waves are coming in units of 4 degrees for spectral estimates (1) to (n) and their directional spread in whole degrees.**

**Notes:**

**(1) When non-directional spectra are transmitted, the group containing direction and directional spread may be omitted.**

**(2) Complete directional spectra may be coded by repeating as many duplets as needed to define the entire spectrum. A partial directional spectrum may be coded by selecting the largest spectral estimate for any one frequency or wave number band over all directions and coding this for each frequency or wave number band. Secondary peaks may not be coded unless the full directional spectrum is transmitted.**

**(3) For non-directional frequency spectra, the spectral estimates are in $m^2$ $Hz^{-1}$. For non-directional wave number spectra, the spectral estimates are in $m^3$. For a complete directional frequency spectrum, spectral estimates are in $m^2$ $Hz^{-1}$ $radian^{-1}$. For a complete directional wave number spectrum, the spectral estimates are in $m^4$. For incomplete directional spectra, whether in frequency or wave number, the units of the spectral estimates should be $m^2$ $Hz^{-1}$ or $m^3$. That is, the total integrated energy within a frequency band is given rather than just that of the peak. If the spectral estimate is less than $0.100 \times 10^{-5}$, the value of 0 must be used. The exception to this occurs when all subsequent estimates at higher frequencies are also 0, in which case only the zero immediately after the last non-zero spectral estimate need be included; all others need not be coded.**

**(4) There may be cases when spectral estimates are given in integrated units, such as $m^2$, and it is necessary to convert these to the units of the code. This is done by calculating the bandwidth at a frequency by determining the frequency difference between midpoints on either side of the frequency in question. The integrated spectral estimate is then divided by this computed bandwidth.**

**C O D E F O R M :**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG | $(000AC_i)$ | $BBi_Hi_Hi_H$ | |
| SECTION 2 | 22 | $XH_sH_sH_sH_s$ | . . . . . | . . . . . | (GGgg) |
| SECTION 3 | 33 | $XQQQe_Q$ | . . . . . | . . . . . | (GGgg) |
| SECTION 4 | 44 | $t_pRRRR$ | . . . . . | . . . . . | |
| SECTION 5 | 55 | $ts_nT_tT_tT_t$ | . . . . . | . . . . . | |
| SECTION 6 | 66 | $E_1E_1E_2E_2E_3$ | DDDss | | |

**Notes:**

(1) HYDRA is the name of the code for reporting hydrological observations from a hydrological observing station.

(2) A HYDRA report, or a bulletin of HYDRA reports, is identified by $M_iM_iM_jM_j$ = HHXX.

(3) The HYDRA code form consists of six sections:

Section 1 : Identification letters, day and hour of observation, station identification (using one or two groups);

Section 2 : Hydrological data relating to stage;

Section 3 : Hydrological data relating to discharge;

Section 4 : Data relating to precipitation and snow cover;

Section 5 : Data relating to air and water temperature;

Section 6 : Data on the state of ice on the river, lake or reservoir.

Regional associations may decide which of the Sections 2, 3, 4, 5 and 6 of the code form are mandatory for the transmission of hydrological data for the international basins in the Region. Otherwise national Services may define such mandatory sections.

(4) Use of bracketed groups:

The bracketed groups are optional under certain conditions. They may or may not be included in the report as follows:

$(000AC_i)$ — The use of this group is optional when the report is destined for national needs. For international exchange the inclusion of this group in the report is mandatory;

(GGgg) — The inclusion of this group is fixed regionally, or nationally when necessary.

**R E G U L A T I O N S :**

## 67.1 General

**67.1.1** **The code name HYDRA shall not be included in the report.**

**67.1.2** **The identifier groups $M_iM_iM_jM_j$ YYGG $000AC_i$ shall be included as the first line of the text of the bulletin consisting of HYDRA reports of observations which were made at the same time, in the same Region and country.**

**67.1.3 Identification of hydrological observing stations:**

**(a) In an international report the two groups $000AC_i$ $BBi_Hi_Hi_H$ shall be used for full identification of the hydrological observing station;**

**(b) In a national report, the group $000AC_i$ may be omitted.**

**67.1.4 In each individual report, whether it is separate or included in a bulletin, the location of the hydrological observing station shall always be defined by the group $BBi_Hi_Hi_H$ in which BB is the international indicator of the basin and $i_Hi_Hi_H$ is the identification number of the station. In addition, if the report is intended for international exchange, the group $BBi_Hi_Hi_H$ shall be preceded by the group $000AC_i$ in the first line of the bulletin.**

**67.1.5 When data for a particular section are not transmitted, the indicator group of the section shall be omitted.**

## 67.2 Sections

**67.2.1 Within Sections 2, 3, 4 and 5, the groups shall be arranged in order of increasing figures of X, $t_p$ and t.**

**67.2.2 If the ice condition refers to only one phenomenon, the same code figures shall be used for groups $E_1E_1$ and $E_2E_2$. If the ice condition refers to two phenomena, two different code figures shall be used for groups $E_1E_1$ and $E_2E_2$.**

## FM 68–VI HYFOR Hydrological forecast

**CODE FORM:**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | HYFOR | $(000AC_i)$ | $BBi_Hi_Hi_H$ | | |
| SECTION 2 | 22 | $F_HH_{s1}H_{s1}H_{s1}H_{s1}$ | $F_HH_{s2}H_{s2}H_{s2}H_{s2}$ | $M_1Y_1Y_1G_1G_1$ | $(M_2Y_2Y_2G_2G_2)$ |
| SECTION 3 | 33 | $F_HQ_1Q_1Q_1e_Q$ | $F_HQ_2Q_2Q_2e_Q$ | $M_1Y_1Y_1G_1G_1$ | $(M_2Y_2Y_2G_2G_2)$ |
| SECTION 4 | 44 | $1P_iM_1Y_1Y_1$ | $2P_iM_2Y_2Y_2$ | | |

**Notes:**

(1) HYFOR is the name of the code for the transmission of hydrological forecasts.

(2) The HYFOR code form consists of four sections:

Section 1 : Code name, station identification (using one or two groups);

Section 2 : Stage forecasts, and date-time of occurrence or date-times of the beginning and the end of the period for which forecasts are valid;

Section 3 : Discharge forecasts, and date-time of occurrence or date-times of the beginning and the end of the period for which forecasts are valid;

Section 4 : Forecasts of ice phenomena and dates of beginning and end of the period for which forecasts are valid.

Regional associations may decide which of the Sections 2, 3 and 4 of the code form are mandatory for the transmission of forecasts for international basins under their jurisdiction. Otherwise national Services may define such mandatory sections.

(3) Use of bracketed groups:

The bracketed groups are optional under certain conditions. They may or may not be included in the coded forecast as follows:

$(000AC_i)$ — The use of this group is optional when the forecast is destined for national needs. For international exchange the inclusion of this group in the coded forecast is mandatory;

$(M_2Y_2Y_2G_2G_2)$ — This group is used only when a hydrological forecast applies to a given period.

**REGULATIONS:**

### 68.1 General

**68.1.1 The code name HYFOR shall appear as a prefix to individual forecasts.**

**68.1.2 The identifier groups HYFOR $000AC_i$ shall be included as the first line of the text of the bulletin consisting of HYFOR forecasts established for the hydrological observation stations situated in the same Region and country.**

**68.1.3 Regulation 67.1.3 shall apply.**

**68.1.4 Regulation 67.1.4 shall apply.**

**68.1.5 When forecasts for a particular section are not transmitted, the indicator group of the section shall be omitted.**

## 68.2 Sections

**68.2.1** **In Sections 2, 3 and 4, the groups shall be arranged in order of increasing code figures of $F_H$ and $P_i$.**

**68.2.2** **In Sections 2 and 3 and for $F_H$ = 8 or 9, one group $M_1Y_1Y_1G_1G_1$ only shall be used to define the date of occurrence of the forecast. For $F_H$ = 1, 2, 3, 4, 5, 6 or 7, two groups $M_1Y_1Y_1G_1G_1$, $M_2Y_2Y_2G_2G_2$ define the beginning and the end of the period for which the forecast is expected to occur.**

**68.2.3** **In Sections 2 and 3, the forecast value of the variable (level or discharge) is given by two successive groups beginning with the same code figure of $F_H$. The first group shall indicate the lower and the second shall indicate the upper limits of the forecast value.**

**CODE FORM:**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 0 | CLIMAT | MMJJJ | IIiii | | |
| SECTION 1 | 111 | $1\overline{P_0P_0P_0P_0}$ | $2\overline{PPPP}$ | $3s_n\overline{TTT}s_ts_ts_t$ | $4s_n\overline{T_xT_xT_x}s_n\overline{T_nT_nT_n}$ |
| | | $5\overline{eee}$ | $6R_1R_1R_1R_1n_rn_r$ | $7S_1S_1S_1p_Sp_Sp_S$ | $8m_Pm_Pm_Tm_Tm_{Tx}m_{Tn}$ |
| | | $9m_em_em_Rm_Rm_Sm_S$ | | | |
| SECTION 2 | (222 | $0Y_bY_bY_cY_c$ | $1\overline{P_0P_0P_0P_0}$ | $2\overline{PPPP}$ | $3s_n\overline{TTT}s_ts_ts_t$   $4s_n\overline{T_xT_xT_x}s_n\overline{T_nT_nT_n}$ |
| | | $5\overline{eee}$ | $6R_1R_1R_1R_1n_rn_r$ | $7S_1S_1S_1$ | $8y_Py_Py_Ty_Ty_{Tx}y_{Tx}$   $9y_ey_ey_Ry_Ry_Sy_S$) |
| SECTION 3 | (333 | $0T_{25}T_{25}T_{30}T_{30}$ | $1T_{35}T_{35}T_{40}T_{40}$ | $2T_{n0}T_{n0}T_{x0}T_{x0}$ | $3R_{01}R_{01}R_{05}R_{05}$ |
| | | $4R_{10}R_{10}R_{50}R_{50}$ | $5R_{100}R_{100}R_{150}R_{150}$ | $6s_{00}s_{00}s_{01}s_{01}$ | $7s_{10}s_{10}s_{50}s_{50}$ |
| | | $8f_{10}f_{10}f_{20}f_{20}f_{30}f_{30}$ | $9V_1V_1V_2V_2V_3V_3$) | | |
| SECTION 4 | (444 | $0s_nT_{xd}T_{xd}T_{xd}y_xy_x$ | $1s_nT_{nd}T_{nd}T_{nd}y_ny_n$ | $2s_nT_{ax}T_{ax}T_{ax}y_{ax}y_{ax}$ | |
| | | $3s_nT_{an}T_{an}T_{an}y_{an}y_{an}$ | $4R_xR_xR_xR_xy_ry_r$ | $5i_wf_xf_xf_xy_{fx}y_{fx}$ | |
| | | $6D_{ts}D_{ts}D_{gr}D_{gr}$ | $7i_yG_xG_xG_nG_n$) | | |

**Notes:**

(1) CLIMAT is the name of the code for reporting monthly values from a land station.

(2) The CLIMAT code form consists of five sections:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 0 | — | Code name and groups MMJJJ IIiii |
| 1 | 111 | Monthly data of the month referred to in MMJJJ including number of days missing from the records. This section is mandatory |
| 2 | 222 | Monthly normals corresponding to the month referred to in MMJJJ including number of years missing from the calculation |
| 3 | 333 | Number of days in the month with parameters beyond certain thresholds during the month referred to in MMJJJ |
| 4 | 444 | Extreme values during the month referred to in MMJJJ and occurrence of thunderstorms and hail |

**REGULATIONS:**

## 71.1 General

**71.1.1** **When one or several parameters of a group are not available, the missing parameter(s) shall be coded with a set of solidi (/). If all parameters of a group are not available, the group shall be omitted from the report.**

**71.1.2** **When all parameters of a section are missing, except for Section 0 and Section 1, which are mandatory, the section shall be omitted.**

**71.1.3** **The monthly data shall be coded in the code form which is in force during the month to which the data refer (e.g. if the CLIMAT code change is effective on 1 November, the CLIMAT data for October, transmitted in November, will be in the old code form; the first CLIMAT message in the new code form will be for November data, transmitted in December).**

**71.1.4 A CLIMAT bulletin shall contain reports for one specific month only.**

## 71.2 Section 0

**71.2.1 The code name CLIMAT and the groups MMJJJ IIiii shall appear as the prefix to an individual report.**

**71.2.2 The code name CLIMAT and the group MMJJJ shall be included as the first line of the text of a meteorological bulletin of CLIMAT reports. In this case, individual CLIMAT reports in the bulletin shall contain neither the code name CLIMAT nor the group MMJJJ, but shall begin with the group IIiii.**

## 71.3 Section 1

**71.3.1** *Group* **$3s_n\overline{TTT}s_ts_ts_t$**

**This group shall contain both the average air temperature and the standard deviation of the daily values.**

**71.3.2** *Group* **$6R_1R_1R_1R_1R_dn_rn_r$**

**If for a particular month the total amount of precipitation is zero, $R_1R_1R_1R_1$ shall be given as 0000 and $R_d$ given by the highest number of quintile which has 0.0 as lower limit (e.g. in months with no rainfall in the 30-year period, $R_d$ = 5).**

**71.3.3** *Group* **$7S_1S_1S_1p_Sp_Sp_S$**

**This group shall be coded to report the total duration of sunshine in whole hours, and the percentage of the normal that that value represents ($p_Sp_Sp_S$).**

Notes:

(a) If the percentage of the normal is 1% or less but greater than zero, $p_Sp_Sp_S$ shall be coded as 001.

(b) If the normal is zero hours, $p_Sp_Sp_S$ shall be coded as 999.

(c) If the normal is not defined, $p_Sp_Sp_S$ shall be coded as 3 solidi (///).

## 71.4 Section 2

**71.4.1 Meteorological Services shall submit to the Secretariat, for distribution to the Members, complete normal data of the elements for stations to be included in CLIMAT bulletins. CLIMAT reports for the two months following the submission of such complete normal data to the Secretariat shall include the normals for the months in question, in the form given in Section 2. The same procedure shall be followed when Services consider it necessary to make amendments to previously published normal values.**

Note: When normal data are included in the bulletins, the number of stations per bulletin may be reduced if necessary.

**71.4.2 The normal data reported shall be deduced from observations made over a specific period defined by *Technical Regulations*.**

Note: Section 2 of the code supplies the means to specify the start and finish years, and those years missing from the calculations where it is not possible to supply data for the full recommended period.

**71.4.3** *Group* **$3s_n\overline{TTT}s_ts_ts_t$**

**The standard deviation $s_ts_ts_t$ in this group shall be the normal of the standard deviation of the daily values.**

**71.4.4** *Group* **$6R_1R_1R_1R_1n_rn_r$**

**If the normal precipitation for the month is zero, the entire group shall be coded as 6000000.**

## 71.5 Section 3

**If the data portion of any group is equal to zero, that group shall be omitted from the report. For example, during one 30-day month the maximum is less than 25°C on 10 days, from 25°C to 29°C on 10 days, and from 30°C to 34°C on 10 days, the first group in Section 3 shall be coded as 02010 and the second group shall not be included in the report.**

## 71.6 Section 4

**71.6.1** **In groups 0, 1, 2, 3, 4 and 5, if the extreme value occurred on only one day, the day of occurrence shall be coded as the last two digits in the group. If the extreme value occurred on more than one day, 50 shall be added to the first day and that value be coded as the last two digits in the group.**

**71.6.2** ***Group*** **$7i_yG_xG_xG_nG_n$**

**This group shall be included only when a change in practice has occurred, that is when the time of reading of maximum temperature ($G_xG_x$) or the time of reading of minimum temperature ($G_nG_n$) has changed.**

**FM 72–XII CLIMAT SHIP** **Report of monthly means and totals from an ocean weather station**

**C O D E  F O R M :**

| | | | | | | |
|---|---|---|---|---|---|---|
| SECTION 0 | CLIMAT SHIP | | $MMJJJ$ | | | |
| | $99L_aL_aL_a$ | | $Q_cL_oL_oL_o$ | | | |
| | $\overline{PPPP}$ | $s_n\overline{TTT}$ | $\left\{\begin{array}{l} 9s_n\overline{T_wT_wT_w} \\ \text{or} \\ 8s_n\overline{T_wT_wT_w} \end{array}\right.$ | $\overline{eee}n_rn_r$ <br> $\overline{eee}//$ | $R_1R_1R_1R_1R_d$ | |
| SECTION 2 | (NORMAL | $\overline{PPPP}$ | $s_n\overline{TTT}$ | $\left\{\begin{array}{l} 9s_n\overline{T_wT_wT_w} \\ \text{or} \\ 8s_n\overline{T_wT_wT_w} \end{array}\right.$ | $\overline{eee}n_rn_r$ <br> $\overline{eee}//)$ | $R_1R_1R_1R_1/)$ |

**Note:** CLIMAT SHIP is the name of the code for reporting monthly means and totals from an ocean weather station.

**R E G U L A T I O N S :**

## 72.1 Section 1

**72.1.1** **The code name CLIMAT SHIP and the group MMJJJ shall appear as a prefix to an individual report.**

**72.1.2** **The code name CLIMAT SHIP and the group MMJJJ shall be included as the first line of the text of a meteorological bulletin of CLIMAT SHIP reports. In this case, individual reports in the bulletin shall contain neither the code name CLIMAT SHIP nor the group MMJJJ.**

**72.1.3** **Regulations 71.1.3 and 71.1.4 shall apply.**

**72.1.4** ***Group*** **$R_1R_1R_1R_1R_d$**

**72.1.4.1** **When monthly total precipitation is not available, the group $R_1R_1R_1R_1R_d$ shall be omitted from the report and $n_rn_r$, in the preceding group, shall be coded //.**

**72.1.4.2** **If for a particular month the total amount of precipitation is zero, $R_1R_1R_1R_1$ shall be given as 0000 and $R_d$ given by the highest number of quintile which has 0.0 as lower limit (e.g. in months with no rainfall in the 30-year period, $R_d = 5$).**

## 72.2 Section 2

**72.2.1** **Regulation 71.4.1 shall apply.**

**72.2.2** **In broadcasts of normal data, $\overline{PPPP}$, $\overline{TTT}$ and $\overline{T_wT_wT_w}$ shall represent normal values deduced from observations over a 30-year normal period.**

**FM 73–VI** $\left\{\begin{array}{l}\textbf{NACLI}\\\textbf{CLINP}\\\textbf{SPCLI}\\\textbf{CLISA}\\\textbf{INCLI}\end{array}\right\}$ **Report of monthly means for an oceanic area**

## C O D E  F O R M :

$\left.\begin{array}{l}\text{NACLI}\\\text{or}\\\text{CLINP}\\\text{or}\\\text{SPCLI}\\\text{or}\\\text{CLISA}\\\text{or}\\\text{INCLI}\end{array}\right\}$ MMJJJ

| | | | | |
|---|---|---|---|---|
| $L_aL_aL_oL_on$ | $\overline{P_1P_1P_2P_2P_3}$ | $\overline{P_3P_4P_4P_5P_5}$ | . . . . . | . . . . . |
| $L'_aL'_aL'_oL'_on'$ | $\overline{P'_1P'_1P'_2P'_2P'_3}$ | $\overline{P'_3P'_4P'_4P'_5P'_5}$ | . . . . . | . . . . . |
| $L''_aL''_aL''_oL''_on''$ | $\overline{P''_1P''_1P''_2P''_2P''_3}$ | $\overline{P''_3P''_4P''_4P''_5P''_5}$ | . . . . . | . . . . . |
| . . . . . | . . . . . | . . . . . | | |

**Note:** The code names NACLI, CLINP, SPCLI, CLISA and INCLI are the names of the code for reporting monthly means for the following oceanic areas:

NACLI for the North Atlantic;
CLINP for the North Pacific;
SPCLI for the South Pacific;
CLISA for the South Atlantic;
INCLI for the Indian Ocean.

## R E G U L A T I O N S :

**73.1** **The appropriate code name (NACLI, CLINP, etc.) and the group MMJJJ shall appear as a prefix to individual reports.**

**73.2** **The appropriate code name (NACLI, CLINP, etc.) and the group MMJJJ shall be included as the first line of the text of a meteorological bulletin of such reports. Individual reports in the bulletin shall contain neither the code names nor the group MMJJJ.**

**73.3** **When monthly means for oceanic areas are issued, they shall be reported in the form above as soon as possible after the end of the month.**

**73.4** **The monthly mean data shall be coded in the code form which is in force during the month to which the data refer.**

### 73.5 *Groups* $\overline{P_1P_1P_2P_2P_3}$ $\overline{P_3P_4P_4P_5P_5}$

**73.5.1** **For the zone between latitudes 20°N and 20°S, the pressure shall be given in tenths of a hectopascal; for other zones, it shall be given in whole hectopascals.**

**73.5.2** **Every position group $L_aL_aL_oL_on$, $L'_aL'_aL'_oL'_on'$, etc., shall be followed by groups of the form $\overline{P_1P_1P_2P_2P_3}$, $\overline{P_3P_4P_4P_5P_5}$, . . . , $\overline{P'_1P'_1P'_2P'_2P'_3}$, $\overline{P'_3P'_4P'_4P'_5P'_5}$, . . . , etc.**

**74.5.3** **The first pressure $\overline{P_1P_1}$ shall be the mean monthly pressure at mean sea level for the point of intersection of the parallel and the meridian specified by $L_aL_a$ and $L_oL_o$ in the preceding position group.**

**73.5.4** **The pressures following, i.e. $\overline{P_2P_2}$, $\overline{P_3P_3}$, . . . , etc., shall be the values of the mean monthly pressure on the same parallel $L_aL_a$, but at points $L_oL_o$ ± 5°, $L_oL_o$ ± 10°, . . . , etc. The number given for n shall specify the number of the points on the parallel for which pressure is given.**

**Note: The succession of points for which pressures are given is in the direction east-west or west-east, the convenient direction for the ocean concerned being chosen. In *Weather Reporting* (WMO-No. 9), Volume C, this direction is specified in every case.**

**FM 75–XII Ext. CLIMAT TEMP** **Report of monthly aerological means from a land station**

**FM 76–XII Ext. CLIMAT TEMP SHIP** **Report of monthly aerological means from a ocean weather station**

**C O D E  F O R M :**

| | | | | | |
|---|---|---|---|---|---|
| CLIMAT TEMP | MMJJJ | $\left\{ \begin{array}{l} \text{IIiii*} \\ \text{or} \\ 99L_aL_aL_a \end{array} \right.$ | | | |
| CLIMAT TEMP SHIP | MMJJJ | | $Q_cL_oL_oL_oL_o$** | | |
| | | $g\overline{P_0P_0P_0T_0}$ | $\overline{T_0T_0D_0D_0D_0}$ | | |
| | | $\overline{H_1H_1H_1H_1}n_{T1}$ | $n_{T1}\overline{T_1T_1T_1D_1}$ | $\overline{D_1D_1}n_{v1}r_{f1}r_{f1}$ | $\overline{d_{v1}d_{v1}d_{v1}f_{v1}f_{v1}}$ |
| | | $\overline{H_2H_2H_2H_2}n_{T2}$ | $n_{T2}\overline{T_2T_2T_2D_2}$ | $\overline{D_2D_2}n_{v2}r_{f2}r_{f2}$ | $\overline{d_{v2}d_{v2}d_{v2}f_{v2}f_{v2}}$ |
| | | . . . . . | . . . . . | . . . . . | . . . . . |
| | | $\overline{H_nH_nH_nH_n}n_{Tn}$ | $n_{Tn}\overline{T_nT_nT_nD_n}$ | $\overline{D_nD_n}n_{vn}r_{fn}r_{fn}$ | $\overline{d_{vn}d_{vn}d_{vn}f_{vn}f_{vn}}$ |

**Note:** CLIMAT TEMP is the name of the code for reporting monthly aerological mean values from a land station. CLIMAT TEMP SHIP is the name of the code for reporting monthly aerological means from an ocean weather station.

**R E G U L A T I O N S :**

**75.1** **The code name CLIMAT TEMP or CLIMAT TEMP SHIP and the group MMJJJ shall appear as a prefix to an individual report.**

**Note: MM shall be used to indicate the unit of wind speed in addition to indicating the month. When wind speeds are given in knots, 50 shall be added to MM. When the speed is given in metres per second, MM shall not be modified.**

**75.2** **The code name CLIMAT TEMP or CLIMAT TEMP SHIP together with the group MMJJJ shall be included as the first line of the text of a meteorological bulletin of CLIMAT TEMP or CLIMAT TEMP SHIP reports. In this case, individual reports in the bulletin shall contain neither the code names nor the code group MMJJJ.**

**75.3** **The monthly mean data shall be coded in the code form which is in force during the month to which the data refer.**

**75.4** **The monthly mean values of the upper-level element shall include information for station level and for the isobaric surfaces of 850, 700, 500, 300, 200, 150, 100, 50 and 30 hPa, if available. Solidi (/////) shall be reported for any missing value in the groups of a level for which any element or all are not available. No group shall be omitted at any level. Any missing element shall be reported by solidi.**

**75.5** **The mean values of station-level pressure, temperature and dew-point depression shall be the monthly mean values at the time of release of the radiosonde.**

---

* **Used in FM 75 only.**

** **Used in FM 76 only.**

**75.6** **Groups** $\left\{ \begin{array}{l} \overline{H_1H_1H_1H_1}n_{T1} \\ \overline{H_2H_2H_2H_2}n_{T2} \\ \cdots\cdots \\ \overline{H_nH_nH_nH_n}n_{Tn} \end{array} \right.$

**In the case of geopotentials above 9999 standard geopotential metres, the figures indicating the number of tens of thousands shall be omitted.**

**75.7** **Groups** $\left\{ \begin{array}{l} \overline{d_{v1}d_{v1}d_{v1}f_{v1}f_{v1}} \\ \overline{d_{v2}d_{v2}d_{v2}f_{v2}f_{v2}} \\ \cdots\cdots \\ \overline{d_{vn}d_{vn}d_{vn}f_{vn}f_{vn}} \end{array} \right.$

**75.7.1** **The mean vector wind group shall be included in the message for all the reported isobaric surfaces. Solidi (/////) shall be reported for this group if the monthly mean vector wind is not computed for a reported isobaric surface.**

**75.7.2** **To indicate wind speeds of three digits, i.e. of 100 to 199 knots inclusive, 500 shall be added to $\overline{d_{v1}d_{v1}d_{v1}}$, etc.**

**75.8** **A CLIMAT TEMP or CLIMAT TEMP SHIP bulletin shall contain reports for one specific month only.**

## FM 81–I SFAZI Synoptic report of bearings of sources of atmospherics

**CODE FORM:**

SFAZI (999II) iiiGG $F_1I_jD_1D_1D_1$ $F_2I_jD_2D_2D_2$ . . . . .

**Note:** SFAZI is the name of the code for reporting the bearings of sources of atmospherics.

**REGULATIONS:**

**81.1** **The code name SFAZI shall appear as a prefix to an individual report.**

**81.2** **The code name SFAZI shall be included as the first line of the text of a meteorological bulletin of SFAZI reports. In this case, individual reports in the bulletin shall not contain the code name.**

**81.3** **Groups $F_1I_jD_1D_1D_1$ $F_2I_jD_2D_2D_2$ . . . . .**

**81.3.1** **As many groups as necessary shall be included to describe the different sources.**

**Note: Stations are grouped into appropriate networks, each network with a coordinating centre, by arrangement among the Members concerned.**

**81.3.2** **The centre axis shall be reported to the nearest degree.**

**81.4** **Reports shall refer to observation periods terminating at the hours 0000, 0300, 0600, 0900, 1200, 1500, 1800 and 2100 UTC and data shall be transmitted for as many of these periods as possible, in addition to any daily summary (FM 83).**

**81.5** **Reports shall be transmitted not later than three hours after the time to which the observations refer.**

## FM 82–I SFLOC — Synoptic report of the geographical location of sources of atmospherics

**C O D E  F O R M :**

$$\text{SFLOC} \left\{ \begin{array}{l} 66600 \\ \text{or} \\ 66611 \\ \text{or} \\ 66666 \end{array} \right\} \quad \begin{array}{lll} GGx_4a_iA_i & L_aL_aL_oL_ok & \ldots\ldots \\ 9n_fx_4a_iA_i & L_aL_aL_oL_ok & \ldots\ldots \end{array}$$

**Note:** SFLOC is the name of the code for reporting geographical location of sources of atmospherics.

**R E G U L A T I O N S :**

**82.1** **The code name SFLOC shall appear as a prefix to an individual report.**

**82.2** **The code name SFLOC shall be included as the first line of the text of a meteorological bulletin of SFLOC reports. In this case, individual reports in the bulletin shall not contain the code name.**

**82.3** **The first group shall indicate the method used for observations as follows:**

**66600** **shall indicate that atmospherics are located by means of a network of several direction-finders operating on the same individual atmospherics;**

**66611** **shall indicate that atmospherics are located by means of a network of several arrival-time stations operating on the same individual atmospherics;**

**66666** **shall indicate that atmospherics are located by means of a single-station range-bearing technique.**

**82.4** **As many sections as necessary, beginning with 9-indicator groups, are included to describe the different sources.**

**82.5** **Regulations 81.3.1, 81.4 and 81.5 shall apply.**

**FM 83–I SFAZU** **Detailed report of the distribution of sources of atmospherics by bearings for any period up to and including 24 hours**

**CODE FORM:**

| | | | | |
|---|---|---|---|---|
| SFAZU | IIiii | $YG_1G_1G_2G_2$ | | |
| | 999NI | $g_1g_1D'_1D'_1D'_1$ | $g_2g_2D'_2D'_2D'_2$ | |
| | 999NI | $g_1g_1D'_1D'_1D'_1$ | $g_2g_2D'_2D'_2D'_2$ | . . . . . |

**Note:** SFAZU is the name of the code for reporting the distribution of sources of atmospherics by bearings for any period of time up to and including 24 hours.

**REGULATIONS:**

**83.1** **The code name SFAZU shall appear as a prefix to an individual report.**

**83.2** **The code name SFAZU shall be included as the first line of the text of a meteorological bulletin of SFAZU reports. In this case, individual reports in the bulletin shall not contain the code name.**

**83.3** **As many sections, beginning with 999-indicator groups, as necessary shall be included to describe the different sources.**

**83.4** **Regulation 81.3.1 shall apply.**

**83.5** **Summaries referring to the preceding 24-hour period shall be issued once daily.**

## FM 85–IX Ext. SAREP — Report of synoptic interpretation of cloud data obtained by a meteorological satellite

**C O D E  F O R M :**

**Part A**

| | | | | | |
|---|---|---|---|---|---|
| | $M_iM_iM_jM_j$ | YYGGg | IIiii<br>or<br>$99L_aL_aL_a$ | <br><br>$Q_cL_oL_oL_oL_o$ | |
| Name of cyclone | $n_tn_tL_aL_aL_a$ | $Q_cL_oL_oL_oL_o$ | $1A_tW_fa_tt_m$ | $2S_tS_t//$ | $(9d_sd_sf_sf_s)$ |
| | D . . . . D | | | | |

**Part B**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | $YYG_sG_sg_s$ | IIiii<br>or<br>$99L_aL_aL_a$ | <br><br>$Q_cL_oL_oL_oL_o$ | |
| Name of satellite | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | . . . . . | |
| SECTION 2 | $4S_fS_fC_mW_f$ | $QL_aL_aL_oL_o$ | . . . . . | $(9d_sd_sf_sf_s)$ | |
| SECTION 3 | (96/// | /Lddf | $QL_aL_aL_oL_o$ | /Lddf | $QL_aL_aL_oL_o$ |
| | | . . . . . | . . . . . | /Lddf | $QL_aL_aL_oL_o)$ |
| SECTION 4 | $(97//s_c$ | $QL_aL_aL_oL_o$ | $QL_aL_aL_oL_o$ | . . . . . | etc.) |
| SECTION 5 | 51515 | Code groups to be developed regionally | | | |
| | | D . . . . D | | | |

**Notes:**

(1) SAREP is the name of the code for reporting synoptic interpretation of cloud data obtained by a meteorological satellite.

(2) A SAREP report from a land station is identified by $M_iM_i$ = CC, a SAREP report from a sea station by $M_iM_i$ = DD.

(3) The code form is divided into two parts:

| *Part* | *Identifier letters* ($M_jM_j$) | *Contents* |
|---|---|---|
| A | AA | Information on tropical cyclone |
| B | BB | Information on significant features |

Each part can be transmitted as a separate message.

(4) Part B is divided into five sections:

| *Section number* | *Indicator figures or symbolic figure* | *Contents* |
|---|---|---|
| 1 | — | Identification and position data |
| 2 | 4 | Synoptic interpretation of cloud |
| 3 | 96 | Wind information derived from the movement of cloud elements (optional) |
| 4 | 97 | Snow or ice information (optional) |
| 5 | 51515 | Code groups to be developed regionally |

**REGULATIONS:**

## 85.1 General

**85.1.1** **The code name SAREP shall not be included in the report.**

**85.1.2** **The satellite read-out station which originates the report shall indicate its position by means of the group IIiii or the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$.**

**85.1.3** **The ship's call sign D . . . . D shall be included only in SAREP reports from a satellite readout station at sea.**

## 85.2 Part A

**85.2.1** **For the reporting of the interpretation of cloud mass which is recognized as pertaining to a tropical cyclone, Part A shall be used.**

**85.2.2** **The time of the picture of the cyclone(s) shall be encoded by the group YYGGg.**

**85.2.3** **Whenever available the name of the cyclone shall be included.**

**85.2.4** **Tropical cyclones shall be numbered by successive numerals $n_tn_t$. The station originating SAREP reports shall maintain the number assigned to the cyclone as long as it exists or can be identified.**

**85.2.5** **The position of the centre of the cloud mass or the tropical cyclone or the eye of the cyclone, as appropriate, shall be reported by means of the groups $n_tn_tL_aL_aL_a$ $Q_cL_oL_oL_oL_o$.**

**85.2.6** **The movement of the centre of the tropical cyclone, when known, shall be included in the report by means of the group $9d_sd_sf_sf_s$.**

**85.2.7** **When two or more tropical cyclones are detected on the same photograph and thereby given the same time, the groups $n_tn_tL_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $1A_tW_fa_tt_m$ $2S_tS_t//$ ($9d_sd_sf_sf_s$) shall be repeated for each cyclone, preceded by the name whenever it is known.**

## 85.3 Part B

**85.3.1** ***Section 1 – Identification and position data***

**85.3.1.1** **The name of the satellite on which the SAREP report is based shall be included in Section 1.**

**85.3.1.2** **The groups $QL_aL_aL_oL_o$ shall be used to delineate, in clockwise sequence, the analysed area.**

**85.3.1.3** **The first position group shall be repeated.**

**85.3.2** ***Section 2 – Synoptic interpretation of cloud***

**85.3.2.1** **Code groups beginning with the indicator figure 4 shall be used for a description of the synoptic interpretation of significant features.**

**85.3.2.2** **The groups $QL_aL_aL_oL_o$ shall be used to delineate the significant features $S_fS_f$, except when $S_fS_f$ is coded as 99. In this case, the position groups shall refer to the cloud pattern indicated by $C_m$.**

**85.3.2.3** **For delineating areas in Section 2, the same rules shall be followed as indicated under Section 1. When it is used in conjunction with $W_f$, the position group may refer to a nearly circular cloud mass or cloud band. In the case of a nearly circular cloud mass, the position group refers to the centre of the mass. In the case of a cloud band, the position groups refer to a line centrally located along the length of the band.**

**85.3.2.4** **The movement of the system under consideration, when known, shall be included in the report by means of the group $9d_sd_sf_sf_s$.**

**85.3.2.5** **Section 2 shall be used only to describe major synoptic-scale significant features or cloud masses. Mesoscale or more detailed descriptions shall be included in Section 5, their reporting being left to regional decision.**

**85.3.3** ***Section 3 – Wind information derived from the movement of cloud elements***

**Section 3 shall be used only by centres or stations having highly trained staff and computer facilities.**

**85.3.4** ***Section 4 – Snow or ice information***

**85.3.4.1 Section 4 shall be included only once a week or when major changes in snow cover or ice extension are observed, provided snow or ice information is available.**

**85.3.4.2 For delineating areas in Section 4, the same rules shall be followed as indicated under Section 1.**

**85.3.5** ***Section 5 – Code groups to be developed regionally***

**Detailed or mesoscale description of cloud information which is required to be reported shall be included in Section 5.**

**FM 86–XI SATEM** **Report of satellite remote upper-air soundings of pressure, temperature and humidity**

**C O D E  F O R M :**

**Part A**

| | | | | |
|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG/ | $I_6I_6I_6I_3I_4$ | $F_3F_3F_3F_4F_4F_4$ |
| SECTION 2 | 222 | $QL_aL_aL_oL_o$ | $(N_cN_cP_cP_cP_c)$ | |
| SECTION 3 | (333 | $P_AP_An_Ln_Lq$ | $P_1P_1t_{L1}t_{L1}t_{L1}$<br>$P_2P_2t_{L2}t_{L2}t_{L2}$<br>. . . .<br>$P_nP_nt_{Ln}t_{Ln}t_{Ln}$) | |
| SECTION 4 | (444 | $P_AP_An_Ln_Lq$ | $P_1P_1w_{L1}w_{L1}w_{L1}$<br>$P_2P_2w_{L2}w_{L2}w_{L2}$<br>. . . .<br>$P_nP_nw_{Ln}w_{Ln}w_{Ln}$) | |
| SECTION 5 | (555 | $s_nT_0T_0T_tT_t$ | $(P_tP_tP_tI_5A_t)$) | |

**Part B**

| | | | | |
|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG/ | $I_6I_6I_6I_3I_4$ | $F_3F_3F_3F_4F_4F_4$ |
| SECTION 2 | 222 | $QL_aL_aL_oL_o$ | $(N_cN_cP_cP_cP_c)$ | |
| SECTION 5 | (555 | $s_nT_0T_0T_tT_t$ | $(P_tP_tP_tI_5A_t)$) | |
| SECTION 6 | (666 | $P_1P_1P_nP_nu_p$<br>$P_1P_1P_nP_nu_p$ | $n_uA_TTTT_a$<br>$n_uA_TTTT_a$<br>$n_uA_TTTT_a$<br>. . . . ) | |
| SECTION 7 | (777 | $P_1P_1P_nP_nu_p$ | $n_uA_wwww$<br>$n_uA_wwww$<br>. . . . ) | |

**Part C**

| | | | | |
|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG/ | $I_6I_6I_6I_3I_4$ | $F_3F_3F_3F_4F_4F_4$ |
| SECTION 2 | 222 | $QL_aL_aL_oL_o$ | | |
| SECTION 3 | 333 | $P_AP_An_Ln_Lq$ | $P_1P_1t_{L1}t_{L1}t_{L1}$<br>$P_2P_2t_{L2}t_{L2}t_{L2}$<br>. . . .<br>$P_nP_nt_{Ln}t_{Ln}t_{Ln}$ | |

**Part D**

| | | | | |
|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG/ | $I_6I_6I_6I_3I_4$ | $F_3F_3F_3F_4F_4F_4$ |
| SECTION 2 | 222 | $QL_aL_aL_oL_o$ | | |
| SECTION 6 | 666 | $P_1P_1P_nP_nu_p$ | $n_uA_TTTT_a$<br>$n_uA_TTTT_a$<br>. . . . | |

**Notes:**

(1) SATEM is the name of the code for reporting satellite remote upper-air soundings of pressure, temperature and humidity

(2) A SATEM report is identified by $M_iM_i$ = VV

(3) The SATEM code form consists of four parts as follows

| *Part* | *Identifier letters* ($M_jM_j$) | *Isobaric surfaces* |
|---|---|---|
| A | AA | Up to and including the 10-hPa surface |
| B | BB | |
| C | CC | Above the 10-hPa surface |
| D | DD | |

Each part can be transmitted separately.

(4) The code form is divided into a number of sections as follows:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Identification, input data and processing |
| 2 | 222 | Position data and cloud data |
| 3 | 333 | Data for thickness between given reference level and identified standard isobaric surfaces |
| 4 | 444 | Data for precipitable water content between given reference level and standard isobaric surfaces |
| 5 | 555 | Data for tropopause and surface temperature |
| 6 | 666 | Data for (mean) temperature between non-standard pressure levels |
| 7 | 777 | Data for precipitable water between non-standard pressure levels |

**R E G U L A T I O N S :**

## 86.1 General

**86.1.1** **The code name SATEM shall not be included in the report.**

**86.1.2** **Parts A and B shall contain data, in so far as available, only for levels up to and including the 10-hPa level. A report for Part A shall consist of Sections 1 and 2 plus one or more Sections 3, 4 and 5. A report for Part B shall consist of Sections 1 and 2 plus one or more Sections 5, 6 and 7.**

**86.1.3** **Parts C and D shall contain data, in so far as available, only for levels above the 10-hPa level, up to and including the 0.1-hPa level.**

## 86.2 Parts A and C

### 86.2.1 Section 1

**86.2.1.1** **The identification of the satellite shall be reported by means of $I_6I_6I_6$. $I_6I_6I_6$ defines the satellite name and one group contains $F_3F_3F_3$ (originating/generating centre) and $F_4F_4F_4$ (originating/generating sub-centre). If $F_4F_4F_4$ is not coded, it is replaced by three solidi (///).**

**86.2.1.2** **The type of sensor used shall be indicated by means of $I_3$. The type of processing performed shall be indicated by means of $I_4$. The code table for $I_3$ will vary with each type of satellite.**

**86.2.1.3** **Satellite operators, where appropriate, shall therefore inform the WMO Secretariat, as early as possible before launch, of the proposed national coding procedures and code table for $I_3$ for each satellite to be launched. The Secretariat shall then inform all countries by suitable advance information of the specifications of the code table for $I_3$ and shall include this information in Volume II of the *Manual on Codes*.**

**86.2.2** ***Section 2***

**86.2.2.1** **The geographical location of the sounding shall be indicated by means of the group $QL_aL_aL_oL_o$.**

**86.2.2.2** **When included in Section 2 of Part A, the group $N_cN_cP_cP_cP_c$ shall contain data on the cloud cover in the area of the sounding. To describe cloud layers, the group shall be repeated as required.**

**86.2.2.3** **The group $N_cN_cP_cP_cP_c$ shall be included in the report whenever the information on cloud cover (including nil when appropriate) is available and reliable.**

**86.2.3** ***Section 3***

**Section 3 shall contain the thickness between a standard reference level given by the pressure indicator $P_AP_A$ and the standard isobaric surfaces indicated by $P_1P_1 \ldots P_nP_n$.**

**86.2.4** ***Section 4***

**Section 4 shall contain the amount of precipitable water in a layer between a standard reference level indicated by $P_AP_A$ and the standard isobaric surfaces indicated by $P_1P_1 \ldots P_nP_n$.**

## 86.3 Parts B and D

**86.3.1** ***Section 2***

**Regulation 86.2.2.2 shall apply, mutatis mutandis, to Part B.**

**86.3.2** ***Section 6***

**Section 6 shall contain mean temperature data for one or more specified layers indicated by pressure indicators $P_1P_1$ and $P_nP_n$. Each of these layers shall be divided from $P_1P_1$ into adjacent sublayers of variable thicknesses ($n_u$ multiplied by $u_p$ hPa), as required by the vertical locations of temperature measurement.**

**Note: A redundancy check can be performed on each layer $P_1P_1$ and $P_nP_n$ of Section 6. The sum of code figures $n_u$ for the layer, multiplied by the unit layer (indicated by $u_p$), must be equal to the pressure difference between $P_1P_1$ and $P_nP_n$.**

## FM 87–XI SARAD Report of satellite clear radiance observations

**C O D E F O R M :**

| | | | | | |
|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYGG/ | $I_6I_6I_6I_3I_4$ | $F_3F_3F_3F_4F_4F_4$ | |
| SECTION 2 | 222 | $QL_aL_aL_oL_o$ | $(N_cN_cP_cP_cP_c)$ | $//A_2A_2A_2$ | |
| SECTION 3 | $6c_1c_1c_nc_n$ | $1uR_1R_1R_1$ | $2uR_2R_2R_2$ | . . . . . | $nuR_nR_nR_n$ |
| or | | | | | |
| SECTION 4 | $7c_1c_1c_nc_n$ | $1qT_1T_1T_{a1}$ | $2qT_2T_2T_{a2}$ | . . . . . | $nqT_nT_nT_{an}$ |

Notes:

(1) SARAD is the name of the code for reporting satellite clear radiance.

(2) A SARAD report is identified by the symbolic letters $M_iM_iM_jM_j$ = WWXX.

(3) The code form is divided into a number of sections as follows:

| *Section number* | *Indicator figures or symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Identification, date and time |
| 2 | 222 | Position, optional cloud information and zenith angle |
| 3 | 6 | Clear radiance data, directly expressed in energy units |
| 4 | 7 | Clear radiance data, indirectly expressed in equivalent blackbody temperature units |

(4) Part B is divided into five sections:

$$R = \frac{c_1 \nu^3}{\exp \dfrac{c_2 \nu}{T} \pm 1}$$

where
$R$ Radiance in mW/(s.cm$^2$.sr.cm$^{-1}$)
$T$ Equivalent blackbody temperature in K
$\nu$ Wave number in cm$^{-1}$
$c_1$ 1.191 066 x 10$^{-5}$ mW/(s.cm$^2$.sr.cm$^{-4}$)
$c_2$ 1.438 833 K/(cm$^{-1}$).

**R E G U L A T I O N S :**

### 87.1 General

**87.1.1** **The code name SARAD shall not be included in the report.**

**87.1.2** **Whenever it is not possible to report clear radiance data, directly expressed in energy units, with sufficient precision to achieve the temperature sounding accuracies needed (for example, to the nearest degree Celsius), Section 3 shall be omitted and Section 4 shall be used to report clear radiance data, indirectly expressed in equivalent blackbody temperature units.**

**87.1.3** **Except for the case where Regulation 87.1.2 applies, Section 3 shall be used, and Section 4 shall not be included in the report.**

## 87.2 Section 1

**Regulation 86.2.1 shall apply.**

## 87.3 Section 2

**Regulations under 86.2.2 shall apply.**

## 87.4 Section 3

**87.4.1** **Section 3 shall contain clear radiance data corresponding to the sounding identified by means of Section 1 for filter channel numbers arranged in the order of decreasing spectral wave length.**

**87.4.2** **When clear radiance values are not available for filter channel numbers smaller than a given filter channel number, the clear radiance values relative to the filter channels for which no data are available shall not be included in the report. The lowest filter channel number for which data are included shall in all cases be indicated by means of $c_1c_1$ in group $6c_1c_1c_nc_n$.**

**87.4.3** **When clear radiance values are not available for filter channel numbers greater than a given filter channel number, the clear radiance values relative to the filter channels for which no data are available shall not be included in the report. The highest filter channel number for which data are included shall in all cases be indicated by means of $c_nc_n$ in group $6c_1c_1c_nc_n$.**

**87.4.4** **When use is made of Regulations 87.4.2 and 87.4.3 to report abbreviated soundings, data for *all* filter channel numbers between $c_1c_1$ and $c_nc_n$ shall be included in the report.**

**87.4.5** **If the number of filter channels in operation exceeds a multiple of 10, the serial indicator figure preceding the clear radiance values in the report shall be reset to 1, 2, etc.**

## 87.5 Section 4

**87.5.1** **Section 4 shall contain clear radiance data corresponding to the sounding identified by means of Section 1 for filter channel numbers arranged in the order of decreasing spectral wave length.**

**87.5.2** **When clear radiance values are not available for filter channel numbers smaller than a given filter channel number, the clear radiance values relative to the filter channels for which no data are available shall not be included in the report. The lowest filter channel number for which data are included shall in all cases be indicated by means of $c_1c_1$ in group $7c_1c_1c_nc_n$.**

**87.5.3** **When clear radiance values are not available for filter channel numbers greater than a given filter channel number, the clear radiance values relative to the filter channels for which no data are available shall not be included in the report. The highest filter channel number for which data are included shall in all cases be indicated by means of $c_nc_n$ in group $7c_1c_1c_nc_n$.**

**87.5.4** **When use is made of Regulations 87.5.2 and 87.5.3 to report abbreviated soundings, data for *all* filter channel numbers between $c_1c_1$ and $c_nc_n$ shall be included in the report.**

**87.5.5** **Regulation 87.4.5 shall apply.**

**FM 88–XI SATOB** **Report of satellite observations of wind, surface temperature, cloud, humidity and radiation**

**C O D E  F O R M :**

| | | | | | | |
|---|---|---|---|---|---|---|
| SECTION 1 | $M_iM_iM_jM_j$ | YYMMJ | $GGggw_i$ $I_6I_6I_6//$ | $F_3F_3F_3F_4F_4F_4$ | | |
| SECTION 2 | (222 | $B_1B_2B_3nn$ | $U_{La}U_{Lo}U_{La}U_{Lo}/$ | $P_cP_cT_cT_cT_a$ | ddfff | |
| | | | . . . . . | | . . . . . | |
| | | . . . . . | . . . . . | . . . . . | . . . . . | |
| | | | . . . . . | . . . . . | . . . . . ) | |
| | | | | . . . . . | | |
| SECTION 3 | (333 | $B_1B_2B_3nn$ | $U_{La}U_{Lo}P_eP_e/$ | ddfff | | |
| | | | . . . . . | . . . . . | | |
| | | | . . . . . | . . . . . | | |
| | | . . . . . | . . . . . | . . . . . ) | | |
| SECTION 4 | (444 | $B_1B_2B_3nn$ | $U_{La}U_{Lo}T_sT_sT_a$ | | | |
| | | | . . . . . | | | |
| | | . . . . . | . . . . . | | | |
| | | | . . . . . ) | | | |
| SECTION 5 | (555 | $B_1B_2B_3nn$ | $U_{La}U_{Lo}P_dP_d/$ | $N_cN_cT_cT_cT_a$ | | |
| | | | . . . . . | . . . . . | | |
| | | . . . . . | . . . . . | . . . . . | | |
| | | | . . . . . | . . . . . ) | | |
| SECTION 6 | (666 | $B_1B_2B_3nn$ | $U_{La1}U_{Lo1}U_{La2}U_{Lo2}U_{La3}$ | $U_{Lo3}U_{La4}U_{Lo4}U_{La5}U_{Lo5}$ | | $H_1H_2H_3H_4H_5$ |
| | | | . . . . . | . . . . . | | . . . . . |
| | | . . . . . | . . . . . | . . . . . | | . . . . . |
| | | | . . . . . | . . . . . | | . . . . .) |
| SECTION 7 | (777 | $P_bP_b///$ | $B_1B_2B_3nn$ | $U_{La1}U_{Lo1}U_{La2}U_{Lo2}U_{La3}$ | $U_{Lo3}U_{La4}U_{Lo4}U_{La5}U_{Lo5}$ | $U_1U_2U_3U_4U_5$ |
| | | | . . . . . | . . . . . | . . . . . | . . . . . |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |
| | | | . . . . . | . . . . . | . . . . . | . . . . .) |
| SECTION 8 | (888 | $B_1B_2B_3nn$ | $U_{La1}U_{Lo1}U_{La2}U_{Lo2}/$ | $1uF_LF_LF_L$ | $2uF_iF_iF_i$ | $3uF_sF_sF_s$ |
| | | | . . . . . | . . . . . | . . . . . | . . . . .) |

**Notes:**

(1) SATOB is the name of the code for reporting satellite observations of wind, surface temperature, cloud, humidity and radiation.

(2) A SATOB report is identified by the symbolic letters $M_iM_iM_jM_j$ = YYXX

(3) The code form is divided into a number of sections as follows:

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 1 | — | Time and identification data |
| 2 | 222 | Data for wind and cloud or water-vapour temperature at specified pressure levels |
| 3 | 333 | Data for wind at specified pressure levels |
| 4 | 444 | Data for surface temperatures |
| 5 | 555 | Data for clouds |

| *Section number* | *Symbolic figure group* | *Contents* |
|---|---|---|
| 6 | 666 | Data for maximum cloud-top altitude |
| 7 | 777 | Data for troposphere humidity |
| 8 | 888 | Data for radiation balance |

(4) It is recommended that, within each section, a report should be confined to one geographical area. Proper transmission of each report is thereby ensured and the amount of data to be transmitted to individual users is reduced.

**R E G U L A T I O N S :**

## 88.1 General

**88.1.1 The code name SATOB shall not be given in the report.**

**88.1.2 The report shall consist of Section 1 plus Section 8 or Section 1 plus one or more of Sections 2 to 7.**

**88.1.3 The data shall be arranged in 10-degree squares.**

## 88.2 Section 1

**Section 1 shall indicate the satellite name (Regulation 86.2.1.1 applies) and the time of the observation, except when Regulation 88.9.2 applies.**

## 88.3 Section 2

**Section 2 shall be included in the report when data on cloud or water-vapour temperature and winds computed from cloud movement or water-vapour motion are available.**

## 88.4 Section 3

**Section 3 shall be included in the report when data for winds computed from cloud movement or water-vapour motion are available, while cloud or water-vapour temperature data are not available.**

## 88.5 Section 4

**Section 4 shall be included in the report when surface temperature data are available.**

## 88.6 Section 5

**Section 5 shall contain data giving the individual percentage cloud cover of the various cloud layers and the temperature at the top of each layer. If available, the pressure at the top of the layer (in tens of hectopascals) shall be given by $P_dP_d$. If pressure is not available, $P_dP_d$ shall be coded as //.**

## 88.7 Section 6

**Section 6 shall be included in the report when data on maximum cloud-top altitude are available.**

## 88.8 Section 7

**Section 7 shall be included in the report when humidity data from a given level up to the tropopause are available. The group $P_bP_b$/// shall specify the lower level.**

## 88.9 Section 8

**88.9.1** **Section 8 shall be included in the report when data for total radiation (for 24 hours) are available (outgoing: long-wave and short-wave; incoming: short-wave).**

**88.9.2** **When Section 8 is included in the report, GGgg in Section 1 shall be coded as a series of solidi (////), while YY refers to the day over which the total radiation is integrated.**

## Section B

# SPECIFICATIONS OF SYMBOLIC LETTERS (or groups of letters)

**Symbolic letters and remarks as to the methods of coding**

---

**Note: General information about methods of observation will be found in the *Guide to Meteorological Instruments and Methods of Observation* (WMO–No. 8).**

# SYMBOLIC LETTERS AND REMARKS AS TO THE METHODS OF CODING

REMARK: When coding a value which can be directly transcribed into figures, and when the number of significant figures of this value (expressed in the units given in the relevant specification) is lower than the number of symbolic letters reserved for this element, one or more zeros, as appropriate, must be inserted at the left of the significant figure(s) of the reported value.

Example: If the altitude of the cloud base is 3 600 metres and must be reported in the cloud section of the FM 45 IAC code form, where the symbolic letters $H_bH_bH_b$ (altitude of cloud base in hundreds of metres) are reserved for this purpose, the code figure will be 036. Similarly, if the altitude of the cloud base is 800 metres, the code figure will be 008.

| | |
|---|---|
| A | Mirage. (Code table 0101)<br>(9-group in Section 3 of FM 12, FM 13 and FM 14) |
| — | Direction of latitude (N = North, S = South).<br>(FM 22, FM 42, FM 50, FM 57) |
| — | WMO Regional Association in which the hydrological observing station is located (1 – Region I; 2 – Region II, etc.).<br>(FM 67, FM 68) |
| $A_C$ | Accuracy of the position of the centre or the eye of the tropical cyclone. (Code table 0104)<br>(FM 20) |
| $A_N$ | Type of anemometer. (Code table 0114)<br>(FM 18) |
| $A_T$ | Index of accuracy of layer mean air temperature data (supplied by operator).<br>(FM 86) |
| $A_a$ | Accident early notification – article applicable. (Code table 0131)<br>(FM 22) |
| $A_c$ | Cause of incident. (Code table 0133)<br>(FM 22) |
| $A_e$ | Incident situation. (Code table 0135)<br>(FM 22) |
| $A_i$ | Accuracy of the fix and repetition rate of atmospherics. (Code table 0139)<br>(FM 82) |
| $A_t$ | Accuracy of determination of the geographical position of the tropical cyclone. (Code table 0152)<br>(FM 85) |
| — | Index of accuracy of tropopause data (supplied by operator).<br>(FM 86) |

$A_w$ Index of accuracy of precipitable water in the layer (supplied by operator).
(FM 86)

$A_1$ WMO Regional Association area in which buoy, drilling rig or oil- or gas-production platform has been deployed (1 – Region I; 2 – Region II, etc.). (Code table 0161)
(FM 13, FM 18, FM 22, FM 63, FM 64, FM 65)

$A_3$ Day darkness, worst in direction $D_a$. (Code table 0163)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

AA Activity or facility involved in incident. (Code table 0177)
(FM 22, FM 57)

AAA Maritime area.
(FM 61)

$A_hA_hA_h$ Anemometer height expressed in decimetres.
(FM 18)

$A_1A_1A_1$
$A_2A_2A_2$
. . .
$A_nA_nA_n$ Spectral estimates of the first to $n^{th}$ frequencies (or wave numbers if so indicated).
(FM 65)

(1) The use of frequency or wave number is indicated by symbolic letter $I_a$.

$A_2A_2A_2$ Zenith angle, in tenths of a degree.
(FM 87)

AAAAA Area.
(FM 53)

a Characteristic of pressure tendency during the three hours preceding the time of observation. (Code table 0200)
(FM 12, FM 13, FM 14, FM 18)

$a_C$ Change in character of the eye during the 30 minutes preceding the time of observation. (Code table 0204)
(FM 20)

$a_I$ Trend in behaviour of ice. (Code table 0210)
(FM 44)

$a_e$ Tendency of echo pattern. (Code table 0235)
(FM 20)

$a_i$ Distribution of atmospherics. (Code table 0239)
(FM 82)

$a_m$ Portion of the maritime area. (Code table 0244)
(FM 61)

$a_t$ — Apparent 24-hour change in intensity of the tropical cyclone. (Code table 0252)
(FM 85)

$a_1$ — Reason for no report or ground equipment employed. (Code table 0262)
(FM 39, FM 40)

$\left.\begin{matrix} a_1 \\ a_2 \end{matrix}\right\}$ — Hundreds figure of $a_1a_1a_1$, $a_2a_2a_2$.
(FM 47, FM 49)

$a_3$ — Standard isobaric surface for which the geopotential is reported. (Code table 0264)
(FM 12, FM 14)

$a_4$ — Type of measuring equipment used. (Code table 0265)
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

$a_5$ — Type of report and unit of reported radiological quantity. (Code table 0266)
(FM 22)

aa — Decimal exponent of radiological quantity or discharge of the main receiving water body.
(FM 22, FM 57)

$\left.\begin{matrix} a_1a_1 \\ a_2a_2 \end{matrix}\right\}$ — Tens and units figures of $a_1a_1a_1$, $a_2a_2a_2$.
(FM 47, FM 49)

$\left.\begin{matrix} a_1a_1a_1 \\ a_2a_2a_2 \end{matrix}\right\}$ — Type of parameter. (Code table 0291)
(FM 47, FM 49)

(1) In the case of FM 49 GRAF, $a_2a_2a_2$ is replaced by 000 in the code form.

B — Direction of longitude (E = East, W = West).
(FM 22, FM 42, FM 50, FM 57)

— — Turbulence. (Code table 0300)
(FM 51, FM 53, FM 54)

$B_A$ — Turbulence. (Code table 0302)
(FM 42)

$B_T$ — Type of release. (Code table 0324)
(FM 22)

$B_z$ — High-level turbulence. (Code table 0359)
(FM 41)

(1) High-level turbulence refers to the type of aircraft turbulence which is normally found above about 6 km, exclusive of turbulence in Cumulonimbus cloud. High-level turbulence is sometimes referred to as clear-air turbulence but does not exclude turbulence in Cirrus cloud.

BB — Number of bands described by the next two groups, except that BB = 00 indicates each of the following groups represents only a centre frequency or wave number.
(FM 65)

BB *(continued)*

— International indicator for basin in a given WMO Region (A).
(FM 67, FM 68)

(1) This indicator defines the basin, or group of basins, in which the hydrological observing station is situated. This basin or group of basins may be international or national.

(2) The list of international indicators for basins is given in Volume II of the *Manual on Codes*.

$B_RB_R$ Estimated surface friction. (Code table 0366)
(FM 15, FM 16)

$B_TB_T$ Total number of bands described.
(FM 65)

$B_tB_t$ Type of buoy. (Code table 0370)
(FM 18)

$B_1B_2B_3$ Number designating a 10° x 10° square in the geographical grid formed by the intersection of two meridians and two parallels of latitude. These four lines correspond to geographical coordinates which are in pairs of consecutive multiples of 10° and can therefore be expressed as follows:

$I_a$ x 10°, ($I_a$ + 1) x 10° (latitude)

$I_o$ x 10°, ($I_o$ + 1) x 10° (longitude).

In the above expressions, $I_a$ and $I_o$ are positive integers that may vary between 0 and 8 and between 0 and 17 respectively. Both latitudes are either N or S and both longitudes are either E or W.

The square number is obtained by using the specifications below:

$B_1$ = Q – Octant of the globe. (Code table 3300)

$B_2$ = $I_a$.

$B_3$ = Units figure of integer $I_o$.
(FM 88)

(1) That corner of square $B_1B_2B_3$ which corresponds to the geographical coordinates $I_a$ x 10° and $I_o$ x 10° is used as a reference point to obtain the coordinates of any point lying inside the square:

(a) To the nearest degree, by adding up to 9° to the coordinates of the corner in question;

(b) To the nearest tenth of a degree, by adding up to 9.9° to the coordinates of the corner in question.

(2) Points lying on the 180° meridian will be encoded by using $B_3$ = 8 and $B_1$ = 1 in the northern hemisphere and $B_1$ = 6 in the southern hemisphere.

(3) Each Pole will be encoded by $B_2$ = 9, $B_3$ = 0 and $B_1$ = 1 for the North Pole and $B_1$ = 6 for the South Pole.

(4) Between 80° latitude and each of the Poles, the squares are reduced to triangles which nevertheless are covered by the above system.

(5) The numbering system of squares is given in Code table 0371.

$b_i$ Ice of land origin. (Code table 0439)
(FM 12, FM 13, FM 14)

$b_w$ Sub-area belonging to the area indicated by $A_1$. (Code table 0161)
(FM 13, FM 18, FM 22, FM 63, FM 64, FM 65)

$b_1b_1$ }
$b_2b_2$ } Type of special level. (Code table 0491)
(FM 47, FM 49)

(1) In the case of FM 49 GRAF, $b_2b_2$ is replaced by 00 in the code form

C Genus of cloud. (Code table 0500)
(FM 12, FM 13, FM 14)

(1) The genus of the cloud of the reported layers shall be determined on the basis of the 10 genera of cloud and of their illustrations given in the *International Cloud Atlas*.

— Total concentration of all ice. (Code table 0501)
(FM 44)

— Genus of cloud predominating in the layer. (Code table 0500)
(FM 45)

$C_H$ Clouds of the genera Cirrus, Cirrocumulus and Cirrostratus. (Code table 0509)
(FM 12, FM 13, FM 14, FM 35, FM 36, FM 38)

(1) The figure to be reported for $C_H$ shall be determined on the basis of the detailed description of $C_H$ clouds and illustrations of them in the *International Cloud Atlas* in conjunction with specifications in Code table 0509.

(2) The figure $C_H$ = 9 shall be used when the predominant $C_H$ clouds are Cirrocumulus although small amounts of Cirrocumulus may be present in the $C_H$ cloud system reported under $C_H$ = 1 to 8.

$C_L$ Clouds of the genera Stratocumulus, Stratus, Cumulus and Cumulonimbus. (Code table 0513)
(FM 12, FM 13, FM 14, FM 35, FM 36, FM 38)

(1) The figure to be reported for $C_L$ shall be determined on the basis of the detailed description of the low clouds and illustrations of them in the *International Cloud Atlas* in conjunction with specifications in Code table 0513.

$C_M$ Clouds of the genera Altocumulus, Altostratus and Nimbostratus. (Code table 0515)
(FM 12, FM 13, FM 14, FM 35, FM 36, FM 38)

(1) The figure to be reported for $C_M$ shall be determined on the basis of the detailed description of $C_M$ clouds and illustrations of them in the *International Cloud Atlas* in conjunction with specifications in Code table 0515.

$C_R$ Extent of runway contamination. (Code table 0519)
(FM 15, FM 16)

$C_S$ Special clouds. (Code table 0521)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$C_a$ Nature of clouds of vertical development. (Code table 0531)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$C_c$ Coloration and/or convergence of clouds associated with a tropical disturbance. (Code table 0533)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$C_e$ Concentration of the tertiary form of ice. (Code table 0501)
(FM 44)

$C_i$ Indicator of the country for each basin (BB) in which the hydrological observing station is situated.
(FM 67, FM 68)

(1) The list of indicators for countries is given in Volume II of the *Manual on Codes*.

$C_m$ Major cloud configuration. (Code table 0544)
(FM 85)

$C_p$ Concentration of the predominant form of ice. (Code table 0501)
(FM 44)

$C_q$ Concentration of the quaternary form of ice. (Code table 0501)
(FM 44)

$C_s$ Concentration of the secondary form of ice. (Code table 0501)
(FM 44)

— Cloud system. (Code table 0551)
(FM 45)

$C_t$ Description of the top of cloud whose base is below the level of the station. (Code table 0552)
(FM 12, FM 14)

$C_u$ Concentration of the quintary form of ice. (Code table 0501)
(FM 44)

$C_0$ Orographic clouds. (Code table 0561)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$C_1$ Concentration of the predominant stage of development of ice. (Code table 0501)
(FM 44)

— Confidence figure. (Code table 0562)
(FM 45, FM 46)

$C_2$ Concentration of the secondary stage of development of ice. (Code table 0501)
(FM 44)

— Probability in tens of per cent.
(FM 53, FM 54)

(1) $C_2$ cannot exceed 5 = 50 per cent. (If the probability of occurrence of an element exceeds 50 per cent, then that occurrence shall be the predominant feature of the forecast.)

$C_3$ Concentration of the tertiary stage of development of ice. (Code table 0501)
(FM 44)

$C_4$ Concentration of the quaternary stage of development of ice. (Code table 0501)
(FM 44)

$C_5$ Concentration of the quintary stage of development of ice. (Code table 0501)
(FM 44)

$C'$ Genus of cloud whose base is below the level of the station. (Code table 0500)
(FM 12, FM 14)

$C_2C_2$ Probability in per cent rounded off to whole tens.
(FM 51)

(1) $C_2C_2$ cannot exceed 50 = 50 per cent. (If the probability of occurrence of an element exceeds 50 per cent, then that occurrence shall be the predominant feature of the forecast.)

$C_mC_mC_m$ Maximum non-directional spectral density derived from heave sensors, in $m^2$ $Hz^{-1}$ for frequencies and $m^3$ for wave numbers.
(FM 65)

$C_{sm}C_{sm}C_{sm}$ Maximum non-directional spectral density derived from slope sensors, in $m^2$ $Hz^{-1}$ for frequencies and $m^3$ for wave numbers.
(FM 65)

CCCC ICAO international four-letter location indicator.
(FM 15, FM 16, FM 51, FM 54)

$C_sC_sC_sC_s$ Four last digits of check sum.
(FM 47)

$c_T$ Thermodynamic correction technique. (Code table 0659)
(FM 39, FM 40)

$c_i$ Concentration or arrangement of sea ice. (Code table 0639)
(FM 12, FM 13, FM 14)

$c_w$ Wind correction technique. (Code table 0659)
(FM 39, FM 40)

$\left.\begin{array}{l} c_{s1}c_{s1} \\ c_{s2}c_{s2} \\ \cdots \\ c_{sn}c_{sn} \end{array}\right\}$ The ratio of the spectral density derived from slope sensors for a given band, to the maximum spectral density given by $C_{sm}C_{sm}C_{sm}$.
(FM 65)

(1) A coded value of 00 may indicate either zero, or that the band contains the maximum spectral density. Since the band containing the maximum value will have been identified, it will be obvious which meaning should be assigned.

$c_0c_0$ Sea-surface current speed, in tenths of a metre per second or tenths of a knot, in units indicated by $i_c$.
(FM 62)

(1) $d_0d_0c_0c_0$ is encoded 0000 if the current speed is less than 0.05 metre per second (0.1 knot).

$c_1c_1$, $c_2c_2$, . . . $c_nc_n$ The ratio of the spectral density derived from heave sensors for a given band, to the maximum spectral density given by $C_mC_mC_m$.
(FM 65)

(1) See Note (1) under $c_{s1}c_{s1}$, $c_{s2}c_{s2}$, . . . $c_{sn}c_{sn}$

— Number of filter channel which corresponds to the data included in the first (to $R_1R_1R_1$) and in the last (to $R_nR_nR_n$) positions.
(FM 87)

(1) Filter channel numbers range from 01 to a value determined by the instrumental characteristics.

$c_0c_0c_0$, $c_1c_1c_1$, . . . $c_nc_nc_n$ Speed of the current, in centimetres per second, at selected and/or significant depths starting with sea surface.
(FM 18, FM 64)

D True direction from which surface wind is blowing. (Code table 0700)
(FM 61)

— True direction towards which ice has drifted in the past 12 hours. (Code table 0700)
(FM 44)

$D_H$ True direction from which $C_H$ clouds are moving. (Code table 0700)
(FM 12, FM 13, FM 14)

$D_K$ True direction from which swell is moving. (Code table 0700)
(FM 61)

$D_L$ True direction from which $C_L$ clouds are moving. (Code table 0700)
(FM 12, FM 13, FM 14)

$D_M$ True direction from which $C_M$ clouds are moving. (Code table 0700)
(FM 12, FM 13, FM 14)

$D_a$ True direction in which orographic clouds or clouds with vertical development are seen. (Code table 0700)
(FM 12, FM 13, FM 14)

— True direction in which the phenomenon indicated is observed or in which conditions specified in the same group are reported. (Code table 0700)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$D_e$ True direction towards which an echo pattern is moving. (Code table 0700)
(FM 20)

$D_i$ True bearing of principal ice edge. (Code table 0739)
(FM 12, FM 13, FM 14)

(1) If more than one ice edge can be stated, the nearest or most important shall be reported.

$D_p$ True direction from which the phenomenon indicated is coming. (Code table 0700)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$D_s$ True direction of resultant displacement of the ship during the three hours preceding the time of observation. (Code table 0700)
(FM 13)

$D_v$ Direction of observation given by one or two-letter indicators of the eight points of the compass (N, NE, etc.).
(FM 15, FM 16)

$D_w$ True orientation of water feature given in $W_t$. (Code table 0755)
(FM 44)

$D_1$ True direction of the point position from the station. (Code table 0700)
(FM 45)

$D_RD_R$ Runway designator reported in accordance with ICAO Annex 14.
(FM 15, FM 16)

$D_cD_c$ Surface current direction, in tens of degrees.
(FM 63)

$D_{gr}D_{gr}$ Number of days in the month with hail.
(FM 71)

$D_tD_t$ Dew-point depression at the tropopause level. (Code table 0777)
(FM 35, FM 36, FM 37, FM 38)

$D_{ts}D_{ts}$ Number of days in the month with thunderstorm(s).
(FM 71)

$\left.\begin{array}{l} D_0D_0 \\ D_1D_1 \\ \ldots \\ D_nD_n \end{array}\right\}$ Dew-point depression at standard isobaric surfaces or at significant levels, starting with station level. (Code table 0777)
(FM 35, FM 36, FM 37, FM 38)

DDD Ice thickness, in centimetres.
(FM 67)

$\left.\begin{array}{l} \overline{D_0D_0D_0} \\ \overline{D_1D_1D_1} \\ \ldots \\ \overline{D_nD_nD_n} \end{array}\right\}$ Monthly mean dew-point depression, in tenths of a degree Celsius, at specified isobaric surfaces starting with station level.
(FM 75, FM 76)

$\left.\begin{array}{l} D_1D_1D_1 \\ D_2D_2D_2 \\ \text{etc.} \end{array}\right\}$ True direction, in whole degrees, of source.
(FM 81)

$D'_1D'_1D'_1$ $D'_2D'_2D'_2$ etc. — True direction, in whole degrees, of the axis of the centre corresponding to $g_1g_1$, $g_2g_2$, etc.
(FM 83)

$D_{Pa}D_{Pa}D_{Pa}D_{Pa}$ — Radius of protective action (to be) taken, in kilometres.
(FM 22)

$D'D'D'D'$ — Duration of record of wave, in seconds, or length of record of wave, in tens of metres.
(FM 65)

(1) The use of frequency or wave number is indicated by symbolic letter $I_a$.

D . . . . D — Ship's call sign consisting of three or more alphanumeric characters.
(FM 13, FM 20, FM 33, FM 36, FM 62, FM 63, FM 64, FM 65, FM 85)

— Call sign, consisting of three or more alphanumeric characters, for mobile land station making surface or upper-air observations or issuing a radiological report on a routine basis and/or in case of accident.
(FM 14, FM 22, FM 34, FM 38, FM 57)

(1) It is recommended that this group should be encoded in the form $A_1A_2$DDD, where $A_1A_2$ are the two-letter geographical designators related to countries or territories as specified in Table C1, Part I of Attachment II–5 of the *Manual on the Global Telecommunication System* (Volume I). DDD are location designators comprising the first three letters of the name of the town or commune, where the mobile land station carried out upper-air sounding.

$d_T$ — Amount of temperature change, the sign of the change being given by $s_n$. (Code table 0822)
(FM 12, FM 13, FM 14)

$d_c$ — Duration and character of precipitation given by RRR. (Code table 0833)
(9-group in section 3 of FM 12, FM 13 and FM 14)

(1) If only one period of precipitation has occurred during the period covered by $W_1W_2$, the duration is defined as the time elapsed from the beginning (a) until the end of the period of precipitation, if precipitation is not occurring at the time of observation, or (b) until the time of observation, if precipitation is occurring at the time of observation.

(2) If two or more periods of precipitation have occurred during the period covered by $W_1W_2$, the duration of precipitation is defined as the time elapsed from the beginning of the first period of precipitation, all or part of which occurred during the period covered by $W_1W_2$, (a) until the end of the last period of precipitation, if precipitation is not occurring at the time of observation, or (b) until the time of observation, if precipitation is occurring at the time of observation.

$d_p$ — Decimal point locator
(FM 39, FM 40)

(1) The decimal point locator is defined as the number of places to the left of the third significant figure. The decimal point must be so placed as to obtain the actual density in g $m^{-3}$ by $p_1p_1p_1$.

(2) The third significant figure is always included in the value reported for symbol $d_p$.

For example: If air density is 120 g $m^{-3}$, the group $9d_pp_1p_1p_1$ is coded 90120, $d_p$ being 0. If air density is 1.20 g $m^{-3}$, the group $9d_pp_1p_1p_1$ is coded 92120, $d_p$ being 2. If air density is 0.281 g $m^{-3}$, the group $9d_pp_1p_1p_1$ is coded 93281, $d_p$ being 3.

dd — True direction, in tens of degrees, from which wind is blowing (or will blow). (Code table 0877; stations within 1° of the North Pole use Code table 0878)
(FM 12, FM 13, FM 14, FM 18, FM 22, FM 39, FM 40, FM 45, FM 63, FM 64, FM 88)

— True direction (rounded off to the nearest 5°), in tens of degrees, from which wind is blowing.
(FM 32, FM 33, FM 34, FM 41)

— Forecast true direction, in tens of degrees, from which wind will blow at the relevant grid point. (Code table 0877)
(FM 50)

— True direction, in tens of degrees, from which wind is blowing, derived from movement of cloud elements. (Code table 0877)
(FM 85)

(1) When encoding wind direction that has been rounded off to the nearest 5°, the hundreds and tens figures of this rounded direction shall be reported by dd and the units figure shall be added to the hundreds figure of the wind speed.

Examples:

(a) 293°/162 knots shall be encoded

$$\begin{array}{r} 295 \\ +\ \underline{\ \ 162} \\ 29662 \end{array}$$

(b) 292°/162 knots shall be encoded

$$\begin{array}{r} 290 \\ +\ \underline{\ \ 162} \\ 29162 \end{array}$$

(2) Stations within 1° of the South Pole shall use Code table 0877 for reporting wind direction. These stations shall orient their azimuth rings so that the ring's zero coincides with the Greenwich meridian, e.g. wind from 0° longitude is coded 36, from 90°E longitude is coded 09, from 180° longitude is coded 18, and from 90°W longitude is coded 27, etc.

$d_Bd_B$ — Drift direction of the buoy, expressed in tens of degrees, at the last known position of the buoy given in the groups YYMMJ GGgg/.
(FM 18)

$d_ad_a$ — Extreme anticlockwise direction from the mean direction of the wind reported by dd.
(FM 22)

$d_{a1}d_{a1}$ — Mean direction, in units of 4 degrees, from which waves are coming for the band indicated, relative to true north. (Code table 0880)
(FM 65)

(1) A value of 99 indicates the energy for that band is below a given threshold.

$d_{a2}d_{a2}$ — Principal direction, in units of 4 degrees, from which waves are coming for the band indicated, relative to true north. (Code table 0880)
(FM 65)

(1) See Note (1) under $d_{a1}d_{a1}$.

$d_cd_c$ — Extreme clockwise direction from the mean direction of the wind reported by dd.
(FM 22)

$d_dd_d$ — True direction, in units of 4 degrees, from which dominant wave is coming. (Code table 0880)
(FM 65)

$d_hd_h$ True direction, in tens of degrees, from which wind will blow at the altitude indicated by $h_xh_xh_x$. (Code table 0877)
(FM 53, FM 54)

$d_jd_j$ True direction, in tens of degrees, from which jet-stream wind is blowing (or will blow). (Code table 0877)
(FM 45)

$d_md_m$ True direction (rounded off to the nearest 5°), in tens of degrees, from which maximum wind is blowing.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

— True direction, in tens of degrees, from which maximum wind will blow at the flight level given by $n_mn_mn_m$. (Code table 0877)
(FM 50)

— True direction, in tens of degrees, from which maximum wind will blow at the height given by $h'_mh'_m$. (Code table 0877)
(FM 53, FM 54)

$d_sd_s$ True direction, in tens of degrees, towards which the system or front is moving. (Code table 0877)
(FM 20, FM 45, FM 46)

(1) $d_sd_s$ denotes the direction towards which the system is moving at the position indicated by the preceding group(s)

— Directional spread, in whole degrees, of the dominant wave.
(FM 65)

(1) The value of the directional spread is normally less than one radian (about 57°)

— True direction, in tens of degrees, towards which the tropical cyclone or system is moving. (Code table 0877)
(FM 85)

$d_td_t$ True direction (rounded off to the nearest 5°), in tens of degrees, from which wind is blowing at the tropopause level.
(FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

$d_wd_w$ True direction, in tens of degrees, from which waves are coming. (Code table 0877)
(FM 45, FM 46)

$\left.\begin{array}{l} d_{w1}d_{w1} \\ d_{w2}d_{w2} \end{array}\right\}$ True direction, in tens of degrees, from which swell waves are coming. (Code table 0877)
(FM 12, FM 13, FM 14)

$d_0d_0$ True direction, in tens of degrees, towards which sea-surface current is moving. (Code table 0877)
(FM 62)

$d_0d_0$
$d_1d_1$
. . .
$d_nd_n$

True direction (rounded off to the nearest 5°), in tens of degrees, from which wind is blowing at specified levels starting with surface level.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

—

True direction, in tens of degrees, towards which sea current at selected and/or significant depths starting with the sea surface is moving. (Code table 0877)
(FM 18, FM 64)

$d_1d_1$
$d_2d_2$
. . .
$d_nd_n$

True direction, in tens of degrees, from which wind is blowing at the specified levels. (Code table 0877)
(FM 39, FM 40)

—

True direction, in units of 4 degrees, from which waves are coming. (Code table 0880)
(FM 65)

ddd

True direction, in degrees, rounded off to the nearest 10°, from which wind is blowing (or will blow).
(FM 15, FM 16, FM 51)

—

True direction, in whole degrees, from which wind is blowing.
(FM 42)

$d_nd_nd_n$

The extreme counterclockwise direction of a variable wind, reported with reference to true north and rounded off to the nearest 10°.
(FM 15, FM 16)

$d_{ta}d_{ta}d_{ta}$

Main transport direction in atmosphere, in degrees from north.
(FM 22)

$d_{tw}d_{tw}d_{tw}$

Main transport direction in water, in degrees from north.
(FM 22)

$\overline{d_{v1}d_{v1}d_{v1}}$
$\overline{d_{v2}d_{v2}d_{v2}}$
. . .
$\overline{d_{vn}d_{vn}d_{vn}}$

True direction, in whole degrees, of the monthly mean vector wind at specified isobaric surfaces.
(FM 75, FM 76)

(1) 500 shall be added to $\overline{d_vd_vd_v}$ when the speed of the monthly mean vector wind is 100 units or more up to 199 units.

$d_xd_xd_x$

The extreme clockwise direction of a variable wind, reported with reference to true north and rounded off to the nearest 10°.
(FM 15, FM 16)

$d_id_id_id_i$

Mesh width of grid, along the i-axis of a cartesian grid at the latitude of true scale, in kilometres.
(FM 47)

—

Mesh width of grid along the parallels of a geographical grid, in tenths of a degree.
(FM 47)

$d_id_id_id_i$ Mesh width of grid, along the j-axis of a cartesian grid at the latitude of true scale, in kilometres.
(FM 47)

— Mesh width of grid along the meridians of a geographical grid, in tenths of a degree.
(FM 47)

E State of the ground without snow or measurable ice cover. (Code table 0901)
(FM 12, FM 14)

$E_R$ Runway deposits. (Code table 0919)
(FM 15, FM 16)

$E_c$ Characteristics of release. (Code table 0933)
(FM 22)

$E_e$ Release behaviour over time. (Code table 0935)
(FM 22)

$E_h$ Elevation above the horizon of the base of anvil of Cumulonimbus or of the summit of other phenomena. (Code table 0938)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$E_s$ State of current or expected release. (Code table 0943)
(FM 22)

$E_3$ Slush condition under the ice layer. (Code table 0964)
(FM 67)

E´ State of the ground with snow or measurable ice cover. (Code table 0975)
(FM 12, FM 14)

$E_sE_s$ Thickness of ice accretion on ships, in centimetres.
(FM 12, FM 13, FM 14)

$\left.\begin{array}{l}E_1E_1\\E_2E_2\end{array}\right\}$ Ice phenomena on river, lake or reservoir. (Code table 0977)
(FM 67)

EEE Amount of either evaporation or evapotranspiration, in tenths of a millimetre, during the preceding 24 hours.
(FM 12, FM 13, FM 14)

$e_C$ Elevation angle of the top of the cloud indicated by C. (Code table 1004)
(FM 12, FM 13, FM 14)

$e_Q$ Number of zeros after QQQ, $Q_1Q_1Q_1$ or $Q_2Q_2Q_2$ to obtain the discharge in $dm^3\ s^{-1}$.
(FM 67, FM 68)

$e_1$ Type of isopleth and units of isopleth values uuu. (Code table 1062)
(FM 45)

$e_2$ Type of isopleth and units of isopleth values uu. (Code table 1063)
(FM 45, FM 46)

e´ Elevation angle of the top of the phenomenon above horizon; that is, the angle between the horizontal plane through the eye of the observer and the straight line form the eye of the observer to the top of the phenomenon. (Code table 1004)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$e_Re_R$ Depth of deposit. (Code table 1079)
(FM 15, FM 16)

$e_Te_T$ Type of thermodynamic sensing equipment. (Code table 1085)
(FM 39, FM 40)

$e_we_w$ Type of wind sensing equipment. (Code table 1095)
(FM 39, FM 40)

$\overline{eee}$ Mean vapour pressure for the month, in tenths of a hectopascal.
(FM 71, FM 72)

$F_H$ Type of forecast given by the four figures which follow and indication of the number of date-time group(s) used. (Code table 1109)
(FM 68)

$F_c$ Character of front. (Code table 1133)
(FM 45, FM 46)

$F_e$ Tertiary form of ice. (Code table 1135)
(FM 44)

$F_i$ Intensity of front. (Code table 1139)
(FM 45, FM 46)

$F_m$ Forecast strength of surface wind. (Code table 1144)
(FM 61)

$F_p$ Predominant form of ice. (Code table 1135)
(FM 44)

(1) If two or more forms of ice have the same concentration, selection of the predominant form shall be made in a decreasing size sequence.

$F_q$ Quaternary form of ice. (Code table 1135)
(FM 44)

$F_s$ Secondary form of ice. (Code table 1135)
(FM 44)

$F_t$ Type of front. (Code table 1152)
(FM 45, FM 46, FM 53, FM 54)

$F_u$ Quintary form of ice. (Code table 1135)
(FM 44)

$F_x$ Maximum wind force, in the period covered by $W_1W_2$, on the Beaufort scale (0 = 10 Beaufort; 1 = 11 Beaufort; 2 = 12 Beaufort, etc.).
(9-group in Section 3 of FM 12, FM 13 and FM 14)

(1) The Beaufort scale of wind is given in Section E of this volume.

$\left.\begin{array}{l}F_1\\F_2\\\text{etc.}\end{array}\right\}$ Intensity of points. (Code table 1162)
(FM 81)

$F_1F_2$ Identification of originating/generating centre. (Common Code table C–1 – see Attachment I).
(FM 47, FM 49, FM 57)

$F_LF_LF_L$ Outgoing long-wave radiation, in joules, integrated over 24 hours.
(FM 88)

$F_iF_iF_i$ Incoming short-wave radiation, in joules, integrated over 24 hours.
(FM 88)

$F_sF_sF_s$ Outgoing short-wave radiation, in joules, integrated over 24 hours.
(FM 88)

$F_3F_3F_3$ Identification of originating/generating centre (Common Code table C-1 – See Attachment I).
(FM 86, FM 87, FM 88)

$F_4F_4F_4$ Identification of originating/generating sub-centre (defined by centre $F_3F_3F_3$ if necessary – Table to be supplied to WMO Secretariat by centre).
(FM 86, FM 87, FM 88)

FFFF Amount of radiation, in kilojoules per square metre, over a 1-hour period.
(FM 12, FM 13, FM 14)

$F_{24}F_{24}F_{24}F_{24}$ Amount of radiation, in joules per square centimetre, over a 24-hour period.
(FM 12, FM 13, FM 14)

f Wind speed derived from movement of cloud elements. (Code table 1200)
(FM 85)

$f_e$ Speed of movement of echo pattern. (Code table 1236)
(FM 20)

ff Wind speed, in units indicated by $i_w$.
(FM 12, FM 13, FM 14, FM 18, FM 22)

(1) If wind speed is 99 units or more, see Regulation 12.2.2.3.3.

— Wind speed, in knots or metres per second.
(FM 15, FM 16, FM 51)

(1) For wind speeds of 100 units or more, see Regulations 15.5.6 or 51.3.5, as appropriate.

ff *(continued)*

— Wind speed, in knots.
(FM 45)

(1) For wind speeds of 100 units or more, see Regulation 45.3.6.2.

— Wind speed, in units indicated by $i_u$.
(FM 63, FM 64)

$f_m f_m$ Maximum wind speed, in knots or metres per second.
(FM 15, FM 16, FM 51)

(1) See Note (1) under ff (second specification).

$f_s f_s$ Speed, in knots, of system, front or area.
(FM 20, FM 45, FM 46)

(1) $f_s f_s$ denotes the speed of the system at the position indicated by the preceding group(s).

— Speed, in knots, of tropical cyclone or other system.
(FM 85)

$f_{ta} f_{ta}$ Main transport speed in atmosphere, in metres per second.
(FM 22)

$f_{tw} f_{tw}$ Main transport speed in water, in metres per second.
(FM 22)

$\left.\begin{array}{l} \overline{f_{v1}f_{v1}f_{v1}} \\ \overline{f_{v2}f_{v2}f_{v2}} \\ \ldots \\ \overline{f_{vn}f_{vn}f_{vn}} \end{array}\right\}$ Speed, in knots or metres per second, of the monthly mean vector wind at specified isobaric surfaces.
(FM 75, FM 76)

$f_{10} f_{10}$ Number of days in the month with observed or recorded wind speed equal to or more than 10 metres per second or 20 knots.
(FM 71)

(1) If continuous recording exists, the daily maximum of the mean wind speed over a 10-minute period shall be used.

(2) If continuous recording does not exist, the maximum mean wind speed over a 10-minute period, observed during the day, shall be used. In the absence of wind instruments, Regulation 12.2.2.3.2 shall apply.

$f_{20} f_{20}$ Number of days in the month with observed or recorded wind speed equal to or more than 20 metres per second or 40 knots.
(FM 71)

(1) See Notes (1) and (2) under $f_{10} f_{10}$.

$f_{30} f_{30}$ Number of days in the month with observed or recorded wind speed equal to or more than 30 metres per second or 60 knots.
(FM 71)

(1) See Notes (1) and (2) under $f_{10} f_{10}$.

fff — Wind speed, in units indicated by $i_w$, of 99 units or more.
(FM 12, FM 13, FM 14, FM 22)

(1) See Regulation 12.2.2.3.3.

— Wind speed, in metres per second or knots.
(FM 32, FM 33, FM 34, FM 41, FM 88)

(1) See Note (1) under dd.

(2) See Note (1) under YY.

— Wind speed, in metres per second or knots, at the altitude given by HH.
(FM 39, FM 40)

(1) See Note (1) under YY.

— Wind speed, in knots, at the level given by $h_I h_I h_I$.
(FM 42)

— Forecast wind speed, in knots, at the relevant grid point.
(FM 50)

$f_d f_d f_d$ — The increment to be added to the previous centre frequency or previous centre wave number, to obtain the next centre frequency (Hz) or the next centre wave number ($m^{-1}$), in the series, the exponent being given by symbolic letter x.
(FM 65)

$f_g f_g f_g$ — Maximum derived equivalent vertical gust, in tenths of a metre per second.
(FM 42)

$f_h f_h f_h$ — Wind speed, in kilometres per hour or knots or metres per second, at the level given by $h_x h_x h_x$.
(FM 53, FM 54)

$f_j f_j f_j$ — Wind speed of the jet stream, in units indicated by $i_j$.
(FM 45)

— Wind speed, in kilometres per hour or knots or metres per second, in the jet core.
(FM 53, FM 54)

$f_m f_m f_m$ — Maximum wind speed, in metres per second or knots.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

(2) See Note (1) under YY.

— Maximum wind speed, in kilometres per hour or knots or metres per second, at the flight level given by $n_m n_m n_m$.
(FM 50)

— Wind speed, in kilometres per hour or knots or metres per second, at the level given by $h'_m h'_m$.
(FM 53, FM 54)

$f_tf_tf_t$ — Wind speed, in metres per second or knots, at the tropopause level.
(FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

(2) See Note (1) under YY.

$f_xf_xf_x$ — Highest gust wind speed observed or recorded during the month, in tenths of units indicated by $i_w$.
(FM 71)

$f_0f_0f_0$, $f_1f_1f_1$, . . . $f_nf_nf_n$ — Wind speed, in metres per second or knots, at specified levels starting with station level.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under dd.

(2) See Note (1) under YY.

$f_1f_1f_1$, $f_2f_2f_2$, . . . $f_nf_nf_n$ — Wind speed, in metres per second or knots, at specified isobaric surfaces.
(FM 39, FM 40)

(1) See Note (1) under YY.

— The first centre frequency (Hz) in a series, or the first centre wave number ($m^{-1}$), the exponent being given by symbolic letter x.
(FM 65)

G — Period covered by forecast. (Code table 1300)
(FM 61)

$G_p$ — Period, to the nearest whole hour.
(FM 53, FM 54)

(1) If the period is less than half an hour, $G_p$ shall be encoded as 0.

GG — Actual time of observation, to the nearest whole hour UTC.
(FM 12, FM 13, FM 14, FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38, FM 67, FM 81, FM 82)

(1) In the case of surface observations, the actual time of observation is the time at which the barometer is read.

(2) In the case of upper-air observations, the actual time of observation is the time at which the balloon or rocket is actually released, or the time at which the aircraft actually takes off from the surface.

(3) In the case of atmospherics observation, the actual time of observation is the time at which the observation of all specified elements is completed.

— Actual time, rounded downwards to the nearest hour UTC, of the first AMDAR report in the bulletin.
(FM 42)

— Valid time, to the nearest whole hour UTC, of the beginning of the forecast.
(FM 51, FM 53, FM 54)

(1) See Regulations 51.8, 53.4 and 54.4.

GG (*continued)*

— Actual time, to the nearest whole hour UTC, of the observed satellite data.
(FM 86, FM 87)

$G_FG_F$ Valid time, to the nearest whole hour UTC, of the temperature forecast.
(FM 51)

$G_cG_c$ Actual time, to the nearest whole hour UTC, of the observed data from which the chart is prepared.
(FM 44, FM 45, FM 46)

— Actual time, to the nearest whole hour UTC, of:

(a) Observations of data from which the analysed data field has been derived; or

(b) Analysed data field from which the prognostic data field has been derived; or

(c) End of period which was used to compute values (actual or prognostic) of mean field or field change.
(FM 47, FM 49)

(1) The time shall be one of the standard times for synoptic observations (surface or upper-air, as the case may be).

$G_eG_e$ Time, to the nearest whole hour UTC, of the end of the forecast period that began at GG.
(FM 51)

$G_nG_n$ Principal time of daily reading in UTC (hours) of minimum extreme temperature.
(FM 71)

$G_pG_p$ Number of whole hours to be added to $G_cG_c$ to obtain the time at which the forecast is valid.
(FM 44, FM 45, FM 46)

— Period covered by the forecast, in whole hours.
(FM 57)

$G_rG_r$ Time of issue of the report, on monitoring operation or release, in whole hours UTC.
(FM 22)

— Time of issue of the forecast, to the nearest whole hour UTC.
(FM 57)

$G_sG_s$ Actual time, to the nearest whole hour UTC, of the satellite data used to prepare the chart.
(FM 44)

$G_xG_x$ Principal time of daily reading in UTC (hours) of maximum extreme temperature.
(FM 71)

$G_0G_0$ Initial time, in whole hours UTC, of analyses/forecasts used to produce the trajectory.
(FM 57)

$G_1G_1$ Time of commencement of period of forecast, in whole hours UTC.
(FM 51, FM 53, FM 54, FM 61)

(1) When the period of forecast commences at midnight, $G_1G_1$ shall be encoded 00.

— Time, to the nearest whole hour UTC, specifying the beginning of the period covered by the forecast.
(FM 57)

— Time, to the nearest whole hour UTC, defining the time or the beginning of the period covered by the forecast.
(FM 68)

— Start of recording, to the nearest whole hour UTC.
(FM 83)

$G_2G_2$ Time of ending of period of forecast, in whole hours UTC.
(FM 51, FM 53, FM 54)

(1) When the period of forecast ends at midnight, $G_2G_2$ shall be encoded 24.

(2) When the period is between 25 and 48 hours after $G_1G_1$, $G_2G_2$ shall be encoded by adding 50 to the time of ending of period of forecast (however, this Note (2) does not apply to $G_2G_2$ in FM 51).

— Time, to the nearest whole hour UTC, defining the end of the period covered by the forecast.
(FM 68)

— End of recording, to the nearest whole hour UTC.
(FM 83)

GGg Time of observation, in hours and tens of minutes UTC.
(FM 20, FM 39, FM 40, FM 41, FM 85)

(1) The time to be reported in FM 20 is the time of the last radar exploration which was used to draft the report.

(2) The time to be reported in FM 39 and FM 40 is the time of firing of the rocket.

(3) The time to be reported in FM 41 is the time of observation, in hours and minutes UTC, expressed in the report received from the aircraft, with the last figure omitted.

(4) In the case of FM 85, see Regulation 85.2.2.

$G_sG_sg_s$ Mid-time, in hours and tens of minutes UTC, of the scanning period required to obtain the satellite picture used for the analysis.
(FM 85)

GGgg Time of observation, in hours and minutes UTC.
(FM 12, FM 13, FM 14, FM 15, FM 16, FM 18, FM 22, FM 35, FM 36, FM 37, FM 38, FM 42, FM 62, FM 63, FM 64, FM 65, FM 67, FM 88)

(1) FM 12, FM 13, FM 14, FM 18: actual time of observation.

(2) FM 35, FM 36, FM 37, FM 38: actual time of launching the radiosonde.

(3) FM 63, FM 64: Time of launching the bathythermograph.

GGgg (*continued)*

(4) FM 67: Time of occurrence of the observed maximum or observed minimum values of stage or discharges.

(5) FM 88: Time of observation or time of mid-point observation for wind computation.

— Time, in hours and minutes UTC, of the beginning or the end of a forecast change, or at which specific forecast condition(s) is (are) expected.
(FM 15, FM 16, FM 22, FM 51)

GGggZ Time of observation or forecast, in hours and minutes UTC, followed by the letter Z as an abbreviated indicator of UTC.
(FM 15, FM 16, FM 51, FM 53, FM 54)

(1) FM 15: Actual time of observation.

(2) FM 16: Time of occurrence of change(s) which justified the issue of the report.

(3) FM 51: Time of issue of forecast.

(4) FM 53, FM 54: Time of origin of forecast.

$G_FG_Fg_Fg_F$ Time, in whole hours UTC, at which the WINTEM message is valid.
(FM 50)

(1) As a result, $g_Fg_F$ shall always be equal to 00.

$G_aG_ag_ag_a$ Time of accident, in hours and minutes UTC.
(FM 22, FM 57)

$G_eG_eg_eg_e$ Time of end of monitoring operation or release, in hours and minutes UTC.
(FM 22)

$G_sG_sg_sg_s$ Time of start of monitoring operation or release, in hours and minutes UTC.
(FM 22)

$\left.\begin{array}{l} G^1G^1g^1g^1 \\ G^2G^2g^2g^2 \\ \ldots \\ G^jG^jg^jg^j \end{array}\right\}$ Time, in hours and minutes UTC, of expected arrival of radiological contamination at specified point location.
(FM 57)

g Time of the observations used to compute the reported mean values of geopotential, temperature and humidity. (Code table 1400)
(FM 75, FM 76)

$g_0$ Period of time, in hours, between the time of the observation and the time of the wind change, the time of occurrence of the maximum mean wind speed, or the time of temperature change.
(FM 12, FM 13, FM 14)

(1) The period is the number of whole hours, disregarding the minutes. For example, if the time of occurrence is 45 minutes after the time of the observation, $g_0$ shall be encoded as 0; if the time of occurrence is 1 hour or more, but less than 2 hours after the observation, $g_0$ shall be encoded as 1; and so on.

(2) The value of $g_0$ can be any whole number from 0 to 5.

$g_pg_p$ Number of hours to be added to, or subtracted from, the time given in the preamble, as specified to obtain the time of the supplementary information.
(FM 45, FM 46)

$g_rg_r$ Grid geometry and geographical support. (Code table 1487)
(FM 47)

(1) The grid geometries corresponding to code figures 01–08 are defined in Section 2.

(2) The grid geometries corresponding to code figure 99 are given in *Weather Reporting* (WMO-No. 9), Volume B (see NNN under centre $F_1F_2$).

$g_1g_1$ Time of appearance of centre, to the nearest whole hour UTC.
(FM 83)

$g_2g_2$ Time of disappearance of centre, to the nearest whole hour UTC.
(FM 83)

$H_e$ Altitude of echo top. (Code table 1535)
(FM 20)

$H_1$ Maximum altitude of cloud tops, corresponding to the first point out of five indicated by means of $U_{La1}U_{Lo1}$, $U_{La2}U_{Lo2}$, etc. (Code table 1561)
(FM 88)

$\left.\begin{matrix}H_2\\H_3\\H_4\\H_5\end{matrix}\right\}$ As for $H_1$, but corresponding to the second, third, fourth and fifth points. (Code table 1561)
(FM 88)

HH Altitude, in kilometres, of the level for which data are reported.
(FM 39, FM 40)

$H_wH_w$ Height of wind waves, in units of 0.5 metre.
(FM 12, FM 13, FM 14)

— Height of forecast waves, in units of 0.5 metre.
(FM 61)

(1) The average value of the wave height (i.e. vertical distance between trough and crest) shall be reported or forecast, as obtained from the larger well-formed waves of the wave system being observed or forecast.

(2) Height of the waves less than 0.25 m shall be coded 00, height of the waves from 0.25 m to less than 0.75 m shall be coded 01, height of the waves from 0.75 m to less than 1.25 m shall be coded 02, etc.

$H_{wa}H_{wa}$ Height of waves, obtained by instrumental methods, in the same units as $H_wH_w$.
(FM 12, FM 13, FM 14, FM 18)

(1) See Notes (1) and (2) under $H_wH_w$.

$\left.\begin{matrix}H_{w1}H_{w1}\\H_{w2}H_{w2}\end{matrix}\right\}$ Height of swell waves, in the same units as $H_wH_w$.
(FM 12, FM 13, FM 14)

(1) See Notes (1) and (2) under $H_wH_w$.

$H'H'$ Altitude of the upper surface of clouds reported by C, in hundreds of metres.
(FM 12, FM 14)

(1) $H'H'$ = 99 - the upper surface of clouds is at altitude 9 900 metres or higher.

$H_bH_bH_b$ Altitude of cloud base, in hundreds of metres.
(FM 45)

$H_jH_jH_j$ Geopotential of jet-stream core, in units indicated by $i_i$.
(FM 45)

$H_sH_sH_s$ Significant wave height in decimetres.
(FM 15, FM 16)

$H_tH_tH_t$ Altitude of tops of clouds, in hundreds of metres.
(FM 45)

$H_{wa}H_{wa}H_{wa}$ Height of waves, obtained by instrumental methods, in units of 0.1 metre.
(FM 12, FM 13, FM 14, FM 18)

(1) See Regulation 12.3.3.5 for the use of $H_{wa}H_{wa}H_{wa}$.

(2) See Note (1) under $H_wH_w$.

HHHH D-value or height reduced to the nearest standard isobaric surface, in tens of metres.
(FM 41)

$H_mH_mH_mH_m$ Altitude of the level of maximum wind, in tens of standard geopotential metres.
(FM 32, FM 33, FM 34)

— Maximum wave height, in centimetres.
(FM 65)

(1) In the event wave height can only be reported in tenths of a metre, the final digit in the group shall be encoded as /.

$H_sH_sH_sH_s$ Significant wave height, in centimetres.
(FM 65)

(1) See Note (1) under $H_mH_mH_mH_m$.

— Stage, in centimetres, above zero of the gauge for the station.
(FM 67)

(1) In case of negative stages, 5000 shall be added to the absolute value measured in centimetres.

$H_{se}H_{se}H_{se}H_{se}$ Estimate of significant wave height from slope sensors, in centimetres.
(FM 65)

(1) See Note (1) under $H_mH_mH_mH_m$.

$H_{s1}H_{s1}H_{s1}H_{s1}$ Lower limit of forecast stage, in centimetres, above zero of the gauge for the station.
(FM 68)

(1) In case of negative stages, 5000 shall be added to the absolute forecast value in centimetres.

$H_{s2}H_{s2}H_{s2}H_{s2}$ Upper limit of forecast stage, in centimetres, above zero of the gauge for the station.
(FM 68)

(1) See Note (1) under $H_{s1}H_{s1}H_{s1}H_{s1}$.

$H_1H_1H_1H_1$, $H_2H_2H_2H_2$ Altitude levels of reference in the atmosphere, in tens of metres, or depth levels of reference in the ocean, in metres.
(FM 47, FM 49)

(1) In the case of analyses or prognoses relating to a layer between two levels, the upper level shall be indicated by $H_1H_1H_1H_1$ and the lower by $H_2H_2H_2H_2$ (only for FM 47).

(2) In the case of mean sea level, $H_2H_2H_2H_2$ = 0000.

$\overline{H_1H_1H_1H_1}$, $\overline{H_2H_2H_2H_2}$, . . ., $\overline{H_nH_nH_nH_n}$ Mean geopotentials of specified pressure surfaces, in standard geopotential metres.
(FM 75, FM 76)

(1) This value in standard geopotential metres is, for practical purposes, numerically equal to the height expressed in metres.

(2) In the case of geopotentials above 9999 standard geopotential metres, the figures indicating the number of tens of thousands shall be omitted.

h Height above surface of the base of the lowest cloud seen. (Code table 1600)
(FM 12, FM 13, FM 14, FM 35, FM 36, FM 38)

(1) The term "height above surface" shall be considered as being the height above the official aerodrome elevation or above station level at a non-aerodrome station, or above the surface of the water in reports from ships.

$h_c$ Character of topography system. (Code table 3133)
(FM 45)

$h_t$ Type of topography system. (Code table 3152)
(FM 45)

$h_ah_a$ Geopotential of constant pressure surface, in tens of standard geopotential metres.
(FM 45)

(1) For a HIGH or a LOW, $h_ah_a$ is the geopotential at the centre. Along a ridge line, $h_ah_a$ is the greatest geopotential and, along a trough line, it is the lowest geopotential.

$h_gh_g$ Height above the ground, in metres, at which diameter of deposit is observed (coded 99 for 99 m or more).
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$h_sh_s$ Height of base of cloud layer or mass whose genus is indicated by C. (Code table 1677)
(FM 12, FM 13, FM 14)

(1) If, notwithstanding the existence of fog, sandstorm, duststorm, blowing snow or other obscuring phenomena, the sky is discernible, the partially obscuring phenomena shall be disregarded. If, under the above conditions, the sky is not discernible, the 8-group is to be coded $89/h_sh_s$ with the appropriate vertical visibility value being coded for $h_sh_s$. The vertical visibility is defined as the vertical visual range into an obscuring medium. Vertical visibility is recorded to the same limits of accuracy as specified for cloud heights (Code table 1677).

(2) Heights are above surface (see Note (1) under h).

$h_t h_t$ — Height of the tops of the lowest clouds or height of the lowest cloud layer or fog. (Code table 1677)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$h'_P h'_P$ — Height* of the tropopause level.
(FM 53, FM 54)

$h'_j h'_j$ — Height* of the level of the jet-stream core.
(FM 53, FM 54)

$h'_m h'_m$ — Height* of the maximum wind level.
(FM 53, FM 54)

hhh — Geopotential of an agreed standard isobaric surface given by $a_3$, in standard geopotential metres, omitting the thousands digit.
(FM 12, FM 14)

$h_B h_B h_B$ — Height of lowest level of turbulence. (Code table 1690)
(FM 51, FM 53, FM 54)

(1) FM 51: heights are above surface (see Note (1) under h).

(2) FM 53, FM 54: heights are above sea level.

$h_I h_I h_I$ — Pressure altitude, in hundreds of feet.
(FM 42)

(1) Pressure altitude is a measure of height relative to the standard datum plane of 1013.2 hPa.

$h_d h_d h_d$ — Flight level, in hundreds of feet.
(FM 42)

$h_f h_f h_f$ — Altitude of the 0°C isotherm. (Code table 1690)
(FM 53, FM 54)

$h_i h_i h_i$ — Height of lowest level of icing. (Code table 1690)
(FM 51, FM 53, FM 54)

(1) See Notes (1) and (2) under $h_B h_B h_B$.

---

* These heights are indicated in ICAO flight level numbers with last figure omitted. The ICAO flight levels are related to a pressure datum of 1013.2 hPa and are separated by a nominal distance of 500 feet. Schema of coding:

| Code figure | ICAO flight level number | Metres (approx.) | Feet |
|---|---|---|---|
| 20 | 200 | 6 000 | 20 000 |
| 20 | 205 | 6 150 | 20 500 |
| 21 | 210 | 6 300 | 21 000 |
| 21 | 215 | 6 450 | 21 500 |
| etc. | etc. | etc. | etc. |

$h_sh_sh_s$ Height of base of cloud layer or mass, or observed or forecast vertical visibility. (Code table 1690)
(FM 15, FM 16, FM 51, FM 53, FM 54)

(1) If, notwithstanding the existence of fog, sandstorm, duststorm, blowing snow or other obscuring phenomena, the sky is discernible, the partially obscuring phenomena shall be disregarded.

(2) FM 15, FM 16, FM 51: heights are above surface (see Note (1) under h).

(3) See Note (2) under $h_Bh_Bh_B$.

$h_th_th_t$ Altitude of cloud layer or mass. (Code table 1690)
(FM 53, FM 54)

$h_xh_xh_x$ Altitude to which temperature and wind refer. (Code table 1690)
(FM 53, FM 54)

$h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ Geopotential of the standard isobaric surfaces $P_1P_1$, $P_2P_2$, . . . $P_nP_n$, in standard geopotential metres and tens of standard geopotential metres.
(FM 35, FM 36, FM 37, FM 38)

(1) Geopotentials of surfaces below sea level shall be reported by adding 500 to the absolute value of the geopotential.

(2) The geopotential shall be reported in whole standard geopotential metres up to, but not including, 500 hPa and in tens of standard geopotential metres at 500 hPa and higher, omitting if necessary the thousands or tens of thousands digits.

— Geopotential of the specified isobaric surfaces, in thousands or hundreds of standard geopotential metres.
(FM 39, FM 40)

(1) Geopotential of isobaric surfaces shall be reported in hundreds of standard geopotential metres at and between 70 hPa and 0.0001 hPa, and in thousands of standard geopotential metres at 0.00007 hPa and higher.

hhhh Water depth, in metres.
(FM 65)

$h_ah_ah_ah_a$ Actual release height, in metres.
(FM 22)

(1) Code figure 9999 shall indicate a height of 10 000 metres or above.

$h_eh_eh_eh_e$ Effective release height, in metres.
(FM 22)

(1) Code figure 9999 shall indicate a height of 10 000 metres or above.

$h_mh_mh_mh_m$ Mixing height at the forecast point, in metres.
(FM 57)

(1) Code figure 9999 shall indicate a height of 10 000 metres or above.

$h_rh_rh_rh_r$ Elevation of a surface observing station or pressure altitude of an airborne observing station, in either metres or tens of feet as indicated by $i_h$.
(FM 22, FM 57)

(1) Code figure 9999 shall indicate an altitude of 10 000 metres or above, or 100 000 feet or above, as the case may be.

(1) Code figure 9999 shall indicate an altitude of 10 000 metres or above, or 100 000 feet or above, as the case may be.

$h_0h_0h_0h_0$ Elevation of a mobile land station making surface or upper-air observations, in either metres or feet as indicated by $i_m$.
(FM 14, FM 34, FM 38)

$h^1h^1h^1h^1$
$h^2h^2h^2h^2$
. . .
$h^jh^jh^jh^j$
Height above mean sea level, in metres.
(FM 57)

(1) Code figure 999 shall indicate a height of 10 000 metres or above.

$I$ Density of points. (Code table 1700)
(FM 83)

$I_a$ Indicator for frequency or wave number. (Code table 1731)
(FM 65)

$I_b$ Indicator for directional or non-directional spectral wave data. (Code table 1732)
(FM 65)

$I_c$ Type of forecast ice accretion on the external parts of aircraft. (Code table 1733)
(FM 51, FM 53, FM 54)

$I_d$ Indicator used to specify the hundreds of hectopascals figure (in Part A of TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL reports) or tens of hectopascals figure (in Part C of TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL reports) of the pressure relative to the last standard isobaric surface for which the wind is reported. (Code table 1734)
(FM 35, FM 36, FM 37, FM 38)

(1) When wind data are missing for one or more isobaric surfaces but are available for other isobaric surfaces below and above, a group (or groups) of solidi shall be included for the missing data.

(2) The wind group shall be omitted in the case of those isobaric surfaces for which no data are available, provided wind data are not available for any still higher surface.

(3) Code figure $I_d$ = 0 shall refer to the 1 000-hPa level.

(4) When wind data are not available for any standard isobaric surfaces (either in Part A or in Part C), $I_d$ shall be reported by means of a solidus (/).

(5) The wind group relating to the surface level shall be included in the report; when the corresponding wind data are not available, this group shall be coded /////.

(6) If wind data are available up to and including the 250-hPa level, the wind group relating to the 200-hPa level shall also be included in the report and coded as ///// except when the 250-hPa level is the highest standard isobaric surface reached by the sounding. The same rule shall apply to the 150-hPa level with regard to the 100-hPa level.

$I_e$ Intensity of echoes. (Code table 1735)
(FM 20)

$I_j$ Density of points. (Code table 1741)
(FM 81)

$I_m$ Indicator for method of calculation of spectral data. (Code table 1744)

$I_n$ Possibility that plume will encounter change in wind direction and/or speed. (Code table 1743)
(FM 22)

$I_p$ Indicator for type of platform. (Code table 1747)
(FM 65)

$I_s$ Ice accretion on ships. (Code table 1751)
(FM 12, FM 13, FM 14)

$I_3$ Indicator figure for instrument data used in processing (supplied by operator) (see Volume II).
(FM 86, FM 87)

$I_4$ Indicator figure for data-processing technique used. (Code table 1765)
(FM 86, FM 87)

$I_5$ Indicator figure for data-processing techniques used to identify tropopause level (supplied by operator), (see Volume II).
(FM 86)

II Block number.
(FM 12, FM 20, FM 22, FM 32, FM 35, FM 39, FM 57, FM 65, FM 71, FM 75, FM 81, FM 83, FM 85)

(1) The block numbers define the area in which the reporting station is situated. They are allocated to one country or a part of it or more countries in the same Region. The list of block numbers for all countries is given in *Weather Reporting* (WMO-No. 9), Volume A.

$I_XI_XI_X$ Instrument type for XBT, with fall rate equation coefficients. (Code table 1770)
(FM 63, FM 64)

$I_6I_6I_6$ Indicator figure for satellite identifier (supplied to WMO Secretariat by operators) (Common Code table C-5 – See Attachment I).
(FM 65, FM 86, FM 87, FM 88)

(1) Odd deciles for geostationary satellites.

(2) Even deciles for polar-orbiting satellites.

IS International two-letter characters of the isotope element name.
(FM 22, FM 57)

$I_A \ldots I_A$ Aircraft identifier.
(FM 42)

(1) The aircraft identifier is an alphanumeric which includes, either directly or indirectly, the airline identifier and aircraft identifier and, in the case of an ASDAR report, the ASDAR flight unit identification.

(2) In an AMDAR report from an ASDAR aircraft, the aircraft identifier, by convention, ends with the letter Z. In the case of an AMDAR report from a non-ASDAR aircraft, the letter Z is not appended.

**II . . . I** Data group as specified in Code table 0291 – $a_1a_1a_1/a_2a_2a_2$ and by indicators $n_p$, $n_1$ and $n_2$.
(FM 47, FM 48)

i Tendency of runway visual range values, indicated by i = U for increasing and i = D for decreasing runway visual range values, and i = N when no distinct change in runway visual range is observed.
(FM 15, FM 16)

— Intensity or character of the weather element $w_e$ (type of weather). (Code table 1800)
(FM 45)

$i_E$ Indicator of type of instrumentation for evaporation measurement or type of crop for which evapotranspiration is reported. (Code table 1806)
(FM 12, FM 13, FM 14)

$i_R$ Indicator for inclusion or omission of precipitation data. (Code table 1819)
(FM 12, FM 13, FM 14)

$i_c$ Indicator for units of sea-surface current speed. (Code table 1833)
(FM 62)

$i_h$ Indicator of sign and unit of elevation/altitude. (Code table 1840)
(FM 22, FM 57)

$i_i$ Indicator for units of wind speed and height or pressure in the jet-stream core. (Code table 1841)
(FM 45)

$i_m$ Indicator for units of elevation, and confidence factor for accuracy of elevation. (Code table 1845)
(FM 14, FM 34, FM 38)

$i_s$ Sign indicator for the data in Section 3. (Code table 1851)
(FM 47)

$i_u$ Indicator for units of wind speed and type of instrumentation. (Code table 1853)
(FM 63, FM 64)

$i_w$ Indicator for source and units of wind speed. (Code table 1855)
(FM 12, FM 13, FM 14, FM 18, FM 22, FM 71)

$i_x$ Indicator for type of station operation (manned or automatic) and for present and past weather data. (Code table 1860)
(FM 12, FM 13, FM 14)

$i_y$ Indicator to specify type of reading. (Code table 1857)
(FM 71)

$i_z$ Stability index. (Code table 1859)
(FM 57)

$i_0$ Intensity of the phenomenon. (Code table 1861)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$i_2$ Zone type indicator. (Code table 1863)
(FM 54)

(1) This symbol indicates the way in which the route is divided into sections.

$i_3$ Indicator for supplementary phenomena. (Code table 1864)
(FM 53, FM 54)

iii Station number.
(FM 12, FM 20, FM 22, FM 32, FM 35, FM 39, FM 57, FM 65, FM 71, FM 75, FM 81, FM 83, FM 85)

(1) See Section D of this volume.

— Station number of station from which direction and distance of point position are given.
(FM 45)

$i_Hi_Hi_H$ National hydrological observing station identifier number within a given basin (BB).
(FM 67, FM 68)

(1) The national station identifier number is a three-figure number allocated by the appropriate Hydrological Service.

(2) The list of hydrological observing station identifier numbers of all countries is given in publication WMO-No. . . . (This publication will appear at a later stage.)

$i_ai_ai_a$ Coordinate of the first grid point of the data line along the i-axis of a cartesian grid, in half-grid units.
(FM 47, FM 49)

— Difference between the longitude of the point of reference of the geographical grid and the longitude of the first grid point of the data line, in units of half-degrees.
(FM 47, FM 49)

$i_pi_pi_p$ Indicator for phase of flight and type of observation.
(FM 42)

(1) See Regulation 42.2.1.

iiii i-coordinate of the Pole in grid units and tenths.
(FM 47)

J Units digit of the year (UTC), i.e. 1974 = 4.
(FM 18, FM 62, FM 63, FM 64, FM 65, FM 88)

JJ Tens and units digits of the year (UTC), i.e. 1974 = 74.
(FM 47, FM 49)

JJJ Hundreds, tens and units digits of the year (UTC), i.e. 1974 = 974.
(FM 22, FM 39, FM 40, FM 57, FM 71, FM 72, FM 73, FM 75, FM 76)

$j_1$ Supplementary information indicator. (Code table 2061)
(FM 12, FM 13, FM 14)

jj Sequence number indicating the data line(s) of subsequent forecast point positions given.
(FM 57)

jjj Supplementary information to be developed regionally (see Volume II).
(FM 12, FM 14)

$j_aj_aj_a$ Coordinate of the first grid point of the data line along the j-axis of a cartesian grid, in half-grid units.
(FM 47, FM 49)

— Difference between the latitude of the point of reference of the geographical grid and the latitude of the first grid point of the data line, in units of half-degrees.
(FM 47, FM 49)

$j_2j_3j_4$ Specifications relating to supplementary information. (Code table 2061)
(FM 12, FM 13, FM 14)

jjjj j-coordinate of the Pole in grid units and tenths.
(FM 47)

$j_5j_6j_7j_8j_9$ Supplementary group which follows $5j_1j_2j_3j_4$. (Code table 2061)
(FM 12, FM 13, FM 14)

K Effect of the ice on navigation. (Code table 2100)
(FM 44)

k Indicator for specifying the half-degrees of latitude and longitude. (Code table 2200)
(FM 44, FM 45, FM 46, FM 82)

$k_1$ Indicator for digitization. (Code table 2262)
(FM 63, FM 64)

$k_2$ Method of salinity/depth measurement. (Code table 2263)
(FM 18, FM 64)

$k_3$ Duration and time of current measurement (vector or Doppler current profiling method). (Code table 2264)
(FM 18, FM 64)

$k_4$ Period of current measurement (drift method). (Code table 2265)
(FM 64)

$k_5$ Indicator for the method of current measurement. (Code table 2266)
(FM 63)

| | |
|---|---|
| $k_6$ | Method of removing the velocity and motion of the ship or buoy from current measurement. (Code table 2267)<br>(FM 18, FM 64) |
| $k_1k_1$ | Serial number of the data line.<br>(FM 47, FM 49)<br>(1) $k_1k_1$ = 99 specifies the North Pole.<br>$k_1k_1$ = 98 specifies the South Pole. |
| L | Estimated level of wind data. (Code table 2300)<br>(FM 85) |
| $L_a$ | Tenths of a degree of latitude.<br>(FM 45, FM 46) |
| $L_o$ | Tenths of a degree of longitude.<br>(FM 45, FM 46) |
| $L_aL_a$ | Latitude, in whole degrees.<br>(FM 44, FM 45, FM 46, FM 53, FM 54, FM 82, FM 85, FM 86, FM 87) |
| $L_iL_i$<br>$L_jL_j$ | Type of line or feature being described. (Code table 2382)<br>(FM 44) |
| $L_oL_o$ | Longitude, in whole degrees.<br>(FM 44, FM 45, FM 46, FM 53, FM 54, FM 82, FM 85, FM 86, FM 87)<br>(1) The hundreds digit shall be omitted for longitudes 100° to 180°. |
| $L_aL_a$<br>$L'_aL'_a$<br>$L''_aL''_a$<br>. . . | Latitude parallel, in whole degrees, along which pressure values are given.<br>(FM 73) |
| $L_oL_o$<br>$L'_oL'_o$<br>$L''_oL''_o$<br>. . . | Meridian, in whole degrees, to which the first given pressure ($\overline{P_1P_1}$, $\overline{P'_1P'_1}$, $\overline{P''1P''_1}$, . . .) refers.<br>(FM 73) |
| $L_aL_aL_a$ | Latitude, in tenths of a degree.<br>(FM 13, FM 14, FM 20, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40, FM 41, FM 47, FM 72, FM 76, FM 85)<br>(1) Tenths shall be obtained by dividing the number of minutes by 6, disregarding the remainder. |
| $L_a^1L_a^1l_a^1$<br>$L_a^2L_a^2l_a^2$<br>. . .<br>$L_a^jL_a^jl_a^j$ | Latitude coordinates of grid points, where $l_a^j$ is tenths of a degree of latitude ($l_a^j$ = 0 or 5).<br>(FM 50) |
| $L_oL_oL_o$ | Longitude, in degrees.<br>(FM 47)<br>(1) See Regulation 47.3.9. |

$L_aL_aL_aL_a$ — Latitude, in degrees and minutes.
(FM 22, FM 42, FM 44, FM 57, FM 62, FM 65)

$L_a^1L_a^1L_a^1L_a^1$ — Latitude of site of accident, in degrees and minutes.
(FM 22)

$L_a^1L_a^1L_a^1L_a^1$
$L_a^2L_a^2L_a^2L_a^2$
. . .
$L_a^jL_a^jL_a^jL_a^j$ — Latitude coordinates of forecast position of radiological contamination, in degrees and minutes.
(FM 57)

$L_oL_oL_oL_o$ — Longitude, in tenths of a degree.
(FM 13, FM 14, FM 20, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40, FM 41, FM 47, FM 72, FM 76, FM 85)

(1) See Note (1) under $L_aL_aL_a$.

$L_o^1L_o^1L_o^1l_o^1$
$L_o^2L_o^2L_o^2l_o^2$
. . .
$L_o^iL_o^iL_o^iL_o^i$ — Longitude coordinates of grid points, where $l_o^i$ is tenths of a degree of longitude ($l_o^i$ = 0 or 5).
(FM 50)

(1) i may not exceed seven. See Regulation 50.3.5.

$L_aL_aL_aL_aL_a$ — Latitude, in thousandths of a degree.
(FM 18, FM 63, FM 64)

$L_oL_oL_oL_oL_o$ — Longitude, in degrees and minutes.
(FM 22, FM 42, FM 44, FM 57, FM 62, FM 65)

$L_o^1L_o^1L_o^1L_o^1L_o^1$ — Longitude of site of accident, in degrees and minutes.
(FM 22)

$L_o^1L_o^1L_o^1L_o^1L_o^1$
$L_o^2L_o^2\ L_o^2L_o^2L_o^2$
. . .
$L_o^jL_o^jL_o^jL_o^jL_o^j$ — Longitude coordinates of forecast position of radiological contamination, in degrees and minutes.
(FM 57)

$L_oL_oL_oL_oL_oL_o$ — Longitude, in thousandths of a degree.
(FM 18, FM 63, FM 64)

$l_0l_0$ — Multiplying factor to be applied to the standard mesh width indicated by $d_id_id_id_i$.
(FM 47)

(1) For example, $l_0l_0$ = 02 means a multiplication by a factor of 2.

$M_h$ — Character of air mass. (Code table 2538)
(FM 45)

$M_s$ — Source region of air mass. (Code table 2551)
(FM 45)

$M_t$ Thermodynamic character of air mass. (Code table 2552)
(FM 45)

$M_w$ Water-spout(s), tornadoes, whirlwinds, dust devils. (Code table 2555)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$M_1$ Month when the period covered by the forecast begins. (Code table 2562)
(FM 68)

$M_2$ Month when the period covered by the forecast ends. (Code table 2562)
(FM 68)

MM Month of the year (UTC), i.e. 01 = January; 02 = February, etc.
(FM 18, FM 22, FM 39, FM 40, FM 47, FM 49, FM 57, FM 62, FM 63, FM 64, FM 65, FM 71, FM 72, FM 73, FM 75, FM 76, FM 88)

(1) In FM 75 and FM 76, MM shall be used to indicate the unit of wind speed in addition to indicating the month. When wind speeds are given in knots, 50 shall be added to MM. When the speed is given in metres per second, MM shall not be modified.

$M_iM_i$ Identification letters of the report. (Code table 2582)
(FM 12, FM 13, FM 14, FM 20, FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38, FM 39, FM 40, FM 41, FM 62, FM 63, FM 64, FM 65, FM 67, FM 85, FM 86, FM 87, FM 88)

$M_jM_j$ Identification letters of the part of the report or the version of the code form. (Code table 2582)
(FM 12, FM 13, FM 14, FM 20, FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38, FM 39, FM 40, FM 41, FM 62, FM 63, FM 64, FM 65, FM 67, FM 85, FM 86, FM 87, FM 88)

MMM Number of Marsden squares in which the station is situated at the time of observation. (Code table 2590)
(FM 14, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40)

m Movement. (Code table 2600)
(FM 45, FM 46)

$m_S$ Averaging period for salinity. (Code table 2604)
(FM 62)

$m_T$ Averaging period for sea temperature. (Code table 2604)
(FM 62)

$m_{Tn}$ Number of days missing from the record for daily minimum air temperature.
(FM 71)

(1) If data are missing for 9 days or more, $m_{Tn}$ shall be reported as 9.

$m_{Tx}$ Number of days missing from the record for daily maximum air temperature.
(FM 71)

(1) If data are missing for 9 days or more, $m_{Tx}$ shall be reported as 9.

$m_c$ Averaging period for surface current direction and speed. (Code table 2604)
(FM 62)

$m_r$ Method of reducing data. (Code table 2649)
(FM 39, FM 40)

$m_s$ Stage of melting. (Code table 2650)
(FM 44)

(1) In case of unequal stages, the higher code figure shall be used.

mm Procedure or model used to generate the data field. (Code table 2677)
(FM 47)

$m_Pm_P$ Number of days missing from the records for pressure.
(FM 71)

$m_Rm_R$ Number of days missing from the records for precipitation.
(FM 71)

$m_Sm_S$ Number of days missing from the records for sunshine duration.
(FM 71)

$m_Tm_T$ Number of days missing from the records for air temperature.
(FM 71)

$m_em_e$ Number of days missing from the records for vapour pressure.
(FM 71)

N Total cloud cover. (Code table 2700)
(FM 12, FM 13, FM 14, FM 22, FM 45)

(1) This symbolic letter shall embrace the total fraction of the celestial dome covered by clouds irrespective of their genus.

— Number of the centre.
(FM 83)

$N_h$ Amount of all the $C_L$ cloud present or, if no $C_L$ cloud is present, the amount of all the $C_M$ cloud present. (Code table 2700)
(FM 12, FM 13, FM 14, FM 35, FM 36, FM 38)

$N_m$ Cloud conditions over mountains and passes. (Code table 2745)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$N_s$ Amount of individual cloud layer or mass whose genus is indicated by C. (Code table 2700)
(FM 12, FM 13, FM 14)

$N_t$ Condensation trails. (Code table 2752)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$N_v$ — Cloud conditions observed from a higher level. (Code table 2754)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

N´ — Amount of cloud whose base is below the level of the station. (Code table 2700)
(FM 12, FM 14)

NN — Identification number of a front or system.
(FM 45)

(1) This number is assigned to the front or system by an analysis centre and is used for the same front or system throughout its life even though the type of front changes, e.g. cold to quasi-stationary, etc.

$N_cN_c$ — Percentage of cloud cover, as determined by the sounding instruments.
(FM 86, FM 87, FM 88)

(1) Clear sky shall be coded 00, total cloud cover 99.

$N_eN_e$ — Sequential number of the 60 x 60 km square in the radar coordinate grid. (Code table 2776)
(FM 20)

NNN — Catalogue number of grid used by centre $F_1F_2$.
(FM 47, FM 49)

(1) See *Weather Reporting* (WMO-No. 9), Volume B.

(2) Whenever the grid used does not appear in the above WMO publication, NNN shall be encoded as 999 and Section 2 shall be used (only for FM 47).

$N_sN_sN_s$ — Category of cloud amount, few, scattered, broken or overcast, given by three-letter abbreviations FEW (1 to 2 oktas), SCT (3 to 4 oktas), BKN (5 to 7 oktas) or OVC (8 oktas).
(FM 15, FM 16, FM 51, FM 53, FM 54)

n — Number of consecutive isobaric surfaces for which wind data are reported, starting with the surface specified by $P_1P_1$.
(FM 32, FM 33, FM 34)

n, n´, n´´, . . . — Number of the points on latitude parallels $L_aL_a$, $L'_aL'_a$, $L''_aL''_a$, . . . etc., for which pressure is given.
(FM 73)

$n_f$ — Number of atmospherics observed by the system at the geographical locations that follow, during a 10-minute period within the hour immediately preceding the time of the report. (Code table 2836)
(FM 82)

$n_m$ — Number of mean wind(s) reported.
(FM 41)

$n_p$ — Number of grid points per data group.
(FM 47)

$n_s$ Number of spot wind(s) reported.
(FM 41)

$n_u$ Number of unit thicknesses in sublayer.
(FM 86)

$n_{v1}$, $n_{v2}$, . . ., $n_{vn}$ Number of days for which wind observations are missing for the specified isobaric surface concerned ($n_v$ = 9 if observations are missing for 9 or more days).
(FM 75, FM 76)

$n_1$, $n_2$ Number of digits in which the value of a parameter for a level or a layer is coded for each grid point.
(FM 47, FM 49)

(1) If one parameter $a_1a_1a_1$ is reported for one level only, or for a layer, $n_1$ shall be used to specify the number of digits, and $n_2$ shall be coded as 0 (in the case of FM 49 GRAF, $n_2$ is replaced by 0 in the code form).

(2) If one parameter $a_1a_1a_1$ is reported for two special levels $b_1$ $b_1$ and $b_2b_2$, $n_1$ shall refer to level $b_1b_1$ and $n_2$ to level $b_2b_2$.

(3) If two parameters $a_1a_1a_1$ and $a_2a_2a_2$ are reported, $n_1$ shall refer to parameter $a_1a_1a_1$ and $n_2$ to parameter $a_2a_2a_2$.

$n_3$ Evolution of clouds. (Code table 2863)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$n_4$ Evolution of clouds observed from a station at a higher level. (Code table 2864)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

nn Unit is either millimetre or tens and units of hectopascals (coded 99 for 99 or more units).
(9-group in Section 3 of FM 12, FM 13 and FM 14)

— Serial number of the part of the complete analysis or prognosis which is transmitted separately.
(FM 47, FM 49)

(1) When the complete analysis or prognosis described by the grid has to be transmitted in a number of separate parts, each of optimum length, the serial number of the part which is transmitted shall be indicated by nn, and the total number of parts to be transmitted shall be indicated by $n_tn_t$.

— Number of points in 10-degree square.
(FM 88)

$n_Bn_B$ Number of icebergs within the area. (Code table 2877)
(FM 44)

$n_Gn_G$ Number of growlers and bergy bits within the area. (Code table 2877)
(FM 44)

$n_Ln_L$ Number of layers for which the thickness or precipitable water is reported.
(FM 86)

$n_Tn_T$ Indicator of reference code table for type of parameter $a_1a_1a_1$, $a_2a_2a_2$. (Code table 2890)
(FM 47, FM 49)

$n_{T1}n_{T1}$
$n_{T2}n_{T2}$
. . .
$n_{Tn}$ $n_{Tn}$ Number of days in the month for which temperature observations are missing for the specified isobaric surface concerned.
(FM 75, FM 76)

$n_an_a$ Number of data lines in the complete analysis or prognosis.
(FM 47, FM 49)

(1) If the Pole is a grid point of a geographical grid, the Pole shall be included as a singular data line.

$n_gn_g$ Number of data groups on the data line.
(FM 47, FM 49)

$n_in_i$ Maximum number of unit grid points on the grid lines in the grid system used.
(FM 47)

$n_jn_j$ Maximum of unit grid lines in the grid system used.
(FM 47)

$n_mn_m$ Number of the band in which the maximum non-directional spectral density determined by heave sensors lies.
(FM 65)

$n_rn_r$ Number of days in the month with precipitation equal to or greater than 1 millimetre.
(FM 71, FM 72)

$n_{sm}n_{sm}$ Number of the band in which the maximum non-directional spectral density determined by slope sensors lies.
(FM 65)

$n_tn_t$ Number of parts into which the complete analysis or prognosis has been split for transmission purposes.
(FM 47, FM 49)

(1) See Note (1) under nn.

— Identification number of tropical cyclone, from 01 to 99.
(FM 85)

$n_0n_0$
$n_1n_1$
. . .
$n_nn_n$ Number of level, starting with station level.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) Station level shall be coded $n_0n_0$ = 00.

nnn Isotope mass.
(FM 22, FM 57)

— Specifications related to supplementary phenomena. (Code table 1864)
(FM 53, FM 54)

$n_bn_bn_b$ Type and serial number of buoy.
(FM 13, FM 18, FM 22, FM 63, FM 64, FM 65)

$n_mn_mn_m$ Maximum wind flight level number.
(FM 50)

(1) The last figure shall always be 0.

$n_tn_tn_t$ Tropopause flight level number.
(FM 50)

(1) The last figure shall always be 0.

$\left.\begin{array}{l} n_1n_1n_1 \\ n_2n_2n_2 \\ \cdots \\ n_kn_kn_k \end{array}\right\}$ Flight level numbers for specified levels.
(FM 50)

(1) The last figure shall always be 0.

$P_a$ Countermeasures taken near border. (Code table 3131)
(FM 22)

$P_c$ Character of pressure system. (Code table 3133)
(FM 45, FM 46)

$P_i$ Forecast ice phenomenon. (Code table 3139)
(FM 68)

$P_t$ Type of pressure system. (Code table 3152)
(FM 45, FM 46)

$P_w$ Period of waves. (Code table 3155)
(FM 61)

(1) The period of the waves is the time between the passage of two successive wave crests past a fixed point (it is equal to the wave length divided by the wave speed).

(2) The average value of the wave period shall be forecast, as obtained from the larger well-formed waves of the wave system being forecast.

PP Pressure at a constant level surface, in whole hectopascals.
(FM 45, FM 46)

(1) For a HIGH or a LOW, PP shall be the pressure at the centre. Along a ridge line, PP shall be the highest pressure and, along a trough line, it is the lowest pressure.

$P_AP_A$ Pressure at standard reference levels, in tens of hectopascals up to and at the 20-hPa surface (1 000 hPa = 00), and in tenths of a hectopascal at the 10-hPa surface and above (10 hPa = 00).
(FM 86)

$P_bP_b$ Pressure, in tens of hectopascals, at the base of the reported humid layer.
(FM 88)

$P_cP_c$ Pressure level, in tens of hectopascals, derived from a conversion of cloud temperature and related to the level where cloud displacement was observed.
(FM 88)

$P_dP_d$ Pressure level, in tens of hectopascals, derived from a conversion of cloud temperature.
(FM 88)

$P_eP_e$ Estimated pressure, in tens of hectopascals, where cloud displacement was observed.
(FM 88)

$P_wP_w$ Period of wind waves, in seconds.
(FM 12, FM 13, FM 14)

— Period of waves, in seconds.
(FM 45, FM 46)

(1) See Note (1) under $P_w$.

(2) The average value of the wave period shall be reported, as obtained from the larger well-formed waves of the wave system being observed.

(3) A confused sea shall be indicated by coding 99 for $P_wP_w$.

$P_{wa}P_{wa}$ Period of waves, obtained by instrumental methods, in seconds.
(FM 12, FM 13, FM 14, FM 18)

$\left.\begin{array}{l} P_{w1}P_{w1} \\ P_{w2}P_{w2} \end{array}\right\}$ Period of swell waves, in seconds.
(FM 12, FM 13, FM 14)

(1) See Note (1) under $P_w$.

(2) See Note (2) under $P_wP_w$.

$P_1P_1$ Pressure of the lowest standard isobaric surface, with respect to altitude, for which wind data are reported.
(FM 32, FM 33, FM 34)

(1) The pressure of surfaces up to and including the 100-hPa surface shall be reported in tens of hectopascals. Above the 100-hPa surface, pressures shall be reported in whole hectopascals.

$\left.\begin{array}{l} P_1P_1 \\ P_2P_2 \\ \ldots \\ P_nP_n \end{array}\right\}$ Pressure of standard isobaric surfaces (1 000 hPa = 00, 925 hPa = 92).
(FM 35, FM 36, FM 37, FM 38)

— Pressure of the specified isobaric surfaces, in whole hectopascals, tenths, hundredths, thousandths, ten-thousandths or hundred-thousandths of a hectopascal, as specified by the indicator figures 11, 22, 33, 44, 55 or 66.
(FM 39, FM 40)

— Pressure of the specified isobaric surfaces (1 000 hPa = 00, 10 hPa = 01).
(FM 86)

(1) For SATEM reports, the pressure of surfaces up to and including 10 hPa shall be reported in tens of hectopascals. Above the 10-hPa surface, pressures shall be reported in tenths of a hectopascal.

$\overline{P_1P_1}$, $\overline{P_2P_2}$, . . .
$\overline{P'_1P'_1}$, $\overline{P'_2P'_2}$, . . .
$\overline{P''_1P''_1}$, $\overline{P''_2P''_2}$, . . .
. . . . . .

Monthly mean pressures in oceanic areas.
(FM 73)

(1) For units of pressure, see Regulation 73.5.1.

PPP — Pressure, in whole hectopascals.
(FM 46)

$P_aP_aP_a$ — Pressure at the level at which the aircraft is flying, in hectopascals.
(FM 41)

(1) This pressure is the one which corresponds, in the ICAO standard atmosphere, to the ICAO flight level indicated in the report received from the aircraft. It is the actual pressure at which the aircraft is flying.

$P_cP_cP_c$ — Pressure, in whole hectopascals, at the average cloud top, of the cloud cover as determined by the sounding instruments.
(FM 86, FM 87)

$P_mP_mP_m$ — Pressure at the maximum wind level.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) The pressure of surfaces up to and including the 100-hPa surface shall be reported in whole hectopascals. Above the 100-hPa surface, pressure shall be reported in tenths of a hectopascal.

$P_sP_sP_s$ — Pressure, in hectopascals, of standard constant pressure surface in which the line of maximum wind speed is given.
(FM 45)

$P_tP_tP_t$ — Pressure at the tropopause level.
(FM 35, FM 36, FM 37, FM 38, FM 86)

(1) See Note (1) under $P_mP_mP_m$.

$P_{wa}P_{wa}P_{wa}$ — Period of waves, obtained by instrumental methods, in tenths of a second.
(FM 18)

(1) $P_{wa}P_{wa}P_{wa}$ shall be reported in addition to $P_{wa}P_{wa}$ when the following conditions have been met:

(a) The sea is not calm (i.e. $P_{wa}P_{wa}H_{wa}H_{wa}$ has not been reported as 0000);

(b) $P_{wa}P_{wa}$ has not been reported as //;

(c) The station has the capability of accurately measuring instrumental wave period in units of 0.1 second.

(2) See Notes (1) and (2) under $P_wP_w$.

$P_0P_0P_0$
$P_1P_1P_1$
. . .
$P_nP_nP_n$

Pressure at specified levels.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

(1) See Note (1) under $P_mP_mP_m$.

$\overline{P_0P_0P_0}$ — Monthly mean surface pressure, in whole hectopascals, omitting the thousands digit at the time of release of the radiosonde.
(FM 75, FM 76)

$P_2P_2P_2$ Pressure reduced to mean sea level, in whole hectopascals.
(FM 53, FM 54)

PPPP Pressure at mean sea level, in tenths of a hectopascal, omitting the thousands digit of hectopascals of the pressure value.
(FM 12, FM 13, FM 14, FM 18)

$\overline{PPPP}$ Monthly mean pressure, in tenths of a hectopascal, omitting the thousands digit or monthly mean geopotential, in standard geopotential metres, for surface stations.
(FM 71, FM 72)

(1) $\overline{PPPP}$ shall indicate the pressure reduced to mean sea level or to an agreed datum level, as indicated in *Weather Reporting* (WMO-No. 9), Volume A, or the geopotential of an agreed standard constant pressure level, as indicated in *Weather Reporting* (WMO-No. 9), Volume A.

(2) If the monthly mean pressure is 1 000 hPa or above, the first figure of $\overline{PPPP}$ shall be 0.

$P_HP_HP_HP_H$ QNH value, in whole hectopascals.
(FM 15, FM 16)

$P_aP_aP_aP_a$ Average wave period, in tenths of a second, or average wave length, in metres.
(FM 65)

$P_pP_pP_pP_p$ Spectral peak period derived from heave sensors, in tenths of a second, or spectral peak wave length, in metres.
(FM 65)

$P_{sa}P_{sa}P_{sa}P_{sa}$ Average period derived from slope sensors, in tenths of a second, or average wave length, in metres.
(FM 65)

$P_{sp}P_{sp}P_{sp}P_{sp}$ Spectral peak period derived from slope sensors, in tenths of a second, or spectral peak wave length, in metres.
(FM 65)

$P_0P_0P_0P_0$ Pressure at station level, in tenths of a hectopascal, omitting thousands digit of hectopascals of the pressure value.
(FM 12, FM 14, FM 18, FM 22)

$\overline{P_0P_0P_0P_0}$ Monthly mean pressure at station level, in tenths of a hectopascal, omitting the thousands digit.
(FM 71)

(1) If the monthly mean pressure at station level is 1 000 hPa or above, the first figure of $\overline{P_0P_0P_0P_0}$ shall be 0.

$\left.\begin{matrix} p_1p_1 \\ p_2p_2 \end{matrix}\right\}$ Pressure levels of reference, in tens of hectopascals (1 000 hPa = 00).
(FM 47, FM 49)

(1) In the case of analyses or prognoses relating to a layer between two constant pressure surfaces, the upper level shall be indicated by $p_1p_1$ and the lower level by $p_2p_2$.

ppp — Amount of pressure tendency at station level during the three hours preceding the time of observation, expressed in tenths of a hectopascal.
(FM 12, FM 13, FM 14, FM 18)

$p_Sp_Sp_S$ — Percentage of total sunshine duration relative to the normal.
(FM 71)

$p_1p_1p_1$ — Density in g $m^{-3}$, rounded to three significant figures, at the altitude given by HH.
(FM 39, FM 40)

$p_{24}p_{24}p_{24}$ — Amount of surface pressure change during last 24 hours either positive, zero or negative, in tenths of a hectopascal.
(FM 12, FM 13, FM 14)

Q — Octant of the globe. (Code table 3300)
(FM 45, FM 46, FM 53, FM 54, FM 85, FM 86, FM 87)

$Q_A$ — Location quality class (Code table 3302)
(FM 18)

$Q_L$ — Quality of location. (Code table 3311)
(FM 18)

$Q_N$ — Quality of the buoy satellite transmission. (Code table 3313)
(FM 18)

$Q_P$ — Quality of the pressure measurement. (Code table 3315)
(FM 18)

$Q_{TW}$ — Quality of the measurement of the water-surface temperature. (Code table 3319)
(FM 18)

$Q_c$ — Quadrant of the globe. (Code table 3333)
(FM 13, FM 14, FM 18, FM 20, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40, FM 41, FM 44, FM 47, FM 62, FM 63, FM 64, FM 65, FM 72, FM 76, FM 85)

$Q_d$ — Quality control indicator. (Code table 3334)
(FM 18)

$Q_{d1}$ — Quality control indicator for temperature/salinity profile. (Code table 3334)
(FM 18)

$Q_{d2}$ — Quality control indicator for current profile. (Code table 3334)
(FM 18)

$Q_l$ — Quality control indicator for position. (Code table 3334)
(FM 18)

$Q_t$ — Quality control indicator for time. (Code table 3334)
(FM 18)

$Q_x$ Indicator of position of group.
(FM 18)

(1) See Regulation 18.3.3.

$Q_z$ Indicator of depth correction (indication whether probe depths are corrected using hydrostatic pressure or not). (Code table 3318)
(FM 18)

$Q_2$ Quality of the housekeeping parameter (second word in first block of ARGOS platform transmitters terminal sensor data). (Code table 3363)
(FM 18)

$Q_4$ Quality of the measurement of air temperature. (Code table 3363)
(FM 18)

QQQ The first three digits of the discharge value in $dm^3 s^{-1}$.
(FM 67)

(1) If the discharge is less than 100 $dm^3 s^{-1}$, the first Q or QQ shall be numbered as 0 or 00, as appropriate.

(2) If the discharge is equal to or more than 100 $dm^3 s^{-1}$, QQQ shall be the first three rounded digits of the discharge value. The number of remaining digits is indicated by $e_Q$.

$Q_1Q_1Q_1$ The first three digits of forecast discharge value (lower limit) in $dm^3 s^{-1}$.
(FM 68)

(1) See Notes (1) and (2) under QQQ.

$Q_2Q_2Q_2$ The first three digits of forecast discharge value (upper limit) in $dm^3 s^{-1}$.
(FM 68)

(1) See Notes (1) and (2) under QQQ.

q Relative confidence figure, in tens of per cent, as an overall quality measure of:

(a) Thickness values; (FM 86)

(b) Equivalent blackbody temperature values. (FM 87)

(1) High figures mean high relative confidence.

(2) A value of 0 means the relative confidence is not specified.

$q_1$ Message contraction and data scanning indicator. (Code table 3462)
(FM 47, FM 49)

$q_2$ Data contraction indicator. (Code table 3463)
(FM 47, FM 49)

qqq The three most significant digits of the discharge of the main receiving water body, in cubic metres per second.
(FM 22)

$R_c$ Composition of release. (Code table 3533)
(FM 22)

$R_d$ Frequency group within which $R_1R_1R_1R_1$ falls. (Code table 3534)
(FM 71, FM 72)

$R_e$ Possibility of significant chemical toxic health effect. (Code table 3535)
(FM 22)

— Extent of all ridging. (Code table 0501)
(FM 44)

$R_h$ Maximum height of ridging. (Code table 3538)
(FM 44)

$R_p$ Possibility that plume will encounter precipitation in State in which incident occurred. (Code table 3548)
(FM 22)

$R_s$ Rate of ice accretion on ships. (Code table 3551)
(FM 12, FM 13, FM 14)

$R_t$ Time at which precipitation given by RRR began or ended. (Code table 3552)
(9-group in section 3 of FM 12, FM 13 and FM 14)

(1) When precipitation is occurring at the time of observation or has ended during the hour preceding the observation, the time reported is the "time precipitation began". When precipitation is not occurring at the time of observation and has not occurred in the hour preceding the observation, the time reported is the "time precipitation ended". When two or more periods of precipitation occur during the period covered by $W_1W_2$, the time (beginning or ending) of the last period of precipitation is reported.

$R_w$ Wave length of the radar. (Code table 3555)
(FM 20)

RR Amount of precipitation or water equivalent of solid precipitation, or diameter of solid deposit. (Code table 3570)
(9-group in section 3 of FM 12, FM 13 and FM 14)

$R_{01}R_{01}$ Number of days in the month with precipitation equal to or more than 1.0 mm.
(FM 71)

$R_{05}R_{05}$ Number of days in the month with precipitation equal to or more than 5.0 mm.
(FM 71)

$R_{10}R_{10}$ Number of days in the month with precipitation equal to or more than 10.0 mm.
(FM 71)

$R_{50}R_{50}$ Number of days in the month with precipitation equal to or more than 50.0 mm.
(FM 71)

$R_{100}R_{100}$ Number of days in the month with precipitation equal to or more than 100.0 mm.
(FM 71)

$R_{150}R_{150}$ Number of days in the month with precipitation equal to or more than 150.0 mm.
(FM 71)

RRR Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by $t_R$. (Code table 3590)
(FM 12, FM 13, FM 14, FM 22)

$R_1R_1R_1$
$R_2R_2R_2$
. . .
$R_nR_nR_n$ Radiance values, expressed in ergs with a scale factor as given by u.
(FM 87)

RRRR Total amount of precipitation or water equivalent of snow cover on the ground. (Code table 3596)
(FM 67)

$R_cR_cR_cR_c$ Combination of up to four elements constituting the composition of release.
(FM 22)

$R_xR_xR_xR_x$ Highest daily amount of precipitation during the month, in tenths of millimetres (coded 9998 for 999.8 mm or more, and coded 9999 for trace).
(FM 71)

$R_1R_1R_1R_1$ Total precipitation for the month. (Code table 3596)
(FM 71, FM 72)

$R_{24}R_{24}R_{24}R_{24}$ Total amount of precipitation during the 24-hour period ending at the time of observation, in tenths of millimetres (coded 9998 for 999.8 mm or more, and coded 9999 for trace).
(FM 12, FM 14)

$r_m$ Type of rocket motor. (Code table 3644)
(FM 39, FM 40)

$r_t$ Distance between the end of the observed outermost spiral band and the centre of the tropical cyclone. (Code table 3652)
(FM 20)

$r_ar_a$ Radiosonde/sounding system used. (Code table 3685)
(FM 35, FM 36, FM 37, FM 38)

$r_{f1}r_{f1}$
$r_{f2}r_{f2}$
. . .
$r_{fn}r_{fn}$ Steadiness of wind at specified isobaric surfaces.
(FM 75, FM 76)

(1) The steadiness factor is the ratio of speed of the monthly mean vector wind to the speed of the monthly mean scalar wind expressed as a percentage. It is reported to the nearest one per cent.

$r_ir_i$ Distance, in nautical miles, that the ice has travelled during a 12-hour period.
(FM 44)

$r_1r_1$ First normalized polar coordinate derived from Fourier coefficients.
(FM 65)

$r_2r_2$ Second normalized polar coordinate derived from Fourier coefficients.
(FM 65)

rrr Range, in intervals of 5 km, for echoes at distances of 500 km or more.
(FM 20)

rrrrrrr Reference value used as new zero for the parameter indicated by $a_1a_1a_1$ or $a_2a_2a_2$, in the same units as used for the parameter concerned.
(FM 47, FM 49)

S State of the sea. (Code table 3700)
(9-group in Section 3 of FM 12, FM 13 and FM 14, FM 61)

(1) The state of the sea is the state of agitation of the sea resulting from various factors such as wind, swell, currents, angle between swell and wind, etc.

— Sign of temperature (P = positive or zero, M = negative).
(FM 50)

$S_C$ Shape and definition of the eye of the tropical cyclone. (Code table 3704)
(FM 20)

$S_h$ Type of temperature and height data. (Code table 3738)
(FM 41)

— Sign of the pressure altitude.
(FM 42)

(1) If pressure altitude is zero or positive (aircraft is at or above the standard datum plane of 1013.2 hPa), $S_h$ shall be encoded as the letter F.

(2) If pressure altitude is negative (aircraft is below the standard datum plane of 1013.2 hPa), $S_h$ shall be encoded as the letter A.

$S_i$ Stage of development. (Code table 3739)
(FM 12, FM 13, FM 14)

$S_0$ Hoar frost or coloured precipitation. (Code table 3761)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$S_1$ Predominant stage of development of ice. (Code table 3763)
(FM 44)

(1) If two or more stages of development are of the same concentration, older stages of development shall have precedence over the younger stages.

— Nature of the zone separated by the line formed by the points following the $2C_sS_1S_2Z_1$ group (part to the right of the line). (Code table 3762)
(FM 45)

$S_2$ Secondary stage of development of ice. (Code table 3763)
(FM 44)

$S_2$ *(continued)*

— Nature of the zone separated by the line formed by the points following the $2C_sS_1S_2Z_1$ group (zone inside the line). (Code table 3762)
(FM 45)

$S_3$ Tertiary stage of development of ice. (Code table 3763)
(FM 44)

$S_4$ Quaternary stage of development of ice. (Code table 3763)
(FM 44)

$S_5$ Quintary stage of development of ice. (Code table 3763)
(FM 44)

$S_6$ Type of frozen deposit. (Code table 3764)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$S_7$ Character of snow cover. (Code table 3765)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$S_8$ Snow-storm phenomena (snow raised by wind). (Code table 3766)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$S'$ State of the water surface in an alighting area. (Code table 3700)
(9-group in Section 3 of FM 12, FM 13, FM 14, FM 15 and FM 16)

$S'_7$ Regularity of snow cover. (Code table 3775)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$S'_8$ Evolution of drift snow. (Code table 3776)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

SS Duration of sunshine in the past hour, in tenths of an hour.
(FM 12, FM 13, FM 14)

— Sign of the temperature.
(FM 42)

(a) If temperature is zero or positive, SS shall be encoded as the letters PS.

(b) If temperature is negative, SS shall be encoded as the letters MS.

— Section of front or of pressure system to which NN refers. (Code table 3777)
(FM 45)

$S_fS_f$ Synoptic interpretation of significant features. (Code table 3780)
(FM 85)

$S_tS_t$ Intensity of the tropical cyclone. (Code table 3790)
(FM 85)

| | |
|---|---|
| SSS | Duration of sunshine, in hours and tenths of an hour.<br>(FM 12, FM 13, FM 14) |
| $S_1S_1S_1$ | Total sunshine for the month to the nearest hour.<br>(FM 71) |
| SSSS | Sampling interval (in tenths of a second or in metres).<br>(FM 65) |
| $S_0S_0S_0S_0$ | Salinity, in hundredths of a part per thousand (‰) (practical salinity), at the surface.<br>(FM 62) |
| $S_0S_0S_0S_0$<br>$S_1S_1S_1S_1$<br>. . .<br>$S_nS_nS_nS_n$ | Salinity, in hundredths of a part per thousand (‰), at either significant or selected depths starting with sea surface.<br>(FM 18, FM 64) |
| $S_PS_Ps_ps_p$ | Supplementary information. (Code table 3778)<br>(FM 12, FM 13, FM 14) |
| $s_c$ | Nature of snow or ice interpreted from satellite information. (Code table 3833)<br>(FM 85) |
| $s_n$ | Sign of the data, and relative humidity indicator. (Code table 3845)<br>(FM 12, FM 13, FM 14, FM 18, FM 22, FM 36, FM 62, FM 63, FM 64, FM 67, FM 71, FM 72, FM 86)<br>(1) See Note (1) under UUU. |
| — | Sign of the exponent. (Code table 3845)<br>(FM 22, FM 57) |
| — | Sign of the reference value indicated by rrrrrrr. (Code table 3845)<br>(FM 47, FM 49) |
| $s_p$ | Pasquill–Gifford stability category. (Code table 3847)<br>(FM 57) |
| $s_q$ | Nature and/or type of squall. (Code table 3848)<br>(9-group in Section 3 of FM 12, FM 13 and FM 14) |
| $s_r$ | Solar and infrared radiation correction. (Code table 3849)<br>(FM 35, FM 36, FM 37, FM 38) |
| $s_s$ | Indicator for the sign and type of measurement of sea-surface temperature. (Code table 3850)<br>(FM 12, FM 13, FM 14) |
| $s_w$ | Indicator for the sign and type of wet-bulb temperature reported. (Code table 3855)<br>(FM 12, FM 13, FM 14) |

$s_x$ Sign indicator for the data group which follows (Section 3) and for the cartesian coordinates of the Pole (Section 2). (Code table 3856)
(FM 47)

$s_1$ Type of navigation system. (Code table 3866)
(FM 42)

— Distance, in tens of kilometres, of the point position from the station.
(FM 45)

(1) When the distance is 100 kilometres, the direction shall be coded for symbol $D_1$ and zero shall be reported for symbol $s_1$.

$s_2$ Type of system used. (Code table 3867)
(FM 42)

— Hundreds of kilometres to be added to $s_1$.
(FM 45)

$s_3$ Temperature precision. (Code table 3868)
(FM 42)

ss Depth of newly fallen snow. (Code table 3870)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

— Depth, in centimetres, of layer of snow on ice.
(FM 67)

(1) Depth of snow more than, or equal to, 99 cm shall be coded 99.

$s_as_a$ Tracking technique/status of system used. (Code table 3872)
(FM 35, FM 36, FM 37, FM 38)

$s_is_i$ Forecast value of stability index at point position.
(FM 57)

$s_{00}s_{00}$ Number of days in the month with snow depth more than 0 cm.
(FM 71)

$s_{01}s_{01}$ Number of days in the month with snow depth more than 1 cm.
(FM 71)

$s_{10}s_{10}$ Number of days in the month with snow depth more than 10 cm.
(FM 71)

$s_{50}s_{50}$ Number of days in the month with snow depth more than 50 cm.
(FM 71)

sss Total depth of snow. (Code table 3889)
(FM 12, FM 14)

$s_ts_ts_t$ Standard deviation of daily mean values relative to the monthly mean air temperature, in tenths of a degree Celsius.
(FM 71)

$T_a$ Approximate tenths value and sign (plus or minus) of the air temperature at the level given by $P_aP_aP_a$. (Code table 3931)
(FM 41)

— Approximate tenths value and sign of temperature. (Code table 3931)
(FM 86, FM 88)

(1) When the temperature is computed to the nearest whole degree Celsius, code figure 0 or 1 is used for $T_a$, as appropriate.

$T_{at}$ Approximate tenths value and sign (plus or minus) of the air temperature at the tropopause level. (Code table 3931)
(FM 35, FM 36, FM 37, FM 38)

$\left.\begin{array}{l} T_{a0} \\ T_{a1} \\ \cdots \\ T_{an} \end{array}\right\}$ Approximate tenths value and sign (plus or minus) of:

(a) The air temperature at specified levels starting with station level; (Code table 3931)
(FM 35, FM 36, FM 37, FM 38)

(b) Equivalent blackbody temperature. (Code table 3931
(FM 87)

$T_c$ Tropical system characteristics. (Code table 3933)
(FM 45, FM 46)

$T_i$ Tropical system intensity. (Code tables 3939, 3940)
(FM 45, FM 46)

(1) Two separate code tables are provided for the cases of $T_t$ = 0–8 (Code table 3939) and $T_t$ = 9 (Code table 3940).

When $T_t$ = 9, the code figure given for $T_i$ indicates the force of the strongest wind in the reported cyclonic circulation or, in the case of a prognosis, the strongest wind force expected at the time of the prognosis.

$T_n$ Minimum air temperature. (Code table 3956)
(FM 61)

$T_t$ Tropical circulation type. (Code table 3952)
(FM 45, FM 46)

$T_w$ Variation of temperature during the period covered by $W_1W_2$, associated with glaze or rime. (Code table 3955)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$T_x$ Maximum air temperature. (Code table 3956)
(FM 61)

$T_1$ Topography of greatest extent. (Code table 3962)
(FM 44)

(1) If two types are equal in extent, the higher code number is used first.

$T_2$ Topography of second greatest extent. (Code table 3962)
(FM 44)

TT Two-letter indicators preceding, without a space, the time group, where TT = AT (at), FM (from) or TL (until).
(FM 15, FM 16, FM 22, FM 51)

— Absolute value of air temperature, in whole degrees Celsius, at the height given by HH.
(FM 39, FM 40)

(1) The sign of temperature shall be disregarded; i.e. –57°C shall be coded as 57.

— Tens and unit digits of air temperature, in degrees Celsius.
(FM 41, FM 86)

(1) The tenths of the temperature, which is measured in degrees and tenths, shall be indicated by means of $T_a$.

— Forecast temperature, in whole degrees Celsius, at the relevant grid point.
(FM 50)

$T_FT_F$ Forecast temperature, in whole degrees Celsius.
(FM 51)

(1) For negative values, $T_FT_F$ shall be preceded by the letter M.

$T_PT_P$ Air temperature, in whole degrees Celsius, at the level given by $h'_Ph'_P$.
(FM 53, FM 54)

(1) For negative values, $T_PT_P$ shall be preceded by the letter M.

$T_cT_c$ Temperature of cloud top, in whole degrees Celsius, at pressure estimated from infrared observations of clouds. (FM 88)

(1) This value is used to derive the pressure level $P_cP_c$ in Section 2.

$T_hT_h$ Air temperature, in whole degrees Celsius, at the height indicated by $h_xh_xh_x$.
(FM 53, FM 54)

(1) For negative values, $T_hT_h$ shall be preceded by the letter M.

$T_{n0}T_{n0}$ Number of days in the month with minimum air temperature less than 0°C.
(FM 71)

$T_sT_s$ Temperature of the surface (land, water, ice, etc.), in whole degrees Celsius.
(FM 15, FM 16, FM 88)

$T_tT_t$ Air temperature, in whole degrees Celsius, at the tropopause level.
(FM 35, FM 36, FM 37, FM 38, FM 86)

(1) This temperature, measured in degrees and tenths, is not rounded off to the next whole degree; only the whole degrees are indicated by $T_tT_t$. The tenths of this temperature shall be indicated by means of $T_{at}$.

$T_vT_v$ Variation in air temperature, in whole degrees Celsius.
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$T_wT_w$ Water temperature at resorts during the bathing season.
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$T_{x0}T_{x0}$ Number of days in the month with maximum air temperature less than 0°C.
(FM 71)

$T_0T_0$ Temperature of the surface (land, water, ice, etc.), in whole degrees Celsius.
(FM 86)

$\left.\begin{array}{l} T_0T_0 \\ T_1T_1 \\ \cdots \\ T_nT_n \end{array}\right\}$ Tens and unit digits of:

(a) Air temperature not rounded off, in degrees Celsius, at specified levels starting with station level;
(FM 35, FM 36, FM 37, FM 38)

(b) Equivalent blackbody temperature, not rounded off, in degrees Celsius.
(FM 87)

(1) The tenths of the temperature, which is measured in degrees and tenths, shall be indicated by means of $T_{a0}$, $T_{a1}$ . . . $T_{an}$.

$\left.\begin{array}{l} T_1T_1 \\ T_2T_2 \\ \cdots \\ T_nT_n \end{array}\right\}$ Air temperature, in whole degrees Celsius, at the specified isobaric surfaces.
(FM 39, FM 40)

(1) See Note (1) under TT (second specification).

$T_{25}T_{25}$ Number of days in the month with maximum air temperature equal to or more than 25°C.
(FM 71)

$T_{30}T_{30}$ Number of days in the month with maximum air temperature equal to or more than 30°C.
(FM 71)

$T_{35}T_{35}$ Number of days in the month with maximum air temperature equal to or more than 35°C.
(FM 71)

$T_{40}T_{40}$ Number of days in the month with maximum air temperature equal to or more than 40°C.
(FM 71)

T´T´ Air temperature, in whole degrees Celsius.
(FM 15, FM 16)

(1) For negative values, T´T´ shall be preceded by the letter M.

$T'_dT'_d$ Dew-point temperature, in whole degrees Celsius.
(FM 15, FM 16)

(1) For negative values, $T'_dT'_d$ shall be preceded by the letter M.

TTT Air temperature, in tenths of a degree Celsius, its sign being given by $s_n$.
(FM 12, FM 13, FM 14, FM 18, FM 22, FM 63, FM 64)

$\overline{TTT}$ Monthly mean air temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71, FM 72)

$T_AT_AT_A$ Air temperature, in tenths of degrees Celsius, at the level given by $h_Ih_Ih_I$.
(FM 42)

$T_{an}T_{an}T_{an}$ Lowest air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_{ax}T_{ax}T_{ax}$ Highest air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_bT_bT_b$ Wet-bulb temperature, in tenths of degrees Celsius, its sign being given by $s_w$.
(FM 12, FM 13, FM 14)

$T_dT_dT_d$ Dew-point temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 12, FM 13, FM 14, FM 18, FM 22)

(1) See Note (1) under UUU.

— Dew-point temperature, in tenths of degrees Celsius, its sign being given by SS.
(FM 42)

(1) See Note (1) under UUU.

$T_nT_nT_n$ Minimum air temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 12, FM 13, FM 14)

$\overline{T_nT_nT_n}$ Mean daily minimum air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_{nd}T_{nd}T_{nd}$ Lowest daily mean air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_tT_tT_t$ Temperature of the element indicated by t, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 67)

$T_wT_wT_w$ Sea-surface temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 12, FM 13, FM 14, FM 18, FM 36, FM 62)

$\overline{T_wT_wT_w}$ Monthly mean of sea-surface temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 72)

$T_xT_xT_x$ Maximum air temperature, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 12, FM 13, FM 14)

$\overline{T_xT_xT_x}$ Mean daily maximum air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_{xd}T_{xd}T_{xd}$ Highest daily mean air temperature of the month, in tenths of degrees Celsius, its sign being given by $s_n$.
(FM 71)

$T_0T_0T_0$
$T_1T_1T_1$
. . .
$T_nT_nT_n$ Temperature, in tenths of degrees Celsius, at specified depths starting with sea surface.
(FM 83)

(1) For negative temperatures, 500 shall be added to the absolute value of the temperature in tenths of degrees Celsius.

$\overline{T_0T_0T_0}$
$\overline{T_1T_1T_1}$
. . .
$\overline{T_nT_nT_n}$ Mean monthly air temperature, in tenths of degrees Celsius, at specified isobaric surfaces starting with station level.
(FM 75, FM 76)

(1) For negative temperatures, 500 shall be added to the absolute value of the mean temperature, omitting the thousands digit for temperature equal to or less than – 50.0° Celsius.

$T_0T_0T_0T_0$
$T_1T_1T_1T_1$
. . .
$T_nT_nT_nT_n$ Temperatures, in hundredths of degrees Celsius, at either significant or selected depths starting with sea surface.
(FM 18, FM 64)

(1) For negative temperatures, 5000 shall be added to the absolute value of the temperature equal in degrees ° Celsius.

TTTTT Change indicators of trend forecasts and aerodrome forecasts (BECMG, TEMPO).
(FM 15, FM 16, FM 51)

(1) Specifications for these change indicators are given in the *Technical Regulations (*WMO-No. 49, Volume II, Parts I and II.

t Nature of the temperature reading, the value of which is indicated by $s_nT_tT_tT_t$. (Code table 4001)
(FM 67)

$t_E$ Thickness of the predominant form of ice, snow depth not included. (Code table 4006)
(FM 44)

$t_L$ Thickness of layer. (Code table 4013)
(FM 51, FM 53, FM 54)

$t_R$ Duration of period of reference for amount of precipitation, ending at the time of the report. (Code table 4019)
(FM 12, FM 13, FM 14, FM 22)

$t_e$ Time interval over which the movement of the centre or the eye of the tropical cyclone has been calculated. (Code table 4035)
(FM 20)

$t_m$ — Time interval over which the movement of the tropical cyclone has been calculated. (Code table 4044)
(FM 85)

$t_n$ — Tens digit of the altitude, expressed in units of 300 metres or 500 metres, which applies to the following data groups.
(FM 32, FM 33, FM 34)

$t_p$ — Period to which measurement of precipitation refers, and/or time at which water equivalent of snow is measured, both coded by RRRR. (Code table 4047)
(FM 67)

(1) This period or time always ends at the exact hour GG of the measurement.

$t_w$ — Time of commencement of a phenomenon before the hour of observation. (Code table 4055)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

tt — Time before observation or duration of phenomena. (Code table 4077)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

ttt — Time interval between $G_cG_c$ and

(a) Time to which the prognosis of a data field refers; or

(b) The *end* of the period to which a prognosis of a mean data field or a data field change refers, in units expressed by $u_t$.
(FM 47, FM 49)

$t_{L1}t_{L1}t_{L1}$
$t_{L2}t_{L2}t_{L2}$
. . .
$t_{Ln}t_{Ln}t_{Ln}$ — Thickness, in geopotential decameters, of layers between $P_AP_A$ and respectively $P_1P_1$ . . . $P_nP_n$ (thousands figure omitted).
(FM 86)

$t_bt_bt_b$ — Length of averaging period or of data change period, in units expressed by $u_b$.
(FM 47)

$U_{La}$ — Unit digit in the reported latitude.
(FM 14, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40)

— Units in degrees (or tenths of a degree) in the reported latitude.
(FM 88)

$U_{Lo}$ — Units digit in the reported longitude.
(FM 14, FM 33, FM 34, FM 36, FM 37, FM 38, FM 40)

— Units in degrees (or tenths of a degree) in the reported longitude.
(FM 88)

$U_1$ — Average relative humidity, in tens of per cent, of the layer between the pressure level indicated by $P_bP_b$ and the level of the tropopause, at the first of the five points indicated by $U_{La1}U_{Lo1}$, $U_{La2}U_{Lo2}$, etc.
(FM 88)

$U_2$ $U_3$ $U_4$ $U_5$ — As for $U_1$, but corresponding to the second, third, fourth and fifth points.
(FM 88)

$U_vU_v$ — Variation in relative humidity, in per cent.
(9-group in Section 3 of FM 12, FM 13 and FM 14)

UUU — Relative humidity of the air, in per cent, the first figure being zero except for UUU = 100 per cent.
(FM 12, FM 13, FM 14, FM 18, FM 42)

(1) See Regulation 12.2.3.3.1.

u — Scale factor. (Code table 4200)
(FM 47, FM 49, FM 87, FM 88)

$u_b$ — Unit of time for averaging period or data change period, expressed by $t_bt_bt_b$. (Code table 4232)
(FM 47)

$u_p$ — Unit of thickness of sublayers. (Code table 4242)
(FM 86)

$u_t$ — Unit of time for ttt. (Code table 4252)
(FM 47)

$u_1$ — Units digit of the altitude, expressed in units of 300 metres or 500 metres, for the first data group following.
(FM 32, FM 33, FM 34)

$u_2$ — Units digit of the altitude, expressed in units of 300 metres or 500 metres, for the second data group following.
(FM 32, FM 33, FM 34)

$u_3$ — Units digit of the altitude, expressed in units of 300 metres or 500 metres, for the third data group following.
(FM 32, FM 33, FM 34)

uu — Isopleth values, its units being given by $e_2$.
(FM 45, FM 46)

uuu — Isopleth values, its units being given by $e_1$.
(FM 45)

V — Forecast surface visibility. (Code table 4300)
(FM 61)

$V_b$ — Variation of visibility during the hour preceding the observation. (Code table 4332)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$V_s$ Visibility seawards (from a coastal station). (Code table 4300)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$V'_s$ Visibility over the water surface of an alighting area. (Code table 4300)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

VV Horizontal visibility at surface. (Code table 4377)
(FM 12, FM 13, FM 14)

(1) If the distance of visibility is between two of the distances given in Code table 4377, the code figure for the smaller distance shall be reported; e.g. if the distance is 350 metres, code figure 03 shall be reported.

$V_BV_B$ Drifting speed, in cm $s^{-1}$, of the buoy at the last known position of the buoy given in the groups YYMMJ GGgg/.
(FM 18)

$V_cV_c$ Surface current speed, in tenths of a knot.
(FM 63)

$V_sV_s$ Visibility towards the sea. (Code table 4377)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$V_1V_1$ Number of days in the month with observed or recorded visibility less than 50 m, irrespective of the duration of the observational period.
(FM 71)

$V_2V_2$ Number of days in the month with observed or recorded visibility less than 100 m, irrespective of the duration of the observational period.
(FM 71)

$V_3V_3$ Number of days in the month with observed or recorded visibility less than 1 000 m, irrespective of the duration of the observational period.
(FM 71)

VVVV Horizontal visibility at surface, in metres, in increments of 50 metres up to 500 metres, in increments of 100 metres between 500 and 5 000 metres, and in increments of 1 000 metres between 5 000 metres up to 9 999 metres, with 9999 indicating visibility of 10 km and above.
(FM 15, FM 16, FM 51, FM 53, FM 54)

(1) If the value is between two increments, it shall be rounded off downward to the lower of the two increments. For example, a visibility of 370 metres shall be reported as 0350, a visibility of 570 metres shall be reported as 0500, a visibility of 3 570 metres shall be reported as 3500, and a visibility of 5 700 metres shall be reported as 5000.

$V_NV_NV_NV_N$ Minimum horizontal visibility at surface, in metres.
(FM 15, FM 16)

$V_RV_RV_RV_R$ Runway visual range, in metres.
(FM 15, FM 16)

(1) Runway visual range shall be reported in steps of 25 metres when the runway visual range is less than 400 metres; in steps of 50 metres when it is between 400 metres and 800 metres;

and in steps of 100 metres when the runway visual range is more than 800 metres. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

$V_iV_iV_iV_i$ Information on the engineering status of the buoy.
(FM 18)

$v_p$ Forward speed of phenomenon. (Code table 4448)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

$v_s$ Ship's average speed made good during the three hours preceding the time of observation. (Code table 4451)
(FM 13)

vv Vertical wind shear, in knots, per 300 metres.
(FM 45, FM 53, FM 54)

$v_av_a$ Absolute value of the vector difference between the maximum wind and the wind blowing at 1 km above the level of maximum wind, in units indicated by YY.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

$v_bv_b$ Absolute value of the vector difference between the maximum wind and the wind blowing at 1 km below the level of maximum wind, in units indicated by YY.
(FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38)

vvv Vertical wind shear, in knots, per 1 000 metres.
(FM 45)

W Weather during past hour. (Code table 4561)
(FM 22)

$W_C$ Diameter or length of major axis of the eye of the tropical cyclone. (Code table 4504)
(FM 20)

$W_R$ Type of weather phenomenon or cloud in the 60 x 60 km square detected by radar. (Code table 4530)
(FM 20)

$\left.\begin{matrix} W_{a1} \\ W_{a2} \end{matrix}\right\}$ Past weather reported from an automatic weather station. (Code table 4531)
(FM 12, FM 13, FM 14)

$W_f$ Mean width or mean diameter of the feature specified by $S_fS_f$, or mean diameter of the overcast cloud of the tropical cyclone. (Code table 4536)
(FM 85)

$W_m$ Forecast weather. (Code table 4544)
(FM 61)

$W_t$ Type of opening in the ice. (Code table 4552)
(FM 44)

$W_1$ }
$W_2$ } Past weather. (Code table 4561)
(FM 12, FM 13, FM 14)

$w_e$ Weather. (Code table 4635)
(FM 45)

$w_i$ Method by which winds were determined. (Code table 4639)
(FM 88)

ww Present weather reported from a manned weather station. (Code table 4677)
(FM 12, FM 13, FM 14, FM 22, FM 45)

(1) For correct use of the code, it is necessary to study with care Part III of the *International Cloud Atlas* (WMO-No. 407) which deals with meteors other than clouds

(2) The first figure of the scale ww indicates *grosso modo* a division of the scale into ten deciles, numbered 0–9, which correspond to ten principal categories of weather. Firstly, the decile the most suitable to the general state of the weather is chosen; then, in the complete list, the code figure is chosen which best describes the weather at the time of observation or (where specifically mentioned in the code) during the period of one hour immediately preceding it. In making the choice of the decile or in determining the complete code figure ww, one does not take into account meteorological phenomena which have been experienced more than one hour before the observation

$w_aw_a$ Present weather reported from an automatic weather station. (Code table 4680)
(FM 12, FM 13, FM 14)

$w_sw_s$ Significant weather. (Code table 4683)
(FM 45, FM 46)

$w_1w_1$ Present weather phenomenon not specified in Code table 4677, or specification of present weather phenomenon in addition to group $7wwW_1W_2$. (Code table 4687)
(9-group in Section 3 of FM 12, FM 13 and FM 14)

w´w´ Significant present and forecast weather. (Code table 4678)
(FM 15, FM 16, FM 51)

www Amount, in millimetres, of precipitable water in a layer.
(FM 86)

$w_{L1}w_{L1}w_{L1}$ }
$w_{L2}w_{L2}w_{L2}$ }
. . . }
$w_{Ln}w_{Ln}w_{Ln}$ } Amount, in millimetres, of precipitable water in layers between $P_AP_A$ and respectively $P_1P_1 \ldots P_nP_n$
(FM 86)

$w_1w_1w_1$ Forecast weather. (Code table 4691)
(FM 53, FM 54)

X Time of measurement or period of reference and tendency of the element measured, the value of which is indicated by $H_sH_sH_sH_s$ or $QQQe_Q$. (Code table 4700)
(FM 67)

(1) This characteristic applies to the measurement of stage or discharge given by the four figures of the group which follow X.

$X_RX_R$ Recorder type. (Code table 4770)
(FM 63, FM 64)

$X_tX_t$ Type of drogue. (Code table 4780)
(FM 18)

XXX The three most significant digits of radiological quantity or release quantity.
(FM 22, FM 57)

x Exponent for spectral wave data. (Code table 4800)
(FM 65)

$x_4$ Hemisphere indicator. (Code table 4865)
(FM 82)

$x_1x_1$ Form in which point position groups are given. (Code table 4887)
(FM 45)

$x_2x_2x_2$ Type of analysis. (Code table 4892)
(FM 45)

$x_3x_3x_3$ Value designator of a given chart or analysis. (Code table 4892)
(FM 45)

Y Day of the week (UTC). (Code table 4900)
(FM 83)

(1) The day indicated by Y shall be the day of the report or of the group involved; it is, therefore, the day of the observation and not the day of transmission.

(2) When information is given for a period which includes parts of two calendar days, Y shall refer to the second calendar day.

YY Day of the month (UTC), with 01 indicating the first day, 02 the second day, etc.:

(a) On which the actual time of observation falls;
(FM 12, FM 13, FM 14, FM 15, FM 16, FM 18, FM 20, FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38, FM 39, FM 40, FM 41, FM 42, FM 62, FM 63, FM 64, FM 65, FM 67, FM 85, FM 86, FM 87, FM 88)

(b) Indicating the date (day) of the beginning of the period for which the whole forecast or set of forecasts is valid;
(FM 53, FM 54, FM 61)

(c) Or indicating the day of the observation of the data, from which the chart is prepared;
(FM 44, FM 45, FM 46, FM 47, FM 49)

(d) On which the forecast was issued (FM 51);

(e) Indicating the date (day) on which part of the forecast commences or a forecast change commences (FM 51).

(1) In FM 32, FM 33, FM 34, FM 35, FM 36, FM 37, FM 38, FM 39, FM 40, FM 41 and FM 88, YY shall be used to indicate the unit of wind speed in addition to indicating the day of the month. When wind speeds are given in knots, 50 shall be added to YY. When the speed is given in metres per second, YY shall not be modified.

$Y_FY_F$ (a) Day of the month (UTC) on which the WINTEM message is valid;
(FM 50)

(b) Valid day of the month (UTC) of the temperature forecast
(FM51).

$Y_aY_a$ Date of accident, calendar day.
(FM 22, FM 57)

$Y_bY_b$ Year of beginning of the reference period.
(FM 71)

$Y_cY_c$ Year of ending of the reference period.
(FM 71)

$Y_eY_e$ (a) Date of end of monitoring operation or release, calendar day;
(FM 22)

(b) Day of month (UTC) of end of forecast change.
(FM 51)

$Y_rY_r$ Date of issue of the report, calendar day.
(FM 22)

— Date of issue of the forecast, calendar day.
(FM 57)

$Y_sY_s$ Date of start of monitoring operation or release, calendar day.
(FM 22)

— Day of the month (UTC) of observation of satellite data used for the preparation of the chart.
(FM 44)

$Y_0Y_0$ Date of analyses/forecasts used to produce the trajectory, calendar day.
(FM 57)

$Y_1Y_1$ Day of the month of the beginning of the period of validity.
(FM 51, FM 53, FM 54)

— Date of the beginning of the period covered by the forecast, calendar day.
(FM 57)

— Day of the month (UTC) indicating the date or the beginning of the period covered by the forecast.
(FM 68)

$\left.\begin{array}{l} Y^1Y^1 \\ Y^2Y^2 \\ \ldots \\ Y^jY^j \end{array}\right\}$ Date of expected arrival of radiological contamination at specified point location, calendar day.
(FM 57)

$Y_2Y_2$ Day of the month (UTC) indicating the end of the period covered by the forecast.
(FM 51, FM 68)

$y_Py_P$ Number of missing years within the reference period from the calculation of pressure normal.
(FM 71)

$y_Ry_R$ Number of missing years within the reference period from the calculation of normal for precipitation.
(FM 71)

$y_Sy_S$ Number of missing years within the reference period from the calculation of normal for sunshine duration.
(FM 71)

$y_Ty_T$ Number of missing years within the reference period from the calculation of normal for mean air temperature.
(FM 71)

$y_{Tx}y_{Tx}$ Number of missing years within the reference period from the calculation of normal for mean extreme air temperature.
(FM 71)

$y_{an}y_{an}$ Day of lowest air temperature during the month.
(FM 71)

$y_{ax}y_{ax}$ Day of highest air temperature during the month.
(FM 71)

$y_ey_e$ Number of missing years within the reference period from the calculation of vapour pressure normal.
(FM 71)

$y_{fx}y_{fx}$ Day of highest observed or recorded wind speed during the month.
(FM 71)

$y_ny_n$ Day of lowest daily mean air temperature during the month.
(FM 71)

$y_ry_r$ Day of highest daily amount of precipitation during the month.
(FM 71)

$y_xy_x$ Day of highest daily mean air temperature during the month.
(FM 71)

yyyyy Position groups in the form indicated by the $333x_1x_1$ group.
(FM 45)

$Z_T$ Character of the temperature reported by TT. (Code table 5122)
(FM 39, FM 40)

| | |
|---|---|
| $Z_0$ | Optical phenomena. (Code table 5161)<br>(9-group in Section 3 of FM 12, FM 13 and FM 14) |
| $Z_1$ | Nature of evolution of zone $S_2$. (Code table 5162)<br>(FM 45) |
| ZZ | Meteorological zone number by 5 degrees of longitude or latitude. (Code table 5177)<br>(FM 54) |
| $Z_dZ_dZ_d$ | Length of the cable at which the drogue is attached, in metres.<br>(FM 18) |
| $Z_cZ_cZ_cZ_c$ | Length of cable, in metres (thermistor strings).<br>(FM 18) |
| $Z_dZ_dZ_dZ_d$ | Total water depth, in metres.<br>(FM 63, FM 64) |
| $Z_hZ_hZ_hZ_h$ | Hydrostatic pressure of lower end of cable, in kPa.<br>(FM 18) |
| $z_i$ | Present ice situation and trend of conditions over preceding three hours. (Code table 5239)<br>(FM 12, FM 13, FM 14) |
| zz | Variation, location or intensity of phenomena. (Code table 4077)<br>(9-group in Section 3 of FM 12, FM 13 and FM 14) |
| — | Depth, in hundreds of metres, starting with the surface.<br>(FM 63) |
| $z_0z_0$<br>$z_1z_1$<br>. . .<br>$z_nz_n$ | Significant depths, in metres, starting with the surface.<br>(FM 63) |
| zzz | Zone specification. (Code table 1863)<br>(FM 54) |
| $z_0z_0z_0z_0$<br>$z_1z_1z_1z_1$<br>. . .<br>$z_nz_nz_nz_n$ | Selected and/or significant depths, in metres, starting with the surface.<br>(FM 18, FM 64) |
| /<br>//<br>… | Missing data.<br>(1) The number of solidi depends on the number of symbolic letters for which no data can be reported. |

# Section C

# SPECIFICATIONS OF CODE FIGURES
# (code tables)

a. **Numbering system of international code tables**

b. **Code tables**

# a. NUMBERING SYSTEM OF INTERNATIONAL CODE TABLES

When coding a report, analysis or forecast, symbolic letters or letter groups are replaced by figures, which specify the value or the state of the corresponding element. In some cases, the specification of the symbolic letter (or group of letters) is sufficient to permit a direct transcription into figures, e.g. GG or PPP. In other cases, these figures are obtained by means of a special code table for each element.

The code tables are used inversely for decoding incoming reports, analyses or forecasts, thus making available the information contained therein.

The code tables are numbered, each code table bearing a number consisting of four figures from 0100 up to 5299 and allotted in the alphabetical order of the symbols to which the code tables correspond. The attribution of the numbers is done in accordance with the following system:

The first two figures represent the number of the main letter of the symbol in alphabetical order. Capital letters are given an odd number, and small letters an even number: 01 for A, 02 for a, 03 for B, 04 for b . . . . . 51 for Z and 52 for z.

The two last figures are allocated in accordance with the following scheme:

00 to 01 are reserved for code tables corresponding to a symbol composed of one letter only (X or x, for instance);

02 to 30 are reserved for code tables corresponding to symbols of the forms $X_A$ to $X_Z$, $x_A$ to $x_Z$ and derived symbols such as $X_{A0}$ or $x_{A0}$;

31 to 60 are reserved for code tables corresponding to symbols of the forms $X_a$ to $X_z$, $x_a$ to $x_z$ and derived symbols such as $X_{a0}$ or $x_{a0}$;

61 to 70 are reserved for code tables corresponding to symbols of the forms $X_0$ to $X_n$, or $x_0$ to $x_n$, n being any number;

71 to 99are reserved for code tables corresponding to symbols of the forms X´, XX, XXX, x´, xx, xxx or any similar forms such as $X_bX_b$, $X_0X_0X_0$, $x_bx_b$, $x_0x_0x_0$.

The numbering system and the numbers attributed to the code tables for the different elements are given in the following table.

Besides the specifications given by the code tables in worldwide use, other sets of code tables are established for regional use, which are numbered with a three-figure number ranging from 120 to 800, and are given in Volume II of the *Manual on Codes*.

**NUMBERING SYSTEM OF**
**INTERNATIONAL CODE TABLES**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0101 | A | 0552 | $C_t$ | 1063 | $e_2$ | 1853 | $i_u$ |
| 0104 | $A_C$ | 0561 | $C_0$ | 1079 | $e_Re_R$ | 1855 | $i_w$ |
| 0114 | $A_N$ | 0562 | $C_1$ | 1085 | $e_Te_T$ | 1857 | $i_y$ |
| 0131 | $A_a$ | 0639 | $c_i$ | 1095 | $e_we_w$ | 1859 | $i_z$ |
| 0133 | $A_c$ | 0659 | $c_T$, $c_W$ | 1109 | $F_H$ | 1860 | $i_x$ |
| 0135 | $A_e$ | | D, $D_H$, $D_K$, $D_L$, | 1133 | $F_c$ | 1861 | $i_0$ |
| 0139 | $A_i$ | 0700 | $D_M$, $D_a$, $D_e$, $D_p$, | 1135 | $F_e$, $F_p$, $F_q$, | 1863 | $i_2$, zzz |
| 0152 | $A_t$ | | $D_s$, $D_1$ | | $F_s$, $F_u$ | 1864 | $i_3$, nnn |
| 0161 | $A_1$, $b_w$ | 0739 | $D_i$ | 1139 | $F_i$ | 2061 | $j_1$, $j_2j_3j_4$, $j_5j_6j_7j_8j_9$ |
| 0163 | $A_3$ | 0755 | $D_w$ | 1144 | $F_m$ | 2100 | K |
| 0177 | AA | | $D_tD_t$ | 1152 | $F_t$ | 2200 | k |
| 0200 | a | | $D_0D_0$ | 1162 | $F_1$, $F_2$, etc. | 2262 | $k_1$ |
| 0204 | $a_C$ | 0777 | $D_1D_1$ | 1200 | f | 2263 | $k_2$ |
| 0210 | $a_I$ | | . . . | 1236 | $f_e$ | 2264 | $k_3$ |
| 0235 | $a_e$ | | $D_nD_n$ | 1300 | G | 2265 | $k_4$ |
| 0239 | $a_i$ | 0822 | $d_T$ | 1400 | g | 2266 | $k_5$ |
| 0244 | $a_m$ | 0833 | $d_c$ | 1487 | $g_rg_r$ | 2267 | $k_6$ |
| 0252 | $a_t$ | | dd, $d_hd_h$, $d_jd_j$, | 1535 | $H_e$ | 2300 | L |
| 0262 | $a_1$ | | $d_md_m$, $d_sd_s$, | 1561 | $H_1$, $H_2$, $H_3$, $H_4$, $H_5$ | 2382 | $L_iL_i$, $L_jL_j$ |
| 0264 | $a_3$ | | $d_wd_w$, $d_{w1}d_{w1}$, | 1600 | h | 2538 | $M_h$ |
| 0265 | $a_4$ | | $d_{w2}d_{w2}$, $d_0d_0$ | 1677 | $h_sh_s$, $h_th_t$ | 2551 | $M_s$ |
| 0266 | $a_5$ | | $d_0d_0$ | | $h_Bh_Bh_B$, $h_fh_fh_f$, | 2552 | $M_t$ |
| 0291 | $a_1a_1a_1$, $a_2a_2a_2$ | 0877 | $d_1d_1$ | 1690 | $h_ih_ih_i$, $h_sh_sh_s$, | 2555 | $M_w$ |
| 0300 | B | | . . . $d_nd_n$ | | $h_th_th_t$, $h_xh_xh_x$ | 2562 | $M_1$, $M_2$ |
| 0302 | $B_A$ | | $d_1d_1$ | 1700 | I | 2582 | $M_iM_i$, $M_jM_j$ |
| 0324 | $B_T$ | | $d_2d_2$ | 1731 | $I_a$ | 2590 | MMM |
| 0359 | $B_z$ | | . . . | 1732 | $I_b$ | 2600 | m |
| 0366 | $B_RB_R$ | | $d_nd_n$ | 1733 | $I_c$ | 2604 | $m_S$, $m_T$, $m_c$ |
| 0370 | $B_tB_t$ | 0878 | dd | 1734 | $I_d$ | 2649 | $m_r$ |
| 0371 | $B_1B_2B_3$ | | $d_{a1}d_{a1}$, $d_{a2}d_{a2}$ | 1735 | $I_e$ | 2650 | $m_s$ |
| 0439 | $b_i$ | | $d_dd_d$ $d_1d_1$ | 1741 | $I_j$ | 2677 | mm |
| 0491 | $b_1b_1$,$b_2b_2$ | 0880 | $d_2d_2$ | 1743 | $I_n$ | 2700 | N, $N_h$, $N_s$, N´ |
| 0500 | C, C´ | | . . . | 1744 | $I_m$ | 2745 | $N_m$ |
| | C, $C_e$, $C_p$, $C_q$, | | $d_nd_n$ | 1747 | $I_p$ | 2752 | $N_t$ |
| 0501 | $C_s$, $C_u$, $C_1$, $C_2$, | 0901 | E | 1751 | $I_s$ | 2754 | $N_v$ |
| | $C_3$, $C_4$, $C_5$, $R_e$ | 0919 | $E_R$ | 1765 | $I_4$ | 2776 | $N_eN_e$ |
| 0509 | $C_H$ | 0933 | $E_c$ | 1770 | $I_XI_XI_X$ | 2836 | $n_f$ |
| 0513 | $C_L$ | 0935 | $E_e$ | 1800 | i | 2863 | $n_3$ |
| 0515 | $C_M$ | 0938 | $E_h$ | 1806 | $i_E$ | 2864 | $n_4$ |
| 0519 | $C_R$ | 0943 | $E_s$ | 1819 | $i_R$ | 2877 | $n_Bn_B$, $n_Gn_G$ |
| 0521 | $C_S$ | 0964 | $E_3$ | 1833 | $i_c$ | 2890 | $n_Tn_T$ |
| 0531 | $C_a$ | 0975 | E´ | 1840 | $i_h$ | 3131 | $P_a$ |
| 0533 | $C_c$ | 0977 | $E_1E_1$, $E_2E_2$ | 1841 | $i_j$ | 3133 | $P_c$, $h_c$ |
| 0544 | $C_m$ | 1004 | $e_C$, e´ | 1845 | $i_m$ | 3139 | $P_i$ |
| 0551 | $C_s$ | 1062 | $e_1$ | 1851 | $i_s$ | 3152 | $P_t$, $h_t$ |

*(continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3155 | $P_w$ | 3704 | $S_C$ | | $T_a$, $T_{at}$ | 4504 | $W_C$ |
| 3300 | Q | 3738 | $S_h$ | | $T_{a0}$ | 4530 | $W_R$ |
| 3302 | $Q_A$ | 3739 | Si | 3931 | $T_{a1}$ | 4531 | $W_{a1}$, $W_{a2}$ |
| 3311 | $Q_L$ | 3761 | $S_0$ | | . . . | 4536 | $W_f$ |
| 3313 | $Q_N$ | 3762 | $S_1$, $S_2$ | | $T_{an}$ | 4544 | $W_m$ |
| 3315 | $Q_P$ | 3763 | $S_1$, $S_2$, $S_3$, | 3933 | $T_c$ | 4552 | $W_t$ |
| 3318 | $Q_z$ | | $S_4$, $S_5$ | 3939 | Ti | 4561 | W, $W_1$, $W_2$ |
| 3319 | $Q_{TW}$ | 3764 | $S_6$ | 3940 | Ti | 4635 | $w_e$ |
| 3333 | $Q_c$ | 3765 | $S_7$ | 3952 | $T_t$ | 4639 | $w_i$ |
| 3334 | $Q_d$, $Q_{d1}$, $Q_{d2}$, $Q_l$, | 3766 | $S_8$ | 3955 | $T_w$ | 4677 | ww |
| | $Q_t$ | 3775 | $S'_7$ | 3956 | $T_n$, $T_x$ | 4678 | w´w´ |
| 3363 | $Q_2$, $Q_4$ | 3776 | $S'_8$ | 3962 | $T_1$, $T_2$ | 4680 | $w_aw_a$ |
| 3462 | $q_1$ | 3777 | SS | 4001 | t | 4683 | $w_sw_s$ |
| 3463 | $q_2$ | 3778 | $S_PS_Ps_ps_p$ | 4006 | $t_E$ | 4687 | $w_1w_1$ |
| 3533 | $R_c$ | 3780 | $S_fS_f$ | 4013 | $t_L$ | 4691 | $w_1w_1w_1$ |
| 3534 | $R_d$ | 3790 | $S_tS_t$ | 4019 | $t_R$ | 4700 | X |
| 3535 | $R_e$ | 3833 | $s_c$ | 4035 | $t_e$ | 4770 | $X_RX_R$ |
| 3538 | $R_h$ | 3845 | $s_n$ | 4044 | $t_m$ | 4780 | $X_tX_t$ |
| 3548 | $R_p$ | 3847 | $s_p$ | 4047 | $t_p$ | 4800 | x |
| 3551 | $R_s$ | 3848 | $s_q$ | 4055 | $t_w$ | 4865 | $x_4$ |
| 3552 | $R_t$ | 3849 | $s_r$ | 4077 | tt, zz | 4887 | $x_1x_1$ |
| 3555 | $R_w$ | 3850 | $s_s$ | 4200 | u | 4892 | $x_2x_2x_2$, $x_3x_3x_3$ |
| 3570 | RR | 3855 | $s_w$ | 4232 | $u_b$ | 4900 | Y |
| 3590 | RRR | 3856 | $s_x$ | 4242 | $u_p$ | 5122 | $Z_T$ |
| 3596 | RRRR | 3866 | $s_1$ | 4252 | $u_t$ | 5161 | $Z_0$ |
| | $R_1R_1R_1R_1$ | 3867 | $s_2$ | 4300 | V, $V_s$, $V'_s$ | 5162 | $Z_1$ |
| 3644 | $r_m$ | 3868 | $s_3$ | 4332 | $V_b$ | 5177 | ZZ |
| 3652 | $r_t$ | 3870 | ss | 4377 | VV, $V_sV_s$ | 5239 | $z_i$ |
| 3685 | $r_ar_a$ | 3872 | $s_as_a$ | 4448 | $v_p$ | | |
| 3700 | S, S´ | 3889 | sss | 4451 | $v_s$ | | |

# b. CODE TABLES

## 0101

**A** *Mirage*

| Code figure | |
|---|---|
| **0** | **No specification** |
| **1** | **Image of distant object raised (looming)** |
| **2** | **Image of distant object raised clear above the horizon** |
| **3** | **Inverted image of distant object** |
| **4** | **Complex, multiple images of distant object (images not inverted)** |
| **5** | **Complex, multiple images of distant object (some images being inverted)** |
| **6** | **Sun or moon seen appreciably distorted** |
| **7** | **Sun visible, although astronomically below the horizon** |
| **8** | **Moon visible, although astronomically below the horizon** |

Note: When code figures 4, 5 or 6 apply, recognition of the objects is liable to be difficult.

## 0104

**$A_C$** *Accuracy of the position of the centre or the eye of the tropical cyclone*

| Code figure | |
|---|---|
| **1** | **Eye visible on radar scope, accuracy good (within 10 km)** |
| **2** | **Eye visible on radar scope, accuracy fair (within 30 km)** |
| **3** | **Eye visible on radar scope, accuracy poor (within 50 km)** |
| **4** | **Position of the centre within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy good (within 10 km)** |
| **5** | **Position of the centre within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy fair (within 30 km)** |
| **6** | **Position of the centre within the area covered by the radar scope, determination by means of the spiral-band overlay, accuracy poor (within 50 km)** |
| **7** | **Position of the centre outside the area covered by the radar scope, extrapolation by means of the spiral-band overlay** |
| **/** | **Accuracy undetermined** |

## 0114

**$A_N$** *Type of anemometer*

| Code figure | |
|---|---|
| **0** | **Cup rotor** |
| **1** | **Propeller rotor** |
| **2** | **Wind Observation through Ambient Noise (WOTAN)** |
| **/** | **Missing value (coded 15 in BUFR)** |

## 0131

**$A_a$** ***Accident early notification – article applicable***

| Code figure | |
|---|---|
| 1 | Articles 1 and 2 |
| 2 | Article 3 |
| 3 | Article 5.2 |
| 4–6 | Reserved |
| 7 | Missing value |

## 0133

**$A_c$** ***Cause of incident***

| Code figure | |
|---|---|
| 0 | Incident State does not understand what happened |
| 1 | Incident State knows the cause of the incident |
| 2 | Reserved |
| 3 | Missing value |

## 0135

**$A_e$** ***Incident situation***

| Code figure | |
|---|---|
| 0 | No improvement |
| 1 | Unstable |
| 2 | No deterioration |
| 3 | Improving |
| 4 | Stable |
| 5 | Deteriorating |
| 6 | Reserved |
| 7 | Missing value |

## 0139

**$A_i$** ***Accuracy of the fix and repetition rate of atmospherics***

| Code figure | Accuracy of fix | Repetition rate |
|---|---|---|
| 0 | No assessment | No assessment |
| 1 | Estimated error less than 50 km | Less than 1 per second |
| 2 | Estimated error between 50 and 200 km | Less than 1 per second |
| 3 | Estimated error more than 200 km | Less than 1 per second |
| 4 | Estimated error less than 50 km | 1 or more countable flashes per second |
| 5 | Estimated error between 50 and 200 km | 1 or more countable flashes per second |
| 6 | Estimated error more than 200 km | 1 or more countable flashes per second |
| 7 | Estimated error less than 50 km | Rate so rapid number cannot be counted |
| 8 | Estimated error between 50 and 200 km | Rate so rapid number cannot be counted |
| 9 | Estimated error more than 200 km | Rate so rapid number cannot be counted |

## 0152

**$A_t$** ***Accuracy of determination of the geographical position of the tropical cyclone***

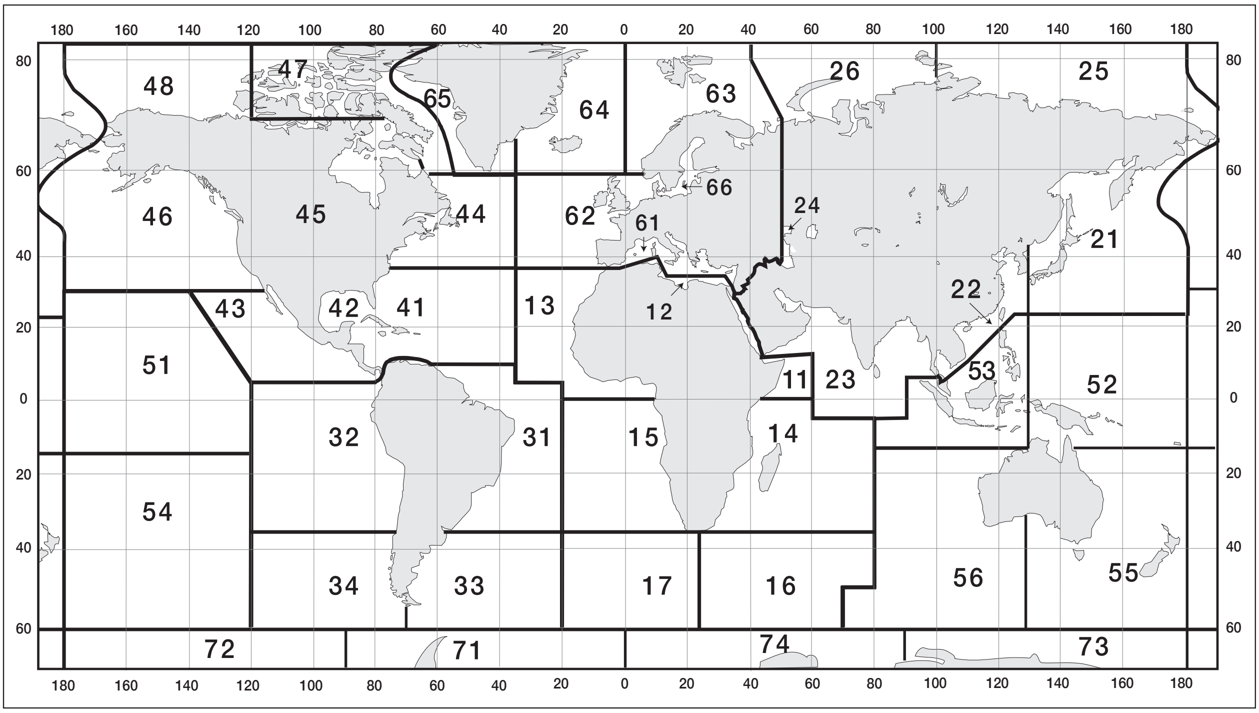
| Code figure | |
|---|---|
| **0** | **Cyclone centre within 10 km of the transmitted position** |
| **1** | **Cyclone centre within 20 km of the transmitted position** |
| **2** | **Cyclone centre within 50 km of the transmitted position** |
| **3** | **Cyclone centre within 100 km of the transmitted position** |
| **4** | **Cyclone centre within 200 km of the transmitted position** |
| **5** | **Cyclone centre within 300 km of the transmitted position** |
| **/** | **Cyclone centre undetermined** |

## 0161

**$A_1$** ***WMO Regional Association area in which buoy, drilling rig or oil- or gas-production platform has been deployed (1 – Region I; 2 – Region II, etc.)***

**$b_w$** ***Sub-area belonging to the area indicated by $A_1$***

Note: Two digit-numbers in the map correspond to $A_1$ suffixed by $b_w$.




## 0163

**$A_3$** ***Day darkness, worst in direction $D_a$***

| Code figure | |
|---|---|
| **0** | **Day darkness, bad** |
| **1** | **Day darkness, very bad** |
| **2** | **Day darkness, black** |

## 0177

**AA** ***Activity or facility involved in incident***

| Code figure | |
|---|---|
| 1 | Nuclear reactor on ground |
| 2 | Nuclear reactor at sea |
| 3 | Nuclear reactor in space |
| 4 | Nuclear fuel facility |
| 5 | Radioactive waste management facility |
| 6 | Transport of nuclear fuel or radioactive waste |
| 7 | Storage of nuclear fuel or radioactive waste |
| 8 | Manufacture of radio-isotopes |
| 9 | Use of radio-isotopes |
| 10 | Storage of radio-isotopes |
| 11 | Disposal of radio-isotopes |
| 12 | Transport of radio-isotopes |
| 13 | Use of radio-isotopes for power generation |
| 14–19 | Reserved |
| 20 | Fire in toxic chemical plant |
| 21 | Transport of toxic chemicals |
| 22 | Toxic chemical leakage into a river |
| 23–29 | Reserved |
| 30 | Other |
| 31 | Missing value |

## 0200

**a** ***Characteristic of pressure tendency during the three hours preceding the time of observation***

| Code figure | | |
|---|---|---|
| 0 | Increasing, then decreasing; atmospheric pressure the same or higher than three hours ago | |
| 1 | Increasing, then steady; or increasing, then increasing more slowly | Atmospheric pressure now higher than three hours ago |
| 2 | Increasing (steadily or unsteadily)* | |
| 3 | Decreasing or steady, then increasing; or increasing, then increasing more rapidly | |
| 4 | Steady; atmospheric pressure the same as three hours ago* | |
| 5 | Decreasing, then increasing; atmospheric pressure the same or lower than three hours ago | |
| 6 | Decreasing, then steady; or decreasing, then decreasing more slowly | Atmospheric pressure now lower than three hours ago |
| 7 | Decreasing (steadily or unsteadily)* | |
| 8 | Steady or increasing, then decreasing; or decreasing, then decreasing more rapidly | |

* For reports from automatic stations, see Regulation 12.2.3.5.3.

## 0204

**$a_C$** *Change in character of the eye during the 30 minutes preceding the time of observation*

| Code figure | |
|---|---|
| 0 | Eye has first become visible during the past 30 minutes |
| 1 | No significant change in the characteristics or size of the eye |
| 2 | Eye has become smaller with no other significant change in characteristics |
| 3 | Eye has become larger with no other significant change in characteristics |
| 4 | Eye has become less distinct with no significant change in size |
| 5 | Eye has become less distinct and decreased in size |
| 6 | Eye has become less distinct and increased in size |
| 7 | Eye has become more distinct with no significant change in size |
| 8 | Eye has become more distinct and decreased in size |
| 9 | Eye has become more distinct and increased in size |
| / | Change in character and size of eye cannot be determined |

## 0210

**$a_I$** *Trend in behaviour of ice*

| Code figure | |
|---|---|
| 0 | No change |
| 1 | Ice situation improving (for navigation) |
| 2 | Ice situation worsening (for navigation) |
| 3 | Ice breaking up |
| 4 | Ice opening or drifting away |
| 5 | Ice increasing |
| 6 | Ice freezing together |
| 7 | Ice drifting in |
| 8 | Ice under pressure |
| 9 | Ice hummocking, or hummocking and screwing |
| / | Undetermined or unknown |

## 0235

**$a_e$** *Tendency of echo pattern*

| Code figure | Tendency of intensity | Tendency of the area |
|---|---|---|
| 1 | Decreasing | Decreasing |
| 2 | Decreasing | No appreciable change |
| 3 | Decreasing | Increasing |
| 4 | No appreciable change | Decreasing |
| 5 | No appreciable change | No appreciable change |
| 6 | No appreciable change | Increasing |
| 7 | Increasing | Decreasing |
| 8 | Increasing | No appreciable change |
| 9 | Increasing | Increasing |
| / | Undetermined | Undetermined |

## 0239

**$a_i$** ***Distribution of atmospherics***

| Code figure | |
|---|---|
| **0** | **No atmospherics** |
| **2** | **Isolated point of activity** |
| **4** | **Sources of atmospherics activity located in the *area* enclosed by lines joining successive points $L_aL_aL_oL_ok$** |
| **6** | **Origin of atmospherics activity approximating a *line* joining successive points $L_aL_aL_oL_ok$** |
| **9** | **No report due to technical reasons** |

## 0244

**$a_m$** ***Portion of the maritime area***

| Code figure | |
|---|---|
| **0** | **Whole of the area AAA** |
| **1** | **NE quadrant of the area AAA** |
| **2** | **Eastern half of the area AAA** |
| **3** | **SE quadrant of the area AAA** |
| **4** | **Southern half of the area AAA** |
| **5** | **SW quadrant of the area AAA** |
| **6** | **Western half of the area AAA** |
| **7** | **NW quadrant of the area AAA** |
| **8** | **Northern half of the area AAA** |
| **9** | **Rest of the area AAA** |

## 0252

**$a_t$** ***Apparent 24-hour change in intensity of the tropical cyclone***

| Code figure | |
|---|---|
| **0** | **Much weakening** |
| **1** | **Weakening** |
| **2** | **No change** |
| **3** | **Intensification** |
| **4** | **Strong intensification** |
| **9** | **Not observed previously** |
| **/** | **Undetermined** |

## 0262

**$a_1$** ***Reason for no report or ground equipment employed***

| Code figure | |
|---|---|
| **0** | **Launch not scheduled** |
| **1** | **Rocket motor failure** |
| **2** | **Instrument (or) telemetry signal not received** |
| **3** | **Ground tracking equipment failure** |
| **4** | **Weather prohibited launch** |
| **5** | **Range restrictions prohibited launch** |
| **6** | **Lack of expendables prohibited launch** |
| **7** | **Radar only employed** |
| **8** | **Radar and telemetry equipment employed** |
| **9** | **Telemetry equipment only employed** |

Notes:

(1) Code figures 0 to 6 shall be used to show the reason for no report when a scheduled launch is aborted, or when a launch is accomplished but no data are available.

(2) Code figures 7 to 9 shall be used to show the type of ground equipment employed during a satisfactory launch.

## 0264

**$a_3$** ***Standard isobaric surface for which the geopotential is reported***

| Code figure | |
|---|---|
| **1** | **1 000 hPa** |
| **2** | **925 hPa** |
| **5** | **500 hPa** |
| **7** | **700 hPa** |
| **8** | **850 hPa** |

## 0265

**$a_4$** ***Type of measuring equipment used***

| Code figure | |
|---|---|
| **0** | **Pressure instrument associated with wind-measuring equipment** |
| **1** | **Optical theodolite** |
| **2** | **Radiotheodolite** |
| **3** | **Radar** |
| **4** | **Pressure instrument associated with wind-measuring equipment but pressure element failed during ascent** |
| **5** | **VLF-Omega** |
| **6** | **Loran-C** |
| **7** | **Wind profiler** |
| **8** | **Satellite navigation** |
| **9** | **Reserved** |

## 0266

**$a_5$** ***Type of report and unit of reported radiological quantity***

| Code figure | |
|---|---|
| 1 | Report of accidental radioactivity release to atmosphere, in becquerels (Bq) |
| 2 | Report of accidental radioactivity release to water, in becquerels (Bq) |
| 3 | Report of accidental radioactivity release to both atmosphere and water, in becquerels (Bq) |
| 4 | Report of accidental radioactivity release to ground water, in becquerels (Bq) |
| 5 | Report of named isotope concentration in precipitation, in becquerels per litre (Bq $l^{-1}$) |
| 6 | Report of named isotope type including gross beta concentration in air, in becquerels per cubic metre (Bq $m^{-3}$), and, if data available, the density of deposits, in becquerels per square metre (Bq $m^{-2}$) |
| 7 | Report of gamma dose in air along main transport path and, if data available, on land surface, in millisieverts (mSv) |
| 8 | Report of an airborne observing station of named isotope type including concentration in air, in becquerels per cubic metre (Bq $m^{-3}$), and/or report of gamma dose in air, in millisieverts (mSv) |
| 9 | Reserved |

## 0291

**$a_1a_1a_1$, $a_2a_2a_2$** ***Type of parameter***

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 000 | — | — | — | | Indicates missing parameter |
| 001 | Pressure | 0 hPa | 1 hPa | | |
| 002 | Geopotential height | 0 gpm | 10 gpm | | |
| 003 | Geometrical height | 0 m | 10 m | | |
| 004 | Temperature | 0°C | 1°C | | |
| 005 | Maximum temperature | 0°C | 1°C | | Surface level only |
| 006 | Minimum temperature | 0°C | 1°C | | Surface level only |
| 007 | Temperature deviation from normal | 0°C | 1°C | | |
| 008 | Potential temperature | 0°C | 1°C | | |
| 009 | Pseudo-adiabatic potential temperature | 0°C | 1°C | | |
| 010 | Dew-point temperature | 0°C | 1°C | | |
| 011 | Dew-point depression (or deficit) | 0°C | 1°C | | |
| 012 | Specific humidity | 0 g $kg^{-1}$ | 0.1 g $kg^{-1}$ | | |
| 013 | Relative humidity | 0 % | 1 % | | |
| 014 | Humidity mixing ratio | 0 g $kg^{-1}$ | 0.1 g $kg^{-1}$ | | |
| 015 | Stability index | 0°C | 1°C | | See Code table 2677 for specific parameters |
| 016 | Saturation deficit | 0 hPa | 0.1 hPa | | |
| | | (for a specific *level*) | | | |
| | | 0 gpm | 10 gpm | | |
| | | (for a specific *layer*) | | | |
| 017 | 4-layer lifted index | 0°C | 1°C | | |
| 018<br>019 | | | | | Reserved |
| 020 | Wind direction | 0° | 10° | | |
| 021 | Wind speed | 0 m $s^{-1}$ | 1 m $s^{-1}$ | | |
| 022 | Wind direction and speed | 0°, 0 m $s^{-1}$ | 5°, 1 m $s^{-1}$ | | TEMP code form |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 023 } 024 } | Wind components | 0 m $s^{-1}$ | 1 m $s^{-1}$ | | Relative to coordinate system used |
| 025 | Wind speed | 0 kt | 1 kt | | |
| 026 | Wind direction and speed | 0°, 0 kt | 5°, 1 kt | | TEMP code form |
| 027 } 028 } | Wind components | 0 kt | 1 kt | | Relative to coordinate system used |
| 029 | Stream function | 0 $m^2$ $s^{-1}$ | $10^5$ $m^2$ $s^{-1}$ | | |
| 030 | Relative vorticity | 0 $s^{-1}$ | $10^{-5}$ $s^{-1}$ | | |
| 031 | Absolute vorticity | 0 $s^{-1}$ | $10^{-5}$ $s^{-1}$ | | |
| 032 | Relative vorticity advection | 0 $s^{-2}$ | $10^{-9}$ $s^{-2}$ | | |
| 033 | Absolute vorticity advection | 0 $s^{-2}$ | $10^{-9}$ $s^{-2}$ | | |
| 034 | Horizontal velocity divergence | 0 $s^{-1}$ | $10^{-5}$ $s^{-1}$ | | |
| 035 | Horizontal moisture divergence | 0 g $kg^{-1}$ $s^{-1}$ | 0.1 g $kg^{-1}$ $s^{-1}$ | | |
| 036 | Geostrophic vorticity | 0 $s^{-1}$ | $10^{-5}$ $s^{-1}$ | | |
| 037 | Geostrophic vorticity advection | 0 $s^{-2}$ | $10^{-9}$ $s^{-2}$ | | |
| 038 | | | | | Reserved |
| 039 | Velocity potential | 0 $m^2$ $s^{-1}$ | $10^3$ $m^2$ $s^{-1}$ | | |
| 040 | Vertical velocity (↓) | 0 cb $s^{-1}$ | $10^{-1}$ cb $s^{-1}$ | | |
| 041 | Vertical velocity (↓) | 0 cb/12 h | 1 cb/12 h | | |
| 042 | Vertical velocity (↓) | 0 hPa $h^{-1}$ | 1 hPa $h^{-1}$ | | |
| 043 | Vertical velocity (↑) | 0 mm $s^{-1}$ | 1 mm $s^{-1}$ | | |
| 044 | Vertical wind shear | 0 m $s^{-1}$/1 000 m | 1 m $s^{-1}$/1 000 m | | |
| 045 | Vertical wind shear | 0 kt/1 000 m | 1 kt/1 000 m | | |
| 046 | Lapse rate | 0°C/100 m | 0.1°C/100 m | | |
| 047 | Precipitable water | 0 mm | 1 mm | | |
| 048 | Convective precipitation amount | 0 mm | 1 mm | | |
| 049 | Precipitation rate | 0 mm $h^{-1}$ | 1 mm $h^{-1}$ | | |
| 050 | Precipitation amount | 0 mm | 1 mm | | Surface level only |
| 051 | Snow depth | 0 cm | 1 cm | | Surface level only |
| 052 | Outgoing long-wave radiation | 0 joule | 0.1 joule (1 J = $10^7$ ergs) | | Integrated over 24 hours |
| 053 | Outgoing short-wave radiation | 0 joule | 0.1 joule | | Integrated over 24 hours |
| 054 | Incoming short-wave radiation | 0 joule | 0.1 joule | | Integrated over 24 hours |
| 055 | Non-convective precipitation amount | 0 mm | 1 mm | | |
| 056 } 057 } | | | | | Reserved |
| 058 | Afternoon SST warming | 0°C | 0.01°C | | |
| 059 | Temperature anomaly | 0°C | 0.01°C | | |
| 060 | Deviation of sea level from mean | 0 cm | 1 cm | | |
| 061 | Sea temperature | 0°C | 0.1°C | | |
| 062 | Salinity | 0 ‰ | | | |
| 063 | Density | | | | |
| 064 | Significant height of combined wind waves and swell | 0 m | 0.5 m | | Threshold value of 0.5 m |
| 065 | Direction of swell | 0° | 10° | | |
| 066 | Significant height of swell | 0 m | 0.5 m | | Threshold value of 0.5 m |
| 067 | Mean period of swell | 0 s | 1 s | | |
| 068 | Direction of wind waves | 0° | 10° | | |
| 069 | Significant height of wind waves | 0 m | 0.5 m | | Threshold value of 0.5 m |
| 070 | Mean period of wind waves | 0 s | 1 s | | |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 071 | Direction of current | 0° | 10° | | |
| 072 | Speed of current | 0 cm $s^{-1}$ | 1 cm $s^{-1}$ | | |
| 073<br>074 | Current components | 0 cm $s^{-1}$ | 1 cm $s^{-1}$ | | Relative to coordinate system used |
| 075 | Primary wave direction | 0° | 10° | | |
| 076 | Primary wave period | 0 s | 1 s | | |
| 077 | Secondary wave direction | 0° | 10° | | |
| 078 | Secondary wave period | 0 s | 1 s | | |
| 079 | Cloud cover | | 0, 1, 2, 3, 4, 5, 6, 7, 8 | | Cloud amount in oktas (see Code table 2677 for specific parameters) |
| 080 | Thunderstorm | | | 0, 1 | 0 = absent, 1 = occurring |
| 081 | Tropical revolving storm | | | 0, 1 | 0 = absent, 1 = occurring |
| 082 | Line squall | | | 0, 1 | 0 = absent, 1 = occurring |
| 083 | Hail | | | 0, 1 | 0 = absent, 1 = occurring |
| 084 | Turbulence (generally associated with cloud) | | | 0, 1, 2 | 0 = nil or slight, 1 = moderate, 2 = severe |
| 085 | Clear air turbulence | | | 0, 1, 2 | 0 = nil or slight, 1 = moderate, 2 = severe |
| 086 | Icing | | | 0, 1, 2 | 0 = nil or slight, 1 = moderate, 2 = severe |
| 087 | Mountain waves | | | 0, 1 | 0 = absent, 1 = occurring |
| 088 | Sandstorm/duststorm | | | 0, 1 | 0 = absent, 1 = occurring |
| 089 | Freezing rain | | | 0, 1 | 0 = absent, 1 = occurring |
| 090 | Ice concentration | | | 0, 1 | 0 = no sea ice, 1 = occurrence of sea ice |
| 091 | Ice thickness | 0 m | 1 m | | |
| 092 | Ice drift u-component | 0 km/day | 1 km/day | | |
| 093 | Ice drift v-component | 0 km/day | 1 km/day | | |
| 094 | Ice growth | 0 dm | 1 dm | | |
| 095 | Ice convergence/divergence | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 096<br>097<br>098<br>099 | | | | | Reserved |
| 100 | Pressure | 0 daPa | 1 daPa | | |
| 101 | Geopotential thickness | 0 gpm | 1 gpm | | |
| 102 | Geopotential height | 0 gpm | 1 gpm | | |
| 103 | Geometrical height | 0 m | 1 m | | |
| 104 | Temperature | 0°C | 0.1°C | | |
| 105<br>.<br>.<br>.<br>111 | | | | | Reserved |
| 112 | Specific humidity | 0 kg $kg^{-1}$ | 1 kg $kg^{-1}$ | | |
| 113 | Relative humidity | 0 % | 0.1 % | | |
| 114 | Humidity mixing ratio | 0 kg $kg^{-1}$ | 1 kg $kg^{-1}$ | | |
| 115 | Stability (lifted) index | 0°C | 0.1°C | | |
| 116 | Saturation deficit | 0 hPa<br>0 gpm | 1 hPa<br>1 gpm | | |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 117<br>118<br>119 | | | | | Reserved |
| 120 | Wind direction | 0° | 1° | | |
| 121<br>.<br>.<br>.<br>128 | | | | | Reserved |
| 129 | Stream function | 0 $m^2$ $s^{-1}$ | 1 $m^2$ $s^{-1}$ | | |
| 130 | Relative vorticity | 0 $s^{-1}$ | 10-6 $s^{-1}$ | | |
| 131 | Absolute vorticity | 0 $s^{-1}$ | 10-6 $s^{-1}$ | | |
| 132 | Relative vorticity advection | 0 $s^{-2}$ | 1 $s^{-2}$ | | |
| 133 | Absolute vorticity advection | 0 $s^{-2}$ | 1 $s^{-2}$ | | |
| 134 | Horizontal velocity divergence | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 135 | Horizontal moisture divergence | 0 kg $kg^{-1}$ $s^{-1}$ | 1 kg $kg^{-1}$ $s^{-1}$ | | |
| 136 | Geostrophic vorticity | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 137 | Geostrophic vorticity advection | 0 $s^{-2}$ | 1 $s^{-2}$ | | |
| 138 | | | | | Reserved |
| 139 | Velocity potential | 0 $m^2$ $s^{-1}$ | 1 $m^2$ $s^{-1}$ | | |
| 140 | Vertical velocity (↓) | 0 hPa $s^{-1}$ | 1 hPa $s^{-1}$ | | |
| 141 | Vertical velocity (↓) | 0 dPa $s^{-1}$ | 1 dPa $s^{-1}$<br>(1 microbar $s^{-1}$) | | |
| 142 | | | | | Reserved |
| 143 | Vertical velocity (↑) | 0 m $s^{-1}$ | 1 m $s^{-1}$ | | |
| 144 | Vertical wind shear | 0 m $s^{-1}$/1 m | 1 m $s^{-1}$/1 m | | |
| 145 | | | | | Reserved |
| 146 | Lapse rate | 0°C/1 m | 1°C/1 m | | |
| 147 | Precipitable water | 0 m | 1 m | | |
| 148 | | | | | Reserved |
| 149 | Precipitation rate | 0 m $s^{-1}$ | 1 m $s^{-1}$ | | |
| 150 | Precipitation amount | 0 m | 1 m | | |
| 151 | Snow depth | 0 m | 1 m | | |
| 152 | Outgoing long-wave radiation | 0 joule | 1 joule<br>(1 J = $10^7$ ergs) | | |
| 153 | Outgoing short-wave radiation | 0 joule | 1 joule | | |
| 154 | Incoming short-wave radiation | 0 joule | 1 joule | | |
| 155<br>156<br>157<br>158<br>159 | | | | | Reserved |
| 160 | Deviation of sea level from mean | 0 m | 1 m | | |
| 161 | Sea temperature | 0°C | 1°C | | |
| 162 | Sea-surface temperature | 0°C | 0.01°C | | |
| 163 | SST anomaly | 0°C | 0.01°C | | |
| 164 | Significant height of combined wind waves and swell | 0 m | 1 m | | |
| 165 | Direction of swell | 0° | 1° | | |
| 166 | Significant height of swell | 0 m | 1 m | | |
| 167 | | | | | Reserved |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 168 | Direction of wind waves | 0° | 1° | | |
| 169 | Significant height of wind waves | 0 m | 1 m | | |
| 170 | | | | | Reserved |
| 171 | Direction of current | 0° | 1° | | |
| 172 | Speed of current | 0 m $s^{-1}$ | 1 m $s^{-1}$ | | |
| 173<br>174 | Current components | 0 cm $s^{-1}$ | 1 cm $s^{-1}$ | | |
| 175<br>176<br>177<br>178<br>179 | | | | | Reserved |
| 180 | Mixed layer depth | 0 cm | 1 cm | | |
| 181 | Transient thermocline depth | 0 cm | 1 cm | | |
| 182 | Main thermocline depth | 0 cm | 1 cm | | |
| 183 | Main thermocline depth anomaly | 0 cm | 1 cm | | |
| 184<br>.<br>.<br>.<br>201 | | | | | Reserved |
| 202 | Pressure reduced to mean sea level | 0 hPa | 1 hPa | | |
| 203 | Pressure tendency | 0 hPa/3 h | 0.1 hPa/3 h | | |
| 204<br>.<br>.<br>.<br>211 | | | | | Reserved |
| 212 | Virtual temperature | 0°C | 1°C | | |
| 213<br>.<br>.<br>.<br>220 | | | | | Reserved |
| 221 | Radar spectra | | | | Direction and frequency |
| 222 | Radar spectra | | | | Direction and radial number |
| 223 | Radar spectra | | | | Radial number and radial number |
| 224<br>225 | | | | | Reserved |
| 226 | Pressure anomaly | 0 hPa | 1 hPa | | |
| 227 | Geopotential height anomaly | 0 gpm | 1 gpm | | |
| 228 | Wave spectra | | | | Direction and frequency |
| 229 | Wave spectra | | | | Direction and radial number |
| 230 | Wave spectra | | | | Radial number and radial number |
| 231<br>.<br>.<br>.<br>237 | | | | | Reserved |
| 238 | Sigma coord. vertical velocity | 0 $s^{-1}$ | 1 $s^{-1}$ | | |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| 239<br>240<br>241 | | | | | Reserved |
| 242 | Absolute divergence | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 243 | | | | | Reserved |
| 244 | Relative divergence | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 245 | Vertical u-component shear | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 246 | Vertical v-component shear | 0 $s^{-1}$ | 1 $s^{-1}$ | | |
| 247<br>.<br>.<br>.<br>254 | | | | | Reserved |
| 255 | Vapour pressure | 0 hPa | 1 hPa | | |
| 256 | | | | | Reserved |
| 257 | Evaporation | 0 mm | 1 mm | | |
| 258<br>259 | | | | | Reserved |
| 260 | Thunderstorm probability | 0 % | 1 % | | |
| 261<br>262<br>263 | | | | | Reserved |
| 264 | Snowfall rate water equivalent | 0 kg $m^{-2}$ | 1 kg $m^{-2}$ | | |
| 265 | Water equivalent of acc. snow | 0 kg $m^{-2}$ | 1 kg $m^{-2}$ | | |
| 266<br>.<br>.<br>.<br>271 | | | | | Reserved |
| 272 | Convective cloud cover | 0 % | 1 % | | |
| 273 | Low cloud cover | 0 % | 1 % | | |
| 274 | Medium cloud cover | 0 % | 1 % | | |
| 275 | High cloud cover | 0 % | 1 % | | |
| 276 | Cloud water | 0 mm | 1 mm | | |
| 277<br>278<br>279<br>280 | | | | | Reserved |
| 281 | Land-sea mask | | | 0, 1 | 0 = sea, 1 = land |
| 282 | | | | | Reserved |
| 283 | Surface roughness | 0 m | 1 m | | |
| 284 | Albedo | 0 % | 1 % | | |
| 285 | Soil temperature | 0°C | 1°C | | |
| 286 | Soil moisture content | 0 mm | 1 mm | | |
| 287 | Vegetation | 0 % | 1 % | | |
| 288<br>289<br>290<br>291<br>292 | | | | | Reserved |
| 293 | Direction of ice drift | 0° | 10° | | |

| Code figure | Field parameter | Reference value | Unit | Occurrence and/or intensity of phenomenon | Remarks |
|---|---|---|---|---|---|
| **294** | **Speed of ice drift** | **0 km/day** | **1 km/day** | | |
| **295** . . . **310** | | | | | **Reserved** |
| **311** | **Net short-wave radiation (surface)** | **0 joule** | **0.1 joule** | | |
| **312** | **Net long-wave radiation (surface)** | **0 joule** | **0.1 joule** | | |
| **313** | **Net short-wave radiation (top of atmosphere)** | **0 joule** | **0.1 joule** | | |
| **314** | **Net long-wave radiation (top of atmosphere)** | **0 joule** | **0.1 joule** | | |
| **315** | **Long-wave radiation** | **0 joule** | **0.1 joule** | | |
| **316** | **Short-wave radiation** | **0 joule** | **0.1 joule** | | |
| **317** | **Global radiation** | **0 joule** | **0.1 joule** | | |
| **318** **319** **320** | | | | | **Reserved** |
| **321** | **Latent heat flux** | **0 joule** | **0.1 joule** | | |
| **322** | **Sensible heat flux** | **0 joule** | **0.1 joule** | | |
| **323** | **Boundary layer dissipation** | **0 joule** | **0.1 joule** | | |
| **324** **325** **326** | | | | | **Reserved** |
| **327** | **Image data** | | | | |
| **328** . . . **454** | | | | | **Reserved for use by originating centre** |
| **455** . . . **998** | | | | | **Reserved** |
| **999** | **Reserved for totally fixed formats 999000 to 999999, for example:**<br>**999001 TTddfffTTddfffTTddfffTTddfffhh**<br>**TTddfff = temperature, wind direction and wind speed for 400-hPa, 300-hPa, 250-hPa and 200-hPa levels**<br>**hh = height of tropopause in 300-metre units**<br>**Spaces between data groups omitted.**<br>Note: Code figures 999000 to 999999 for $a_1a_1a_1$, $a_2a_2a2$ do not represent parameters. These code figures are used to indicate various standard formats in which the data content is given and which will be defined in an appropriate publication. | | | | **Where applicable, the indication of all groups specifying the level of reference is to be omitted** |

Notes:

(1) The code figures 000 to 327 are used to represent parameters which are exchanged between a number of centres; since the products generated by centres can be extremely diverse, code figures 328 to 454 are reserved for definition by the originating centre, and may differ from centre to centre.

(2) Where it is necessary for a centre to redefine this table completely, a code figure $n_Tn_T$ = 01–99 shall indicate the relevant redefined code table. The code figures $a_1a_1a_1$, $a_2a_2a_2$ shall then refer to the appropriate redefined code table.

(3) The first part of Code table 0291 (code figures 000–099) shall be used without the inclusion in the report of the optional group $2n_Tn_Ta_1a_2$. Parameters in the latter part of the code table (100–999) can only be used with the inclusion in the report of the optional group $2n_Tn_Ta_1a_2$.

## 0300

**B** ***Turbulence***

| Code figure | |
|---|---|
| **0** | **None** |
| **1** | **Light turbulence** |
| **2** | **Moderate turbulence in clear air, occasional** |
| **3** | **Moderate turbulence in clear air, frequent** |
| **4** | **Moderate turbulence in cloud, occasional** |
| **5** | **Moderate turbulence in cloud, frequent** |
| **6** | **Severe turbulence in clear air, occasional** |
| **7** | **Severe turbulence in clear air, frequent** |
| **8** | **Severe turbulence in cloud, occasional** |
| **9** | **Severe turbulence in cloud, frequent** |

## 0302

**$B_A$** ***Turbulence***

| Code figure | |
|---|---|
| **0** | **None (acceleration less than 0.15 g)** |
| **1** | **Light (acceleration from 0.15 g to, but not including 0.5 g)** |
| **2** | **Moderate (acceleration from 0.5 g to 1.0 g)** |
| **3** | **Severe (acceleration > 1.0 g)** |

Note: These accelerations, which may be positive or negative, are deviations from the normal acceleration of gravity (1.0 g).

## 0324

**$B_T$** ***Type of release***

| Code figure | |
|---|---|
| **0** | **No release** |
| **1** | **Release to atmosphere** |
| **2** | **Release to water** |
| **3** | **Release to both atmosphere and water** |
| **4** | **Expected release to atmosphere** |
| **5** | **Expected release to water** |
| **6** | **Expected release to both atmosphere and water** |
| **7** | **Missing value** |

## 0359

**$B_z$** ***High-level turbulence***

| Code figure | |
|---|---|
| **0** | **None** |
| **1** | **Moderate** |
| **2** | **Severe** |

## 0366

**$B_RB_R$** ***Estimated surface friction***

| Code figure | |
|---|---|
| 00 | Friction coefficient 0.00 |
| 01 | Friction coefficient 0.01 |
| | . . . |
| 88 | Friction coefficient 0.88 |
| 89 | Friction coefficient 0.89 |
| 90 | Friction coefficient 0.90 |
| 91 | Braking action poor |
| 92 | Braking action medium/poor |
| 93 | Braking action medium |
| 94 | Braking action medium/good |
| 95 | Braking action good |
| 96–98 | Reserved |
| 99 | Unreliable |
| // | Braking conditions not reported and/or runway not operational |

## 0370

**$B_tB_t$** ***Type of buoy***

| Code figure | |
|---|---|
| 00 | Unspecified drifting buoy |
| 01 | Standard Lagrangian drifter (Global Drifter Programme) |
| 02 | Standard FGGE-type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| 03 | Wind measuring FGGE-type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| 04 | Ice float |
| 05–07 | Reserved |
| 08 | Unspecified subsurface float |
| 09 | SOFAR |
| 10 | ALACE |
| 11 | MARVOR |
| 12 | RAFOS |
| 13–15 | Reserved |
| 16 | Unspecified moored buoy |
| 17 | Nomad |
| 18 | 3-metre discus |
| 19 | 10–12-metre discus |
| 20 | ODAS 30 series |
| 21 | ATLAS (e.g. TAO area) |
| 22 | TRITON |
| 23 | Reserved |
| 24 | Omnidirectional wave rider |
| 25 | Directional wave rider |
| 26 | Subsurface ARGO float |
| 27–62 | Reserved |
| // | Missing value (coded 63 in BUFR) |

# 0371

**$B_1B_2B_3$** ***Number designating a 10° x 10° square in the geographical grid formed by the intersection of two meridians and two parallels of latitude***

Lat. N (X 10°) — Equator — Lat. S (X 10°); Long. E (X 10°) — Greenwich meridian — Long. W (X 10°)

| Long. \ Lat. | N 9–8 | N 8–7 | N 7–6 | N 6–5 | N 5–4 | N 4–3 | N 3–2 | N 2–1 | N 1–Equator | S Equator–1 | S 1–2 | S 2–3 | S 3–4 | S 4–5 | S 5–6 | S 6–7 | S 7–8 | S 8–9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 18–17 | 287 | 277 | 267 | 257 | 247 | 237 | 227 | 217 | 207 | 707 | 717 | 727 | 737 | 747 | 757 | 767 | 777 | 787 |
| E 17–16 | 286 | 276 | 266 | 256 | 246 | 236 | 226 | 216 | 206 | 706 | 716 | 726 | 736 | 746 | 756 | 766 | 776 | 786 |
| E 16–15 | 285 | 275 | 265 | 255 | 245 | 235 | 225 | 215 | 205 | 705 | 715 | 725 | 735 | 745 | 755 | 765 | 775 | 785 |
| E 15–14 | 284 | 274 | 264 | 254 | 244 | 234 | 224 | 214 | 204 | 704 | 714 | 724 | 734 | 744 | 754 | 764 | 774 | 784 |
| E 14–13 | 283 | 273 | 263 | 253 | 243 | 233 | 223 | 213 | 203 | 703 | 713 | 723 | 733 | 743 | 753 | 763 | 773 | 783 |
| E 13–12 | 282 | 272 | 262 | 252 | 242 | 232 | 222 | 212 | 202 | 702 | 712 | 722 | 732 | 742 | 752 | 762 | 772 | 782 |
| E 12–11 | 281 | 271 | 261 | 251 | 241 | 231 | 221 | 211 | 201 | 701 | 711 | 721 | 731 | 741 | 751 | 761 | 771 | 781 |
| E 11–10 | 280 | 270 | 260 | 250 | 240 | 230 | 220 | 210 | 200 | 700 | 710 | 720 | 730 | 740 | 750 | 760 | 770 | 780 |
| E 10–9 | 289 | 279 | 269 | 259 | 249 | 239 | 229 | 219 | 209 | 709 | 719 | 729 | 739 | 749 | 759 | 769 | 779 | 789 |
| E 9–8 | 388 | 378 | 368 | 358 | 348 | 338 | 328 | 318 | 308 | 808 | 818 | 828 | 838 | 848 | 858 | 868 | 878 | 888 |
| E 8–7 | 387 | 377 | 367 | 357 | 347 | 337 | 327 | 317 | 307 | 807 | 817 | 827 | 837 | 847 | 857 | 867 | 877 | 887 |
| E 7–6 | 386 | 376 | 366 | 356 | 346 | 336 | 326 | 316 | 306 | 806 | 816 | 826 | 836 | 846 | 856 | 866 | 876 | 886 |
| E 6–5 | 385 | 375 | 365 | 355 | 345 | 335 | 325 | 315 | 305 | 805 | 815 | 825 | 835 | 845 | 855 | 865 | 875 | 885 |
| E 5–4 | 384 | 374 | 364 | 354 | 344 | 334 | 324 | 314 | 304 | 804 | 814 | 824 | 834 | 844 | 854 | 864 | 874 | 884 |
| E 4–3 | 383 | 373 | 363 | 353 | 343 | 333 | 323 | 313 | 303 | 803 | 813 | 823 | 833 | 843 | 853 | 863 | 873 | 883 |
| E 3–2 | 382 | 372 | 362 | 352 | 342 | 332 | 322 | 312 | 302 | 802 | 812 | 822 | 832 | 842 | 852 | 862 | 872 | 882 |
| E 2–1 | 381 | 371 | 361 | 351 | 341 | 331 | 321 | 311 | 301 | 801 | 811 | 821 | 831 | 841 | 851 | 861 | 871 | 881 |
| E 1–Greenwich | 380 | 370 | 360 | 350 | 340 | 330 | 320 | 310 | 300 | 800 | 810 | 820 | 830 | 840 | 850 | 860 | 870 | 880 |
| W Greenwich–1 | 080 | 070 | 060 | 050 | 040 | 030 | 020 | 010 | 000 | 500 | 510 | 520 | 530 | 540 | 550 | 560 | 570 | 580 |
| W 1–2 | 081 | 071 | 061 | 051 | 041 | 031 | 021 | 011 | 001 | 501 | 511 | 521 | 531 | 541 | 551 | 561 | 571 | 581 |
| W 2–3 | 082 | 072 | 062 | 052 | 042 | 032 | 022 | 012 | 002 | 502 | 512 | 522 | 532 | 542 | 552 | 562 | 572 | 582 |
| W 3–4 | 083 | 073 | 063 | 053 | 043 | 033 | 023 | 013 | 003 | 503 | 513 | 523 | 533 | 543 | 553 | 563 | 573 | 583 |
| W 4–5 | 084 | 074 | 064 | 054 | 044 | 034 | 024 | 014 | 004 | 504 | 514 | 524 | 534 | 544 | 554 | 564 | 574 | 584 |
| W 5–6 | 085 | 075 | 065 | 055 | 045 | 035 | 025 | 015 | 005 | 505 | 515 | 525 | 535 | 545 | 555 | 565 | 575 | 585 |
| W 6–7 | 086 | 076 | 066 | 056 | 046 | 036 | 026 | 016 | 006 | 506 | 516 | 526 | 536 | 546 | 556 | 566 | 576 | 586 |
| W 7–8 | 087 | 077 | 067 | 057 | 047 | 037 | 027 | 017 | 007 | 507 | 517 | 527 | 537 | 547 | 557 | 567 | 577 | 587 |
| W 8–9 | 088 | 078 | 068 | 058 | 048 | 038 | 028 | 018 | 008 | 508 | 518 | 528 | 538 | 548 | 558 | 568 | 578 | 588 |
| W 9–10 | 189 | 179 | 169 | 159 | 149 | 139 | 129 | 119 | 109 | 609 | 619 | 629 | 639 | 649 | 659 | 669 | 679 | 689 |
| W 10–11 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 600 | 610 | 620 | 630 | 640 | 650 | 660 | 670 | 680 |
| W 11–12 | 181 | 171 | 161 | 151 | 141 | 131 | 121 | 111 | 101 | 601 | 611 | 621 | 631 | 641 | 651 | 661 | 671 | 681 |
| W 12–13 | 182 | 172 | 162 | 152 | 142 | 132 | 122 | 112 | 102 | 602 | 612 | 622 | 632 | 642 | 652 | 662 | 672 | 682 |
| W 13–14 | 183 | 173 | 163 | 153 | 143 | 133 | 123 | 113 | 103 | 603 | 613 | 623 | 633 | 643 | 653 | 663 | 673 | 683 |
| W 14–15 | 184 | 174 | 164 | 154 | 144 | 134 | 124 | 114 | 104 | 604 | 614 | 624 | 634 | 644 | 654 | 664 | 674 | 684 |
| W 15–16 | 185 | 175 | 165 | 155 | 145 | 135 | 125 | 115 | 105 | 605 | 615 | 625 | 635 | 645 | 655 | 665 | 675 | 685 |
| W 16–17 | 186 | 176 | 166 | 156 | 146 | 136 | 126 | 116 | 106 | 606 | 616 | 626 | 636 | 646 | 656 | 666 | 676 | 686 |
| W 17–18 | 187 | 177 | 167 | 157 | 147 | 137 | 127 | 117 | 107 | 607 | 617 | 627 | 637 | 647 | 657 | 667 | 677 | 687 |
| 180° meridian | 188 | 178 | 168 | 158 | 148 | 138 | 128 | 118 | 108 | 608 | 618 | 628 | 638 | 648 | 658 | 668 | 678 | 688 |

190 (North Pole) — 690 (South Pole)

*(Code table 0371 – continued)*

Notes:

(1) The system of $B_1B_2B_3$ numbers is designed for use in code forms to report geographical positions by means of a minimum of code figures and, as a result, to achieve some economy in message length.

(a) The system is particularly suited to the cases where:

(b) Each position is associated with very few data;

(c) The number of positions to report is fairly high;

(d) The positions to report are relatively close to each other;

as may for instance occur with certain types of observational satellite data.

(2) Each square derives its number partly from the octant of the globe (Q) and partly from the position of one of its corners, i.e. the one that possesses the lowest coordinates ($l_a$, $l_o$) ($l_a$ and $l_o$ are integers, expressed in units of 10°). For position-reporting purposes, that corner A can be taken as the origin of a reference frame formed by the sides AB (direction of increasing latitudes) and AC (direction of increasing longitudes) of the square. The geometrical position of the reference frame in question in each of the four quadrants of the globe is shown in Figure 1 (a), (b), (c) and (d) In the vicinity of each Pole, the “squares” become “triangles”; Figure 1 (a´), (b´), (c´) and (d´) show the position of the reference frame in these particular cases.

(3) The position of any point P lying in a square is then defined by:

(a) The square number $B_1B_2B_3$;

(b) The difference $\delta_{la}$ in latitude between P and A;

(c) The difference $\delta_{lo}$ in longitude between P and A ($\delta_{la}$ and $\delta_{lo}$ are either expressed in whole degrees by $U_{La}U_{Lo}$, or in tenths of a degree by $U_{La}U_{Lo}U_{La}U_{Lo}$ (see Figure 1).

(4) It is to be noted that $\delta_{la}$ and $\delta_{lo}$ will always be less than 10°; therefore, the points lying on sides BD and CD of the square do not belong to it but to adjacent squares;

(5) Special cases which are a consequence of the foregoing.

(a) The 180° meridian

Special numbers have been assigned to its 10° line segments (= squares reduced to one side). Position reporting of a point P will in that case be limited to:

(i) The $B_1B_2B_3$ number;

(ii) $\delta_{la}$ only;

(b) The Poles

Numbers 190 (North Pole) and 690 (South Pole) have been assigned to them.

(6) Generating formula:

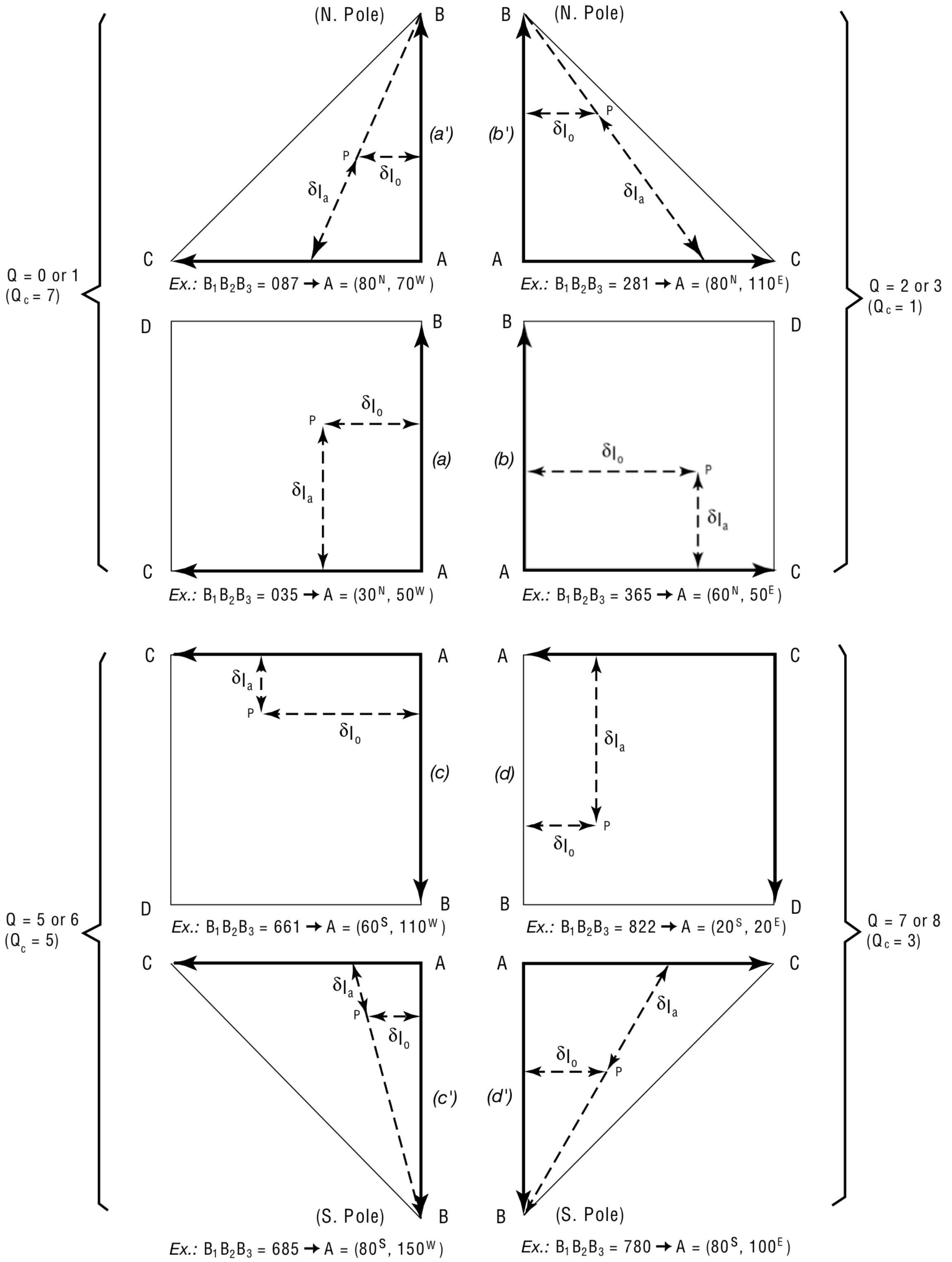
$$B_1B_2B_3 = 100\ Q + 10\left(l_a + \mathrm{DEC}\left(\frac{l_o}{10}\right)\right)$$

The above formula expresses $B_1B_2B_3$ as a function of the code figure Q for the octant of the globe and of the geographical coordinates of corner A of the square (DEC = decimal part of).

*(See Figure 1.)*

*(Code table 0371– continued)*

**FIGURE 1**



# 0439

**$b_i$** ***Ice of land origin***

| Code figure | |
|---|---|
| **0** | **No ice of land origin** |
| **1** | **1–5 icebergs, no growlers or bergy bits** |
| **2** | **6–10 icebergs, no growlers or bergy bits** |
| **3** | **11–20 icebergs, no growlers or bergy bits** |
| **4** | **Up to and including 10 growlers and bergy bits – no icebergs** |
| **5** | **More than 10 growlers and bergy bits – no icebergs** |
| **6** | **1–5 icebergs, with growlers and bergy bits** |
| **7** | **6–10 icebergs, with growlers and bergy bits** |
| **8** | **11–20 icebergs, with growlers and bergy bits** |
| **9** | **More than 20 icebergs, with growlers and bergy bits – a major hazard to navigation** |
| **/** | **Unable to report, because of darkness, lack of visibility or because only sea ice is visible** |

# 0491

**$b_1b_1$, $b_2b_2$** ***Type of special level***

| Code figure | |
|---|---|
| 00 | — |
| 01 | Ground surface |
| 02 | Cloud base level |
| 03 | Level of cloud tops |
| 04 | Level of 0°C isotherm |
| 05 | Level of adiabatic condensation |
| 06 | Maximum wind level |
| 07 | Tropopause |
| 08–09 | Reserved |
| 10 | Lower limit of layer of instability with hail and/or thunderstorms |
| 11 | Upper limit of layer of instability with hail and/or thunderstorms |
| 12 | Not used |
| 13 | Upper limit of tropical revolving storm |
| 14 | Lower limit of layer of moderate turbulence (generally associated with cloud) |
| 15 | Upper limit of layer of moderate turbulence (generally associated with cloud) |
| 16 | Lower limit of layer of severe turbulence (generally associated with cloud) |
| 17 | Upper limit of layer of severe turbulence (generally associated with cloud) |
| 18 | Lower limit of layer of moderate clear air turbulence |
| 19 | Upper limit of layer of moderate clear air turbulence |
| 20 | Lower limit of layer of severe clear air turbulence |
| 21 | Upper limit of layer of severe clear air turbulence |
| 22 | Lower limit of layer of moderate icing |
| 23 | Upper limit of layer of moderate icing |
| 24 | Lower limit of layer of severe icing |
| 25 | Upper limit of layer of severe icing |
| 26 | Lower limit of layer of mountain waves |
| 27 | Upper limit of layer of mountain waves |
| 28 | Lower limit of layer of sandstorm/duststorm |
| 29 | Upper limit of layer of sandstorm/duststorm |
| 30 | Lower limit of layer of freezing rain |
| 31 | Upper limit of layer of freezing rain |
| 32–49 | Reserved |
| 50 | Surface of reflectivity |
| 51–59 | Reserved |
| 60 | Sea surface |
| 61 | Thermocline |
| 62–99 | Reserved |

## 0500

| | |
|---|---|
| **C** | ***Genus of cloud*** |
| **C** | ***Genus of cloud predominating in the layer*** |
| **C´** | ***Genus of cloud whose base is below the level of the station*** |

| Code figure | |
|---|---|
| 0 | Cirrus (Ci) |
| 1 | Cirrocumulus (Cc) |
| 2 | Cirrostratus (Cs) |
| 3 | Altocumulus (Ac) |
| 4 | Altostratus (As) |
| 5 | Nimbostratus (Ns) |
| 6 | Stratocumulus (Sc) |
| 7 | Stratus (St) |
| 8 | Cumulus (Cu) |
| 9 | Cumulonimbus (Cb) |
| / | Not available for instrument detected clouds from AWS or cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena |

## 0501

| | |
|---|---|
| **C** | ***Total concentration of all ice*** |
| **$C_e$** | ***Concentration of the tertiary form of ice*** |
| **$C_p$** | ***Concentration of the predominant form of ice*** |
| **$C_q$** | ***Concentration of the quaternary form of ice*** |
| **$C_s$** | ***Concentration of the secondary form of ice*** |
| **$C_u$** | ***Concentration of the quintary form of ice*** |
| **$C_1$** | ***Concentration of the predominant stage of development of ice*** |
| **$C_2$** | ***Concentration of the secondary stage of development of ice*** |
| **$C_3$** | ***Concentration of the tertiary stage of development of ice*** |
| **$C_4$** | ***Concentration of the quaternary stage of development of ice*** |
| **$C_5$** | ***Concentration of the quintary stage of development of ice*** |
| **$R_e$** | ***Extent of all ridging*** |

| Code figure | | |
|---|---|---|
| 0 | Less than $^1/_{10}$ | (less than 1 okta) |
| 1 | $^1/_{10}$ | (1 okta) |
| 2 | $^2/_{10}$ – $^3/_{10}$ | (2 oktas) |
| 3 | $^4/_{10}$ | (3 oktas) |
| 4 | $^5/_{10}$ | (4 oktas) |
| 5 | $^6/_{10}$ | (5 oktas) |
| 6 | $^7/_{10}$ – $^8/_{10}$ | (6 oktas) |
| 7 | $^9/_{10}$ | (7 oktas) |
| 8 | $^{10}/_{10}$ with openings | (8 oktas with openings) |
| 9 | $^{10}/_{10}$ without openings | (8 oktas without openings) |

# 0509

## $C_H$ *Clouds of the genera cirrus, cirrocumulus and cirrostratus*

| Code figure | Technical specifications | Code figure | Technical specifications |
|---|---|---|---|
| 0 | **No $C_H$ clouds** | 0 | **No cirrus, cirrocumulus or cirrostratus** |
| 1 | **Cirrus fibratus, sometimes uncinus, not progressively invading the sky** | 1 | **Cirrus in the form of filaments, strands or hooks, not progressively invading the sky** |
| 2 | **Cirrus spissatus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a cumulonimbus; or cirrus castellanus or floccus** | 2 | **Dense cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a cumulonimbus; or cirrus with sproutings in the form of small turrets or battlements, or cirrus having the appearance of cumuliform tufts** |
| 3 | **Cirrus spissatus cumulonimbogenitus** | 3 | **Dense cirrus, often in the form of an anvil, being the remains of the upper parts of cumulonimbus** |
| 4 | **Cirrus uncinus or fibratus, or both, progressively invading the sky; they generally thicken as a whole** | 4 | **Cirrus in the form of hooks or of filaments, or both, progressively invading the sky; they generally become denser as a whole** |
| 5 | **Cirrus (often in bands) and cirrostratus, or cirrostratus alone, progressively invading the sky; they generally thicken as a whole, but the continuous veil does not reach 45 degrees above the horizon** | 5 | **Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil does not reach 45 degrees above the horizon** |
| 6 | **Cirrus (often in bands) and cirrostratus, or cirrostratus alone, progressively invading the sky; they generally thicken as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered** | 6 | **Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered** |
| 7 | **Cirrostratus covering the whole sky** | 7 | **Veil of cirrostratus covering the celestial dome** |
| 8 | **Cirrostratus not progressively invading the sky and not entirely covering it** | 8 | **Cirrostratus not progressively invading the sky and not completely covering the celestial dome** |
| 9 | **Cirrocumulus alone, or cirrocumulus predominant among the $C_H$ clouds** | 9 | **Cirrocumulus alone, or cirrocumulus accompanied by cirrus or cirrostratus, or both, but cirrocumulus is predominant** |
| / | **$C_H$ clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds** | / | **Cirrus, cirrocumulus and cirrostratus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds** |

# 0513

**$C_L$** ***Clouds of the genera stratocumulus, stratus, cumulus and cumulonimbus***

| Code figure | Technical specifications | Code figure | Technical specifications |
|---|---|---|---|
| **0** | **No $C_L$ clouds** | **0** | **No stratocumulus, stratus, cumulus or cumulonimbus** |
| **1** | **Cumulus humilis or cumulus fractus other than of bad weather,* or both** | **1** | **Cumulus with little vertical extent and seemingly flattened, or ragged cumulus other than of bad weather,* or both** |
| **2** | **Cumulus mediocris or congestus, with or without cumulus of species fractus or humilis or stratocumulus, all having their bases at the same level** | **2** | **Cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other cumulus or by stratocumulus, all having their bases at the same level** |
| **3** | **Cumulonimbus calvus, with or without cumulus, stratocumulus or Stratus** | **3** | **Cumulonimbus the summits of which, at least partially, lack sharp outlines, but are neither clearly fibrous (cirriform) nor in the form of an anvil; cumulus, stratocumulus or Stratus may also be present** |
| **4** | **Stratocumulus cumulogenitus** | **4** | **Stratocumulus formed by the spreading out of cumulus; cumulus may also be present** |
| **5** | **Stratocumulus other than stratocumulus cumulogenitus** | **5** | **Stratocumulus not resulting from the spreading out of cumulus** |
| **6** | **Stratus nebulosus or Stratus fractus other 6 than of bad weather,* or both** | **6** | **Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no Stratus fractus of bad weather*** |
| **7** | **Stratus fractus or cumulus fractus of bad weather,* or both (pannus), usually below altostratus or nimbostratus** | **7** | **Stratus fractus of bad weather* or cumulus fractus of bad weather,* or both (pannus), usually below altostratus or nimbostratus** |
| **8** | **Cumulus and stratocumulus other than stratocumulus cumulogenitus, with bases at different levels** | **8** | **Cumulus and stratocumulus other than that formed from the spreading out of cumulus; the base of the cumulus is at a different level from that of the stratocumulus** |
| **9** | **Cumulonimbus capillatus (often with an anvil), with or without cumulonimbus calvus, cumulus, stratocumulus, Stratus or pannus** | **9** | **Cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil; either accompanied or not by cumulonimbus without anvil or fibrous upper part, by cumulus, stratocumulus, stratus or pannus** |
| **/** | **$C_L$ clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena** | **/** | **Stratocumulus, stratus, cumulus and cumulonimbus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena** |

* “Bad weather” denotes the conditions which generally exist during precipitation and a short time before and after.

# 0515

**$C_M$** ***Clouds of the genera altocumulus, altostratus and nimbostratus***

| Code figure | Technical specifications | Code figure | Technical specifications |
|---|---|---|---|
| **0** | **No $C_M$ clouds** | **0** | **No altocumulus, altostratus or nimbostratus** |
| **1** | **Altostratus translucidus** | **1** | **Altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible, as through ground glass** |
| **2** | **Altostratus opacus or nimbostratus** | **2** | **Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or nimbostratus** |
| **3** | **Altocumulus translucidus at a single level** | **3** | **Altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level** |
| **4** | **Patches (often lenticular) of altocumulus translucidus, continually changing and occurring at one or more levels** | **4** | **Patches (often in the form of almonds or fish) of altocumulus, the greater part of which is semi-transparent; the clouds occur at one or more levels and the elements are continually changing in appearance** |
| **5** | **Altocumulus translucidus in bands, or one or more layers of altocumulus translucidus or opacus, progressively invading the sky; these altocumulus clouds generally thicken as a whole** | **5** | **Semi-transparent altocumulus in bands, or altocumulus, in one or more fairly continuous layer (semi-transparent or opaque), progressively invading the sky; these altocumulus clouds generally thicken as a whole** |
| **6** | **Altocumulus cumulogenitus (or cumulo-nimbogenitus)** | **6** | **Altocumulus resulting from the spreading out of cumulus (or cumulonimbus)** |
| **7** | **Altocumulus translucidus or opacus in two or more layers, or altocumulus opacus in a single layer, not progressively invading the sky, or altocumulus with altostratus or nimbostratus** | **7** | **Altocumulus in two or more layers, usually opaque in places, and not progressively invading the sky; or opaque layer of altocumulus, not progressively invading the sky; or altocumulus together with altostratus or nimbostratus** |
| **8** | **Altocumulus castellanus or floccus** | **8** | **Altocumulus with sproutings in the form of small towers or battlements, or altocumulus having the appearance of cumuliform tufts** |
| **9** | **Altocumulus of a chaotic sky, generally at several levels** | **9** | **Altocumulus of a chaotic sky, generally at several levels** |
| **/** | **$C_M$ clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of continuous layer of lower clouds** | **/** | **Altocumulus, altostratus and nimbostratus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds** |

## 0519

$C_R$ ***Extent of runway contamination***

| Code figure | |
|---|---|
| **1** | **Less than 10 per cent of runway contaminated (covered)** |
| **2** | **11 per cent to 25 per cent of runway contaminated (covered)** |
| **3–4** | **Reserved** |
| **5** | **26 per cent to 50 per cent of runway contaminated (covered)** |
| **6–8** | **Reserved** |
| **9** | **51 per cent to 100 per cent of runway contaminated (covered)** |
| **/** | **Not reported (e.g. due to runway clearance in progress)** |

## 0521

$C_S$ ***Special clouds***

| Code figure | |
|---|---|
| **1** | **Nacreous clouds** |
| **2** | **Noctilucent clouds** |
| **3** | **Clouds from waterfalls** |
| **4** | **Clouds from fires** |
| **5** | **Clouds from volcanic eruptions** |

Note: A description of these clouds may be found in the *International Cloud Atlas* (WMO-No. 407), Volume I, Part II, Chapter 6.

## 0531

$C_a$ ***Nature of clouds of vertical development***

| Code figure | | |
|---|---|---|
| **0** | **Isolated** | **Cumulus humilis and/or cumulus mediocris** |
| **1** | **Numerous** | |
| **2** | **Isolated** | **Cumulus congestus** |
| **3** | **Numerous** | |
| **4** | **Isolated** | **Cumulus** |
| **5** | **Numerous** | |
| **6** | **Isolated** | **Cumulus and cumulonimbus** |
| **7** | **Numerous** | |

## 0533

$C_c$ ***Coloration and/or convergence of clouds associated with a tropical disturbance***

| Code figure | | |
|---|---|---|
| 1 | **Slight coloration of clouds at sunrise** | |
| 2 | **Deep-red coloration of clouds at sunrise** | |
| 3 | **Slight coloration of clouds at sunset** | |
| 4 | **Deep-red coloration of clouds at sunset** | |
| 5 | **Convergence of $C_H$ clouds at a point below 45°** | **forming or increasing** |
| 6 | **Convergence of $C_H$ clouds at a point above 45°** | **forming or increasing** |
| 7 | **Convergence of $C_H$ clouds at a point below 45°** | **dissolving or diminishing** |
| 8 | **Convergence of $C_H$ clouds at a point above 45°** | **dissolving or diminishing** |

## 0544

$C_m$ ***Major cloud configuration***

| Code figure | |
|---|---|
| 0 | **Low stratus or fog** |
| 1 | **Stratiform** |
| 2 | **Stratocumulifom – closed cells** |
| 3 | **Cirriform** |
| 4 | **Cumuliform and stratiform** |
| 5 | **Cumuliform** |
| 6 | **Open cells – not associated with cumulonimbus** |
| 7 | **Open cells – cumulus and cumulonimbus** |
| 8 | **Cumulonimbus (may be associated with other cloud types)** |
| 9 | **Multi-layered** |
| / | **Undetermined** |

## 0551

$C_s$ ***Cloud system***

| Code figure | |
|---|---|
| 1 | **Thunder type** |
| 2 | **Depression type** |
| 3 | **Intense depression type** |
| 4 | **Depression with snow** |
| 5 | **Depression with warm sector** |
| 6 | **Depression with misty tail** |
| 7 | **Altocumulus** |
| 8 | **Altocumulus with lateral zone** |
| 9 | **Altocumulus with misty tail** |

## 0552

**$C_t$** ***Description of the top of cloud whose base is below the level of the station***

| Code figure | | |
|---|---|---|
| 0 | Isolated cloud or fragments of clouds | |
| 1 | Continuous cloud | flat tops |
| 2 | Broken cloud – small breaks | flat tops |
| 3 | Broken cloud – large breaks | flat tops |
| 4 | Continuous cloud | undulating tops |
| 5 | Broken cloud – small breaks | undulating tops |
| 6 | Broken cloud – large breaks | undulating tops |
| 7 | Continuous or almost continuous waves with towering clouds above the top of the layer | |
| 8 | Groups of waves with towering clouds above the top of the layer | |
| 9 | Two or more layers at different levels | |

## 0561

**$C_0$** ***Orographic clouds***

| Code figure | |
|---|---|
| 1 | Isolated orographic clouds, pileus, incus, forming |
| 2 | Isolated orographic clouds, pileus, incus, not changing |
| 3 | Isolated orographic clouds, pileus, incus, dissolving |
| 4 | Irregular banks of orographic cloud, föhn bank, etc., forming |
| 5 | Irregular banks of orographic cloud, föhn bank, etc., not changing |
| 6 | Irregular banks of orographic cloud, föhn bank, etc., dissolving |
| 7 | Compact layer of orographic cloud, föhn bank, etc., forming |
| 8 | Compact layer of orographic cloud, föhn bank, etc., not changing |
| 9 | Compact layer of orographic cloud, föhn bank, etc., dissolving |

## 0562

**$C_1$** ***Confidence figure***

| Code figure | |
|---|---|
| 0 | No specification |
| 2 | With confidence |
| 5 | Uncertain |
| 8 | Very doubtful |

## 0639

$C_i$ ***Concentration or arrangement of sea ice***

| Code figure | | | |
|---|---|---|---|
| 0 | No sea ice in sight | | |
| 1 | Ship in open lead more than 1.0 nautical mile wide, or ship in fast ice with boundary beyond limit of visibility | | |
| 2 | Sea ice present in concentrations less than $^3/_{10}$ ($^3/_8$), open water or very open pack ice | Sea ice concentration is uniform in the observation area | Ship in ice or within 0.5 nautical mile of ice edge |
| 3 | $^4/_{10}$ to $^6/_{10}$ ($^3/_8$ to less than $^6/_8$), open pack ice | | |
| 4 | $^7/_{10}$ to $^8/_{10}$ ($^6/_8$ to less than $^7/_8$), close pack ice | | |
| 5 | $^9/_{10}$ or more, but not $^{10}/_{10}$ ($^7/_8$ to less than $^8/_8$), very close pack ice | | |
| 6 | Strips and patches of pack ice with open water between | Sea ice concentration is not uniform in the observation area | |
| 7 | Strips and patches of close or very close pack ice with areas of lesser concentration between | | |
| 8 | Fast ice with open water, very open or open pack ice to seaward of the ice boundary | | |
| 9 | Fast ice with close or very close pack ice to seaward of the ice boundary | | |
| / | Unable to report, because of darkness, lack of visibility, or because ship is more than 0.5 nautical mile away from ice edge | | |

## 0659

$c_T$ ***Thermodynamic correction technique***

$c_w$ ***Wind correction technique***

| Code figure | |
|---|---|
| 0 | No correction applied |
| 1 | US standard correction |
| 2 | UK standard correction |
| 3 | Japan standard correction |

## 0700

| | |
|---|---|
| **D** | ***Direction or bearing in one figure*** |
| **D** | ***True direction from which surface wind is blowing*** |
| **D** | ***True direction towards which ice has drifted in the past 12 hours*** |
| **$D_H$** | ***True direction from which $C_H$ clouds are moving*** |
| **$D_K$** | ***True direction from which swell is moving*** |
| **$D_L$** | ***True direction from which $C_L$ clouds are moving*** |
| **$D_M$** | ***True direction from which $C_M$ clouds are moving*** |
| **$D_a$** | ***True direction in which orographic clouds or clouds with vertical development are seen*** |
| **$D_a$** | ***True direction in which the phenomenon indicated is observed or in which conditions specified in the same group are reported*** |
| **$D_e$** | ***True direction towards which an echo pattern is moving*** |
| **$D_p$** | ***True direction from which the phenomenon indicated is coming*** |
| **$D_s$** | ***True direction of resultant displacement of the ship during the three hours preceding the time of observation*** |
| **$D_1$** | ***True direction of the point position from the station*** |

| Code figure | |
|---|---|
| 0 | Calm (in D, $D_K$), or stationary (in $D_s$), or at the station (in $D_a$, $D_1$), or stationary or no clouds (in $D_H$, $D_L$, $D_M$) |
| 1 | NE |
| 2 | E |
| 3 | SE |
| 4 | S |
| 5 | SW |
| 6 | W |
| 7 | NW |
| 8 | N |
| 9 | All directions (in $D_a$, $D_1$), or confused (in $D_K$), or variable (in $D_{(wind)}$), or unknown (in $D_s$), or unknown or clouds invisible (in $D_H$, $D_L$, $D_M$) |
| / | Report from a coastal land station or displacement of ship not reported (in $D_s$ only – see Regulation 12.3.1.2 (*b*)) |

## 0739

| | |
|---|---|
| **$D_i$** | ***True bearing of principal ice edge*** |

| Code figure | |
|---|---|
| 0 | Ship in shore or flaw lead |
| 1 | Principal ice edge towards NE |
| 2 | Principal ice edge towards E |
| 3 | Principal ice edge towards SE |
| 4 | Principal ice edge towards S |
| 5 | Principal ice edge towards SW |
| 6 | Principal ice edge towards W |
| 7 | Principal ice edge towards NW |
| 8 | Principal ice edge towards N |
| 9 | Not determined (ship in ice) |
| / | Unable to report, because of darkness, lack of visibility or because only ice of land origin is visible |

## 0755

**$D_w$** ***True orientation of water feature given in $W_t$***

| Code figure | |
|---|---|
| 0 | No distinct orientation |
| 1 | Major axis of feature orientated NE–SW |
| 2 | Orientated E – W |
| 3 | Orientated SE–NW |
| 4 | Orientated N–S |
| 5 | Parallels shore to E |
| 6 | Parallels shore to S |
| 7 | Parallels shore to W |
| 8 | Parallels shore to N |
| / | Undetermined or unknown |

## 0777

***Dew-point depression in two figures***

**$D_tD_t$** ***Dew-point depression at the tropopause level***

**$D_0D_0$, $D_1D_1$, . . . $D_nD_n$** ***Dew-point depression at standard isobaric surfaces or at significant levels, starting with station level***

| Code figure | Degrees Celsius | Code figure | Degrees Celsius | Code figure | Degrees Celsius | Code figure | Degrees Celsius |
|---|---|---|---|---|---|---|---|
| 00 | 0.0 | 25 | 2.5 | 50 | 5 | 75 | 25 |
| 01 | 0.1 | 26 | 2.6 | 51 | Not used | 76 | 26 |
| 02 | 0.2 | 27 | 2.7 | 52 | Not used | 77 | 27 |
| 03 | 0.3 | 28 | 2.8 | 53 | Not used | 78 | 28 |
| 04 | 0.4 | 29 | 2.9 | 54 | Not used | 79 | 29 |
| 05 | 0.5 | 30 | 3.0 | 55 | Not used | 80 | 30 |
| 06 | 0.6 | 31 | 3.1 | 56 | 6 | 81 | 31 |
| 07 | 0.7 | 32 | 3.2 | 57 | 7 | 82 | 32 |
| 08 | 0.8 | 33 | 3.3 | 58 | 8 | 83 | 33 |
| 09 | 0.9 | 34 | 3.4 | 59 | 9 | 84 | 34 |
| 10 | 1.0 | 35 | 3.5 | 60 | 10 | 85 | 35 |
| 11 | 1.1 | 36 | 3.6 | 61 | 11 | 86 | 36 |
| 12 | 1.2 | 37 | 3.7 | 62 | 12 | 87 | 37 |
| 13 | 1.3 | 38 | 3.8 | 63 | 13 | 88 | 38 |
| 14 | 1.4 | 39 | 3.9 | 64 | 14 | 89 | 39 |
| 15 | 1.5 | 40 | 4.0 | 65 | 15 | 90 | 40 |
| 16 | 1.6 | 41 | 4.1 | 66 | 16 | 91 | 41 |
| 17 | 1.7 | 42 | 4.2 | 67 | 17 | 92 | 42 |
| 18 | 1.8 | 43 | 4.3 | 68 | 18 | 93 | 43 |
| 19 | 1.9 | 44 | 4.4 | 69 | 19 | 94 | 44 |
| 20 | 2.0 | 45 | 4.5 | 70 | 20 | 95 | 45 |
| 21 | 2.1 | 46 | 4.6 | 71 | 21 | 96 | 46 |
| 22 | 2.2 | 47 | 4.7 | 72 | 22 | 97 | 47 |
| 23 | 2.3 | 48 | 4.8 | 73 | 23 | 98 | 48 |
| 24 | 2.4 | 49 | 4.9 | 74 | 24 | 99 | 49 |
| // | No humidity data available | | | | | | |

## 0822

**$d_T$** *Amount of temperature change, the sign of the change being given by $s_n$*

| Code figure | |
|---|---|
| 0 | ΔT = 10°C |
| 1 | ΔT = 11°C |
| 2 | ΔT = 12°C |
| 3 | ΔT = 13°C |
| 4 | ΔT = 14°C or more |
| 5 | ΔT = 5°C |
| 6 | ΔT = 6°C |
| 7 | ΔT = 7°C |
| 8 | ΔT = 8°C |
| 9 | ΔT = 9°C |

## 0833

**$d_c$** *Duration and character of precipitation given by RRR*

| Code figure | | |
|---|---|---|
| 0 | Lasted less than 1 hour | Only one period of precipitation has occurred during the period covered by $W_1W_2$ |
| 1 | Lasted 1–3 hours | |
| 2 | Lasted 3–6 hours | |
| 3 | Lasted more than 6 hours | |
| 4 | Lasted less than 1 hour | Two or more periods of precipitation have occurred during the period covered by $W_1W_2$ |
| 5 | Lasted 1–3 hours | |
| 6 | Lasted 3–6 hours | |
| 7 | Lasted more than 6 hours | |
| 9 | Unknown | |

## 0877

### *Direction in two figures*

**dd** *True direction, in tens of degrees, from which wind is blowing (or will blow)*

**dd** *Forecast true direction, in tens of degrees, from which wind will blow at the relevant grid point*

**dd** *True direction, in tens of degrees, from which wind is blowing, derived from movement of cloud elements*

**$d_hd_h$** *True direction, in tens of degrees, from which wind will blow at the height indicated by $h_xh_xh_x$*

**$d_jd_j$** *True direction, in tens of degrees, from which jet-stream wind is blowing (or will blow)*

**$d_md_m$** *True direction, in tens of degrees, from which maximum wind will blow at the flight level given by $n_mn_mn_m$*

**$d_md_m$** *True direction, in tens of degrees, from which maximum wind will blow at the height given by $h'_mh'_m$*

**$d_sd_s$** *True direction, in tens of degrees, towards which the system or front is moving*

**$d_sd_s$** *True direction, in tens of degrees, towards which the tropical cyclone orsystem is moving*

**$d_wd_w$** *True direction, in tens of degrees, from which waves are coming*

*(Code table 0877 – continued)*

**$d_{w1}d_{w1}$**
**$d_{w2}d_{w2}$** ***True direction, in tens of degrees, from which swell waves are coming***

**$d_0d_0$** ***True direction, in tens of degrees, towards which sea-surface current is moving***

**$d_0d_0$**
**$d_1d_1$**
**. . .**
**$d_nd_n$** ***True direction, in tens of degrees, towards which sea current at selected and/or significant depths starting with the sea surface is moving***

**$d_1d_1$**
**$d_2d_2$**
**. . .**
**$d_nd_n$** ***True direction, in tens of degrees, from which wind is blowing at the specified levels***

| Code figure | | Code figure | |
|---|---|---|---|
| 00 | Calm (no motion for $d_sd_s$, or no waves) | 19 | 185° – 194° |
| | | 20 | 195° – 204° |
| 01 | 5° – 14° | 21 | 205° – 214° |
| 02 | 15° – 24° | 22 | 215° – 224° |
| 03 | 25° – 34° | 23 | 225° – 234° |
| 04 | 35° – 44° | 24 | 235° – 244° |
| 05 | 45° – 54° | 25 | 245° – 254° |
| 06 | 55° – 64° | 26 | 255° – 264° |
| 07 | 65° – 74° | 27 | 265° – 274° |
| 08 | 75° – 84° | 28 | 275° – 284° |
| 09 | 85° – 94° | 29 | 285° – 294° |
| 10 | 95° – 104° | 30 | 295° – 304° |
| 11 | 105° – 114° | 31 | 305° – 314° |
| 12 | 115° – 124° | 32 | 315° – 324° |
| 13 | 125° – 134° | 33 | 325° – 334° |
| 14 | 135° – 144° | 34 | 335° – 344° |
| 15 | 145° – 154° | 35 | 345° – 354° |
| 16 | 155° – 164° | 36 | 355° – 4° |
| 17 | 165° – 174° | 99 | Variable, or all directions, or unknown |
| 18 | 175° – 184° | | (for $d_sd_s$), or waves confused, direction indeterminate |

## 0878

**dd** ***True direction, in tens of degrees, from which wind is blowing (or will blow) at stations within 1° of the North Pole***

| Code figure | Wind coming from a meridian between | Code figure | Wind coming from a meridian between | Code figure | Wind coming from a meridian between | Code figure | Wind coming from a meridian between |
|---|---|---|---|---|---|---|---|
| 00 | Calm | 10 | 95°W – 105°W | 20 | 165°E – 155°E | 30 | 65°E – 55°E |
| 01 | 5°W – 15°W | 11 | 105°W – 115°W | 21 | 155°E – 145°E | 31 | 55°E – 45°E |
| 02 | 15°W – 25°W | 12 | 115°W – 125°W | 22 | 145°E – 135°E | 32 | 45°E – 35°E |
| 03 | 25°W – 35°W | 13 | 125°W – 135°W | 23 | 135°E – 125°E | 33 | 35°E – 25°E |
| 04 | 35°W – 45°W | 14 | 135°W – 145°W | 24 | 125°E – 115°E | 34 | 25°E – 15°E |
| 05 | 45°W – 55°W | 15 | 145°W – 155°W | 25 | 115°E – 105°E | 35 | 15°E – 5°E |
| 06 | 55°W – 65°W | 16 | 155°W – 165°W | 26 | 105°E – 95°E | 36 | 5°E – 5°W |
| 07 | 65°W – 75°W | 17 | 165°W – 175°W | 27 | 95°E – 85°E | | |
| 08 | 75°W – 85°W | 18 | 175°W – 175°E | 28 | 85°E – 75°E | | |
| 09 | 85°W – 95°W | 19 | 175°E – 165°E | 29 | 75°E – 65°E | | |

## 0880

| | |
|---|---|
| $d_{a1}d_{a1}$ | ***Mean direction, in units of 4 degrees, from which waves are coming for the band indicated, relative to true north*** |
| $d_{a2}d_{a2}$ | ***Principal direction, in units of 4 degrees, from which waves are coming for the band indicated, relative to true north*** |
| $d_dd_d$ | ***True direction, in units of 4 degrees, from which the dominant wave is coming*** |
| $d_1d_1$<br>$d_2d_2$<br>. . .<br>$d_nd_n$ | ***True direction, in units of 4 degrees, from which waves are coming*** |

| Code figure | |
|---|---|
| 00 | **358° to less than 2°** |
| 01 | **2° to less than 6°** |
| 02 | **6° to less than 10°** |
| . | |
| . | |
| . | |
| 89 | **354° to less than 358°** |
| 90–98 | **Not used** |
| 99 | **Ratio of the spectral density for the band to the maximum is less than 0.005** |

## 0901

**E** ***State of the ground without snow or measurable ice cover***

| Code figure | |
|---|---|
| 0 | **Surface of ground dry (without cracks and no appreciable amount of dust or loose sand)** |
| 1 | **Surface of ground moist** |
| 2 | **Surface of ground wet (standing water in small or large pools on surface)** |
| 3 | **Flooded** |
| 4 | **Surface of ground frozen** |
| 5 | **Glaze on ground** |
| 6 | **Loose dry dust or sand not covering ground completely** |
| 7 | **Thin cover of loose dry dust or sand covering ground completely** |
| 8 | **Moderate or thick cover of loose dry dust or sand covering ground completely** |
| 9 | **Extremely dry with cracks** |

Notes:

(1) The definitions in the code for E for numbers 0 to 2 and 4 apply to representative bare ground and numbers 3 and 5 to 9 to an open representative area.

(2) In all instances, the highest code figures applicable shall be reported.

## 0919

$E_R$ ***Runway deposits***

| Code figure | |
|---|---|
| **0** | **Clear and dry** |
| **1** | **Damp** |
| **2** | **Wet and water patches** |
| **3** | **Rime and frost covered (depth normally less than 1 mm)** |
| **4** | **Dry snow** |
| **5** | **Wet snow** |
| **6** | **Slush** |
| **7** | **Ice** |
| **8** | **Compacted or rolled snow** |
| **9** | **Frozen ruts or ridges** |
| **/** | **Type of deposit not reported (e.g. due to runway clearance in progress)** |

## 0933

$E_c$ ***Characteristics of release***

| Code figure | |
|---|---|
| **0** | **No release** |
| **1** | **Release has stopped** |
| **2** | **Release** |
| **3** | **Release is continuing** |
| **4–6** | **Reserved** |
| **7** | **Missing value** |

## 0935

$E_e$ ***Release behaviour over time***

| Code figure | |
|---|---|
| **0** | **Release no longer occurring** |
| **1** | **Release still occurring** |
| **2** | **Release expected to increase in next six hours** |
| **3** | **Release expected to remain constant in next six hours** |
| **4** | **Release expected to decrease in next six hours** |
| **5–6** | **Reserved** |
| **7** | **Missing value** |

## 0938

$E_h$ ***Elevation above the horizon of the base of anvil of cumulonimbus or of the summit of other phenomena***

| Code figure | |
|---|---|
| 1 | **Very low on the horizon** |
| 3 | **Less than 30° above the horizon** |
| 7 | **More than 30° above the horizon** |

## 0943

$E_s$ ***State of current or expected release***

| Code figure | |
|---|---|
| 0 | **Gaseous** |
| 1 | **Particulate** |
| 2 | **Mixture of gaseous and particulate** |
| 3 | **Missing value** |

## 0964

$E_3$ ***Slush condition under the ice layer***

| Code figure | |
|---|---|
| 0 | **No slush ice** |
| 1 | **Slush ice to approximately $^1/_3$ of depth of the river, lake or reservoir** |
| 2 | **Slush ice from $^1/_3$ to $^2/_3$ of depth of the river, lake or reservoir** |
| 3 | **Slush ice to depth of the river, lake or reservoir greater than $^2/_3$** |

## 0975

E´ ***State of the ground with snow or measurable ice cover***

| Code figure | |
|---|---|
| 0 | **Ground predominantly covered by ice** |
| 1 | **Compact or wet snow (with or without ice) covering less than one-half of the ground** |
| 2 | **Compact or wet snow (with or without ice) covering at least one-half of the ground but ground not completely covered** |
| 3 | **Even layer of compact or wet snow covering ground completely** |
| 4 | **Uneven layer of compact or wet snow covering ground completely** |
| 5 | **Loose dry snow covering less than one-half of the ground** |
| 6 | **Loose dry snow covering at least one-half of the ground but ground not completely covered** |
| 7 | **Even layer of loose dry snow covering ground completely** |
| 8 | **Uneven layer of loose dry snow covering ground completely** |
| 9 | **Snow covering ground completely; deep drifts** |

Notes:

(1) The definitions in the code for E´ apply to an open representative area.

(2) In all instances, the highest code figures applicable shall be reported.

(3) In the above code table, whenever reference is made to ice, it also includes solid precipitation other than snow.

# 0977

## $E_1E_1$, $E_2E_2$ *Ice phenomena on the river, lake or reservoir*

| Code figure | |
|---|---|
| | **The *first decile* (00 to 09) describes the conditions on the river, lake or reservoir prior to transport of ice:** |
| **00** | **Water surface free of ice** |
| **01** | **Ice along banks** |
| **02** | **Ice crystals** |
| **03** | **Ice slush** |
| **04** | **Ice floes from tributaries entering near the river, lake or reservoir station** |
| | **The *second decile* (10 to 19) describes the propagation of slush ice on the water surface of the river, lake or reservoir:** |
| **10** | **Floating slush ice covering approximately $^1/_3$ (up to 30%) of the water surface** |
| **11** | **Floating slush ice covering about half (40% – 60%) of the water surface** |
| **12** | **Floating slush ice covering more than half (70% – 100%) of the water surface** |
| | **The *third decile* (20 to 29) describes the conditions on the river, lake or reservoir when ice is being transported:** |
| **20** | **Floating ice covering 10% of the water surface** |
| **21** | **Floating ice covering 20% of the water surface** |
| **22** | **Floating ice covering 30% of the water surface** |
| **23** | **Floating ice covering 40% of the water surface** |
| **24** | **Floating ice covering 50% of the water surface** |
| **25** | **Floating ice covering 60% of the water surface** |
| **26** | **Floating ice covering 70% of the water surface** |
| **27** | **Floating ice covering 80% of the water surface** |
| **28** | **Floating ice covering 90% of the water surface** |
| **29** | **Floating ice covering 100% of the water surface** |
| | **The *fourth decile* (30 to 39) describes the freezing-up of the river, lake or reservoir:** |
| **30** | **Water surface frozen at station, free upstream** |
| **31** | **Water surface frozen at station, free downstream** |
| **32** | **Water surface free at station, frozen upstream** |
| **33** | **Water surface free at station, frozen downstream** |
| **34** | **Ice floes near the station, water surface frozen downstream** |
| **35** | **Water surface frozen with breaks** |
| **36** | **Water surface completely frozen over** |
| **37** | **Water surface frozen over, with pile-ups** |
| | **The *fifth decile* (40 to 49) describes the state of the river, lake or reservoir when the ice cover is breaking up:** |
| **40** | **Ice melting along the banks** |
| **41** | **Some water on the ice** |
| **42** | **Ice waterlogged** |
| **43** | **Water holes in the ice cover** |
| **44** | **Ice moving** |
| **45** | **Open water in breaks** |
| **46** | **Break-up (first day of movement of ice on the entire water surface)** |
| **47** | **Ice broken artificially** |

*(Code table 0977 – continued)*

**The *sixth* decile *(*50 to 59) describes the ice jams on the river, lake or reservoir:**

| | |
|---|---|
| **50** | **Ice jam at the station** |
| **51** | **Ice jam below the station** |
| **52** | **Ice jam above the station** |
| **53** | **Scale and position of jam unchanged** |
| **54** | **Jam has frozen solid in the same place** |
| **55** | **Jam has solidified and expanded upstream** |
| **56** | **Jam has solidified and moved downstream** |
| **57** | **Jam is weakening** |
| **58** | **Jam broken up by explosives or other methods** |
| **59** | **Jam broken** |

**The *seventh decile* (60 to 69) describes the conditions at the mouth of the river when there is no continuous layer of ice:**

| | |
|---|---|
| **60** | **Fractured ice** |
| **61** | **Ice piling up against the bank** |
| **62** | **Ice carried towards the bank** |
| **63** | **Band of ice less than 100 m wide fixed to banks** |
| **64** | **Band of ice 100 to 500 m wide fixed to banks** |
| **65** | **Band of ice wider than 500 m fixed to banks** |

**The *eighth decile* (70 to 79) describes the conditions in the mouth section of the river when ice cover is continuous:**

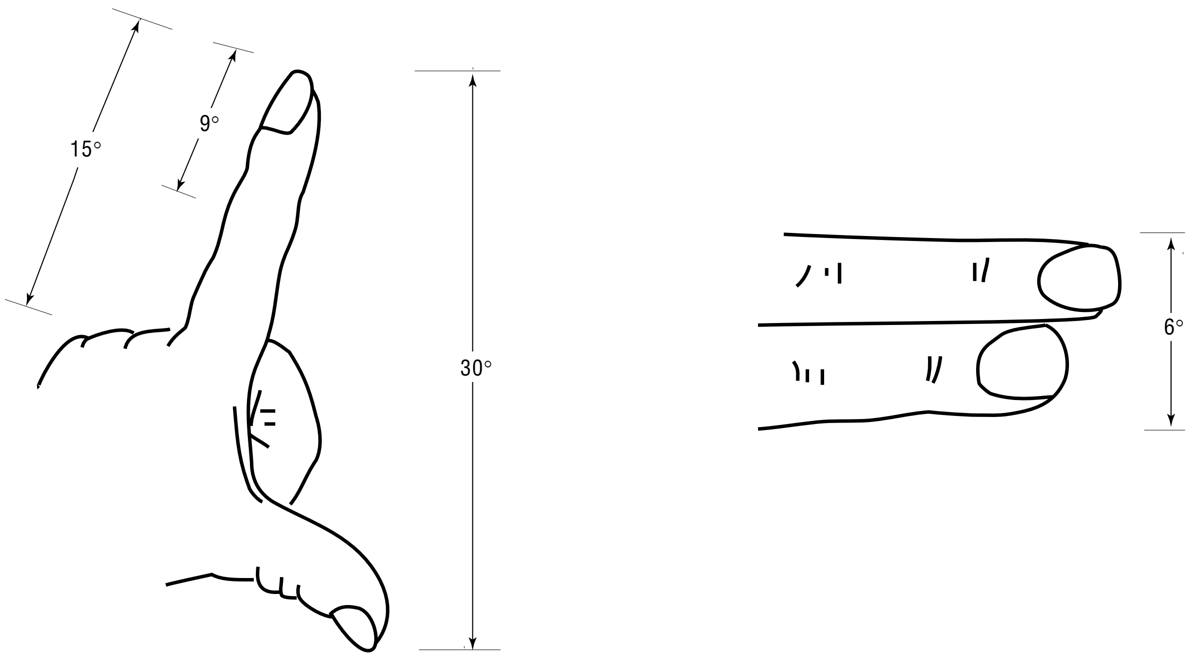
| | |
|---|---|
| **70** | **Cracks in the ice, mainly across the line of flow** |
| **71** | **Cracks along the flow line** |
| **72** | **Smooth sheet of ice** |
| **73** | **Ice sheet with pile-ups** |

## 1004

| | |
|---|---|
| $e_C$ | ***Elevation angle of the top of the cloud indicated by C*** |
| e´ | ***Elevation angle of the top of the phenomenon above horizon*** |

| Code figure | |
|---|---|
| **0** | **Tops of cloud not visible** |
| **1** | **45° or more** |
| **2** | **About 30°** |
| **3** | **About 20°** |
| **4** | **About 15°** |
| **5** | **About 12°** |
| **6** | **About 9°** |
| **7** | **About 7°** |
| **8** | **About 6°** |
| **9** | **Less than 5°** |

Note: Angular elevation may be estimated by a rough-and-ready method. The following illustration demonstrates that method:




At a distance of 30 cm (about a foot) from your eye, the span formed by your thumb and forefinger is about 30°. The total length of your forefinger is about 15°. The length of the top of your forefinger is about 9°. The breadth of two fingers is about 6°.

## 1062

| | |
|---|---|
| $e_1$ | *Type of isopleth and units of isopleth values* uuu |
| **Code figure** | |
| **0** | **Relative or absolute contour or isallohypse; uuu in tens of standard geopotential metres (thousands figure omitted)** |
| **1** | **Dew point; uuu in whole degrees Celsius (add 500 for minus values)** |
| **2** | **Isotherm; uuu in whole degrees Celsius (add 500 for minus values)** |
| **3** | **Potential temperature; uuu in whole kelvins** |
| **4** | **Isobar or isallobar; uuu in whole hectopascals (thousands figure omitted)** |
| **5** | **Mixing ratio; uuu in tenths of a gramme/kilogramme** |
| **6** | **Saturation pressure; uuu in whole hectopascals (thousands figure omitted)** |
| **7** | **Relative humidity; uuu in units of percentage** |
| **8** | **Wind speed; uuu in knots** |
| **9** | **Streamline; uuu used as identification number** |

Note: For code figure 0 in a tropopause analysis, uuu shall be reported in hundreds of standard geopotential metres.

## 1063

| | |
|---|---|
| $e_2$ | *Type of isopleth and units of isopleth values uu* |
| **Code figure** | |
| **0** | **Sea-wave height; uu in metres** |
| **1** | **Swell-wave height; uu in metres** |
| **2** | **Wave height (wave type undetermined); uu in metres** |
| **3** | **Wave direction; uu in tens of degrees** |
| **4** | **Wave period; uu in seconds** |
| **9** | **Sea temperature; uu in whole degrees Celsius** |

## 1079

| | |
|---|---|
| $e_Re_R$ | *Depth of deposit* |
| **Code figure** | |
| **00** | **Less than 1 mm** |
| **01** | **1 mm** |
| **02** | **2 mm** |
| **03** | **3 mm** |
| | **. . .** |
| **89** | **89 mm** |
| **90** | **90 mm** |
| **91** | **Reserved** |
| **92** | **10 cm** |
| **93** | **15 cm** |
| **94** | **20 cm** |
| **95** | **25 cm** |
| **96** | **30 cm** |
| **97** | **35 cm** |
| **98** | **40 cm or more** |
| **99** | **Runway or runways non-operational due to snow, slush, ice, large drifts or runway clearance, but depth not reported** |
| **//** | **Depth of deposit operationally not significant or not measurable** |

# 1085

**$e_Te_T$** ***Type of thermodynamic sensing equipment***

| Code figure | |
|---|---|
| **00** | **No thermodynamic sensor** |
| *01–49* | ***Sonde*** |
| **01** | **Arcasonde, experimental** |
| **02** | **Arcasonde 1A, thin film mount, 10 mil (Bt)** |
| **03** | **WOX1A and WOX4A, experimental** |
| **04** | **WOX1A, 10 mil (Bt)** |
| **05** | **WOX4A, 10 mil (Bt)** |
| **06** | **Walmet, thin film loop mount, 10 mil (Bt)** |
| **07** | **Sts, experimental (Bt)** |
| **08** | **Sts, thin film mount, 10 mil (Bt)** |
| **09** | **Datasonde, experimental (Bt)** |
| **10** | **Datasonde, thin film loop mount, 10 mil (Bt)** |
| **11** | **Pulsed sonde, experimental** |
| **12–19** | **Unassigned** |
| **20** | **MK-1, MK-2, experimental (Rw)** |
| **21** | **MK-1 (Rw)** |
| **22** | **MK-2 (Rw)** |
| **23–29** | **Unassigned** |
| **30** | **Echosonde, ES64-B, experimental (Rw)** |
| **31** | **Echosonde, ES64-B (Rw)** |
| **32** | **Echosonde, ES89P** |
| **33–34** | **Unassigned** |
| **35** | **DMN sonde, thin wire** |
| **36** | **DMN sonde, flat plate** |
| **37–44** | **Unassigned** |
| **45** | **UK rocketsonde MK-11 spiralized coiled 13 μm resistance wire element** |
| **46–49** | **Unassigned** |
| *50–54* | ***Sphere*** |
| **50** | **Sphere, experimental** |
| **51** | **Sphere, inflatable** |
| **52–54** | **Unassigned** |
| *55–59* | ***Grenade*** |
| **55** | **Grenade, experimental** |
| **56** | **Grenade** |
| **57–59** | **Unassigned** |
| *60–64* | ***Density gauge*** |
| **60** | **Density gauge, experimental** |
| **61–64** | **Unassigned** |
| *65–69* | ***Pressure gauge*** |
| **65** | **Pressure gauge, experimental** |
| **66–69** | **Unassigned** |
| *70–79* | ***Remote sensing*** |
| **70** | **Remote sensing, experimental** |
| **71–79** | **Unassigned** |

Note: When specifications indicating experimental equipment are reported, plain-language remarks explaining the experimental nature of the equipment shall be added at the end of the coded report.

## 1095

**$e_we_w$** ***Type of wind sensing equipment***

| Code figure | |
|---|---|
| **00** | **No wind sensor** |
| ***01–09*** | ***Chaff*** |
| **01** | **Chaff, experimental** |
| **02** | **Chaff, metallized** |
| **03–09** | **Unassigned** |
| ***10–29*** | ***Parachute*** |
| **10** | **Parachute, experimental** |
| **11** | **Parachute, 0.5 m to 3.5 m diameter** |
| **12** | **Parachute, 3.6 m to 5.5 m diameter** |
| **13** | **Parachute, greater than 5.5 m diameter** |
| **14** | **Mesh decelerator, experimental** |
| **15–29** | **Unassigned** |
| ***30–49*** | ***Starute*** |
| **30** | **Starute, experimental** |
| **31** | **Starute, 0.5 m to 3.5 m diameter** |
| **32** | **Starute, 3.6 m to 5.5 m diameter** |
| **33** | **Starute, greater than 5.5 m diameter** |
| **34–49** | **Unassigned** |
| ***50–54*** | ***Sphere*** |
| **50** | **Sphere, experimental** |
| **51** | **Sphere, inflatable** |
| **52–54** | **Unassigned** |
| ***55–59*** | ***Grenade*** |
| **55** | **Grenade, experimental** |
| **56–59** | **Unassigned** |
| ***60–64*** | ***Chemical trail*** |
| **60** | **Chemical trail, experimental** |
| **61–64** | **Unassigned** |
| ***65–69*** | ***Meteor trail*** |
| **65** | **Meteor trail, experimental** |
| **66–69** | **Unassigned** |
| ***70–79*** | ***Remote sensing*** |
| **70** | **Remote sensing, experimental** |
| **71–79** | **Unassigned** |
| ***80–99*** | ***Unassigned*** |

Note: When specifications indicating experimental equipment are reported, plain-language remarks explaining the experimental nature of the equipment shall be added at the end of the coded report.

## 1109

**$F_H$** ***Type of forecast given by the four figures which follow and indication of the number of date-time group(s) used***

| Code figure | Type of forecast | Number of group(s) used to indicate date-time or period |
|---|---|---|
| 1 | **Forecast of maximum stage or discharge** | 2 |
| 2 | **Forecast of minimum stage or discharge** | 2 |
| 3 | **Forecast of maximum daily discharge or of maximum daily mean stage** | 2 |
| 4 | **Forecast of minimum daily discharge or of minimum daily mean stage** | 2 |
| 5 | **Forecast of average daily stage or discharge** | 2 |
| 6 | **Forecast of maximum stage or discharge (above flood stage)** | 2 |
| 7 | **Forecast of mean stage or mean discharge** | 2 |
| 8 | **Forecast of stage or discharge** | 1 |
| 9 | **Forecast of specific stage or discharge (above flood stage)** | 1 |

Note: For code figures 6 and 9 of the code, the flood stage for each station shall normally be fixed regionally, otherwise nationally.

## 1133

**$F_c$** ***Character of front***

| Code figure | |
|---|---|
| 0 | **No specification** |
| 1 | **Frontal activity area decreasing** |
| 2 | **Frontal activity area, little change** |
| 3 | **Frontal activity area increasing** |
| 4 | **Intertropical** |
| 5 | **Forming or existence suspected** |
| 6 | **Quasi-stationary** |
| 7 | **With waves** |
| 8 | **Diffuse** |
| 9 | **Position doubtful** |

Note: Intertropical fronts shall be indicated by using the tropical section of the code form.

## 1135

**$F_e$** ***Tertiary form of ice***

**$F_p$** ***Predominant form of ice***

**$F_q$** ***Quaternary form of ice***

**$F_s$** ***Secondary form of ice***

**$F_u$** ***Quintary form of ice***

| Code figure | |
|---|---|
| 0 | No ice |
| 1 | Ice of land origin |
| 2 | Pancake ice |
| 3 | Brash ice, small ice cakes, ice cakes |
| 4 | Small ice floes (20–100 m across) |
| 5 | Medium ice floes (100–500 m across) |
| 6 | Big ice floes (500–2000 m across) |
| 7 | Vast ice floes (2–10 km across) |
| 8 | Giant ice floes (over 10 km across) |
| 9 | Fast ice |
| / | Undetermined or unknown |

## 1139

**$F_i$** ***Intensity of front***

| Code figure | |
|---|---|
| 0 | No specification |
| 1 | Weak, decreasing (including frontolysis) |
| 2 | Weak, little or no change |
| 3 | Weak, increasing (including frontogenesis) |
| 4 | Moderate, decreasing |
| 5 | Moderate, little or no change |
| 6 | Moderate, increasing |
| 7 | Strong, decreasing |
| 8 | Strong, little or no change |
| 9 | Strong, increasing |

## 1144

**$F_m$** ***Forecast strength of surface wind***

| Code figure | Beaufort number | Code figure | Beaufort number |
|---|---|---|---|
| 0 | 0–3 | 5 | 8 |
| 1 | 4 | 6 | 9 |
| 2 | 5 | 7 | 10 |
| 3 | 6 | 8 | 11 |
| 4 | 7 | 9 | 12 |

## 1152

**$F_t$** ***Type of front***

| Code figure | |
|---|---|
| **0** | **Quasi-stationary front at the surface** |
| **1** | **Quasi-stationary front above the surface** |
| **2** | **Warm front at the surface** |
| **3** | **Warm front above the surface** |
| **4** | **Cold front at the surface** |
| **5** | **Cold front above the surface** |
| **6** | **Occlusion** |
| **7** | **Instability line** |
| **8** | **Intertropical front** |
| **9** | **Convergence line** |

Note: Intertropical fronts shall be indicated by using the tropical section of the code form.

## 1162

**$F_1$, $F_2$, etc.** ***Intensity of points***

| Code figure | | |
|---|---|---|
| **1** | **Dots** | |
| **2** | **Dots and dashes** | **weak** |
| **3** | **Dashes** | |
| **4** | **Dots** | |
| **5** | **Dots and dashes** | **moderate** |
| **6** | **Dashes** | |
| **7** | **Dots** | |
| **8** | **Dots and dashes** | **strong** |
| **9** | **Dashes** | |

## 1200

**f** ***Wind speed derived from movement of cloud elements***

| Code figure | |
|---|---|
| **0** | **0 to 9 m $s^{-1}$** |
| **1** | **10 to 19 m $s^{-1}$** |
| **2** | **20 to 29 m $s^{-1}$** |
| **3** | **30 to 39 m $s^{-1}$** |
| **4** | **40 to 49 m $s^{-1}$** |
| **5** | **50 to 59 m $s^{-1}$** |
| **6** | **60 to 69 m $s^{-1}$** |
| **7** | **70 to 79 m $s^{-1}$** |
| **8** | **80 to 89 m $s^{-1}$** |
| **9** | **90 m $s^{-1}$ or more** |
| **/** | **Undetermined** |

## 1236

$f_e$ ***Speed of movement of echo pattern***

| Code figure | |
|---|---|
| **0** | **0 to 9 km $h^{-1}$** |
| **1** | **10 to 19 km $h^{-1}$** |
| **2** | **20 to 29 km $h^{-1}$** |
| **3** | **30 to 39 km $h^{-1}$** |
| **4** | **40 to 49 km $h^{-1}$** |
| **5** | **50 to 59 km $h^{-1}$** |
| **6** | **60 to 69 km $h^{-1}$** |
| **7** | **70 to 79 km $h^{-1}$** |
| **8** | **80 to 89 km $h^{-1}$** |
| **9** | **90 km $h^{-1}$ or more** |
| **/** | **Undetermined** |

## 1300

*G* ***Period covered by forecast***

| Code figure | |
|---|---|
| **0** | **Synopsis of meteorological conditions in the forecast area at the time of the beginning of the forecast period** |
| **1** | **Forecast valid for 3 hours** |
| **2** | **Forecast valid for 6 hours** |
| **3** | **Forecast valid for 9 hours** |
| **4** | **Forecast valid for 12 hours** |
| **5** | **Forecast valid for 18 hours** |
| **6** | **Forecast valid for 24 hours** |
| **7** | **Forecast valid for 48 hours** |
| **8** | **Forecast valid for 72 hours** |
| **9** | **Occasionally** |

## 1400

**g** ***Time of the observations used to compute the reported mean values of geopotential, temperature and humidity***

| Code figure | |
|---|---|
| **1** | **0000 UTC** |
| **2** | **1200 UTC** |
| **3** | **0000 and 1200 UTC** |
| **4** | **0600 UTC** |
| **5** | **1800 UTC** |
| **6** | **0600 and 1800 UTC** |
| **7** | **0000, 1200 and either 0600 or 1800 UTC** |
| **8** | **0600, 1800 and either 0000 or 1200 UTC** |
| **9** | **0000, 0600, 1200 and 1800 UTC** |
| **/** | **Other hours** |

Note: The times of observation are one hour or less from the reported times.

## 1487

**$g_rg_r$** ***Grid geometry and geographical support***

**(G = geographical; C = Cartesian)**

| Code figure | Grid type | MAP PROJECTION | | ORIGIN (OR REFERENCE POINT) DEFINED BY MEANS OF | |
|---|---|---|---|---|---|
| | | Type | Latitude of true scale | Cartesian coordinate of the Pole | Geographical coordinate of origin (or of reference point) |
| 01 | G | — | — | — | X |
| 02 | C | Polar stereographic | 60° | X | — |
| 03 | C | Polar stereographic | 60° | — | X |
| 04 | C | Lambert's conformal | 30° – 60° | X | — |
| 05 | C | Lambert's conformal | 30° – 60° | — | X |
| 06 | C | Lambert's conformal | 10° – 40° | X | — |
| 07 | C | Lambert's conformal | 10° – 40° | — | X |
| 08 | C | Mercator | 22.5° | — | X |
| 99 | Details specified in *Weather Reporting* (WMO-No. 9), Volume B (see NNN under centre $F_1F_2$) | | | | |

## 1535

**$H_e$** ***Altitude of echo top***

| Code figure | |
|---|---|
| 0 | 0 to less than 2 km |
| 1 | 2 to less than 4 km |
| 2 | 4 to less than 6 km |
| 3 | 6 to less than 8 km |
| 4 | 8 to less than 10 km |
| 5 | 10 to less than 12 km |
| 6 | 12 to less than 14 km |
| 7 | 14 to less than 16 km |
| 8 | 16 to less than 18 km |
| 9 | 18 km and above |
| / | Undetermined |

## 1561

**$H_1$, $H_2$, $H_3$, $H_4$, $H_5$** — ***Maximum altitude of cloud tops***

| Code figure | |
|---|---|
| **0** | **3 000 m or less** |
| **1** | **Above 3 000 m to 4 500 m** |
| **2** | **Above 4 500 m to 6 000 m** |
| **3** | **Above 6 000 m to 7 500 m** |
| **4** | **Above 7 500 m to 9 000 m** |
| **5** | **Above 9 000 m to 10 500 m** |
| **6** | **Above 10 500 m to 12 000 m** |
| **7** | **Above 12 000 m to 13 500 m** |
| **8** | **Above 13 500 m to 15 000 m** |
| **9** | **Above 15 000 m** |

## 1600

**h** ***Height above surface of the base of the lowest cloud seen***

| Code figure | |
|---|---|
| **0** | **0 to 50 m** |
| **1** | **50 to 100 m** |
| **2** | **100 to 200 m** |
| **3** | **200 to 300 m** |
| **4** | **300 to 600 m** |
| **5** | **600 to 1 000 m** |
| **6** | **1 000 to 1 500 m** |
| **7** | **1 500 to 2 000 m** |
| **8** | **2 000 to 2 500 m** |
| **9** | **2 500 m or more, or no clouds** |
| **/** | **Height of base of cloud not known *or* base of clouds at a level lower and tops at a level higher than that of the station** |

Notes:

(1) A height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range, e.g. a height of 600 m shall be reported by code figure 5.

(2) Due to the limitation in range of the cloud-sensing equipment used by an automatic station, the code figures reported for h could have one of the three following meanings:

(a) The actual height of the base of the cloud is within the range indicated by the code figure; or

(b) The height of the base of the cloud is greater than the range indicated by the code figure but cannot be determined due to instrumental limitations; or

(c) There are no clouds vertically above the station.

# 1677

**$h_sh_s$** ***Height of base of cloud layer or mass whose genus is indicated by C***

**$h_th_t$** ***Height of the tops of the lowest clouds or height of the lowest cloud layer or fog***

| Code figure | Metres | Code figure | Metres | Code figure | Metres |
|---|---|---|---|---|---|
| 00 | <30 | 34 | 1 020 | 67 | 5 100 |
| 01 | 30 | 35 | 1 050 | 68 | 5 400 |
| 02 | 60 | 36 | 1 080 | 69 | 5 700 |
| 03 | 90 | 37 | 1 110 | 70 | 6 000 |
| 04 | 120 | 38 | 1 140 | 71 | 6 300 |
| 05 | 150 | 39 | 1 170 | 72 | 6 600 |
| 06 | 180 | 40 | 1 200 | 73 | 6 900 |
| 07 | 210 | 41 | 1 230 | 74 | 7 200 |
| 08 | 240 | 42 | 1 260 | 75 | 7 500 |
| 09 | 270 | 43 | 1 290 | 76 | 7 800 |
| 10 | 300 | 44 | 1 320 | 77 | 8 100 |
| 11 | 330 | 45 | 1 350 | 78 | 8 400 |
| 12 | 360 | 46 | 1 380 | 79 | 8 700 |
| 13 | 390 | 47 | 1 410 | 80 | 9 000 |
| 14 | 420 | 48 | 1 440 | 81 | 10 500 |
| 15 | 450 | 49 | 1 470 | 82 | 12 000 |
| 16 | 480 | 50 | 1 500 | 83 | 13 500 |
| 17 | 510 | 51 | Not used | 84 | 15 000 |
| 18 | 540 | 52 | Not used | 85 | 16 500 |
| 19 | 570 | 53 | Not used | 86 | 18 000 |
| 20 | 600 | 54 | Not used | 87 | 19 500 |
| 21 | 630 | 55 | Not used | 88 | 21 000 |
| 22 | 660 | 56 | 1 800 | 89 | >21 000 |
| 23 | 690 | 57 | 2 100 | 90 | Less than 50 m |
| 24 | 720 | 58 | 2 400 | 91 | 50 to 100 m |
| 25 | 750 | 59 | 2 700 | 92 | 100 to 200 m |
| 26 | 780 | 60 | 3 000 | 93 | 200 to 300 m |
| 27 | 810 | 61 | 3 300 | 94 | 300 to 600 m |
| 28 | 840 | 62 | 3 600 | 95 | 600 to 1 000 m |
| 29 | 870 | 63 | 3 900 | 96 | 1 000 to 1 500 m |
| 30 | 900 | 64 | 4 200 | 97 | 1 500 to 2 000 m |
| 31 | 930 | 65 | 4 500 | 98 | 2 000 to 2 500 m |
| 32 | 960 | 66 | 4 800 | 99 | 2 500 m or more, or no clouds |
| 33 | 990 | | | | |

Note: If the observed value is between two of the heights as given in the table, the code figure for the lower height shall be reported, except for code figures 90–99; in this decile, a value exactly equal to one of the heights at the ends of the ranges shall be coded in the higher range, e.g. a height of 600 m is reported by code figure 95.

## 1690

**$h_Bh_Bh_B$** ***Height of lowest level of turbulence***

**$h_fh_fh_f$** ***Altitude of the 0°C isotherm***

**$h_ih_ih_i$** ***Height of lowest level of icing***

**$h_sh_sh_s$** ***Height of base of cloud layer or mass, or observed or forecast vertical visibility***

**$h_th_th_t$** ***Altitude of cloud layer or mass***

**$h_xh_xh_x$** ***Altitude to which temperature and wind refer***

| Code figure | Metres | Code figure | Metres |
|---|---|---|---|
| 000 | <30 | 100 | 3 000 |
| 001 | 30 | 110 | 3 300 |
| 002 | 60 | 120 | 3 600 |
| 003 | 90 | etc. | etc. |
| 004 | 120 | 990 | 29 700 |
| 005 | 150 | 999 | 30 000 or more |
| 006 | 180 | | |
| 007 | 210 | | |
| 008 | 240 | | |
| 009 | 270 | | |
| 010 | 300 | | |
| 011 | 330 | | |
| etc. | etc. | | |
| 099 | 2 970 | | |

Notes:

(1) The code is direct reading in units of 30 metres.

(2) The code table shall be considered as a coding device in which certain code figures are assigned values. These are discrete values, not ranges. Any observation or forecast of values to be coded in the code table shall be made without regard to the code table. The coding is then accomplished according to the following rule: If the observed or forecast value is between two of the heights as given in the table, the code figure for the lower height shall be reported.

## 1700

**I** ***Density of points***

| Code figure | |
|---|---|
| 1 | Low |
| 2 | Medium |
| 3 | High |

## 1731

**$I_a$** ***Indicator for frequency or wave number***

| Code figure | |
|---|---|
| 0 | Frequency (Hz) |
| 1 | Wave number ($m^{-1}$) |

## 1732

$I_b$ ***Indicator for directional or non-directional spectral wave data***

| Code figure | |
|---|---|
| 0 | **Non-directional** |
| 1 | **Directional** |

## 1733

$I_c$ ***Type of forecast ice accretion on the external parts of aircraft***

| Code figure | |
|---|---|
| 0 | **No icing** |
| 1 | **Light icing** |
| 2 | **Light icing in cloud** |
| 3 | **Light icing in precipitation** |
| 4 | **Moderate icing** |
| 5 | **Moderate icing in cloud** |
| 6 | **Moderate icing in precipitation** |
| 7 | **Severe icing** |
| 8 | **Severe icing in cloud** |
| 9 | **Severe icing in precipitation** |

## 1734

$I_d$ ***Indicator used to specify the hundreds of hectopascals figure (in Part A of TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL reports) or tens of hectopascals figure (in Part C of TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL reports) of the pressure relative to the last standard isobaric surface for which the wind is reported***

| Code figure | Wind group included up to and including the following standard isobaric surfaces: | |
|---|---|---|
| | Part A | Part C |
| 1 | **100 hPa or 150 hPa*** | **10 hPa** |
| 2 | **200 hPa or 250 hPa**** | **20 hPa** |
| 3 | **300 hPa** | **30 hPa** |
| 4 | **400 hPa** | **—** |
| 5 | **500 hPa** | **50 hPa** |
| 6 | **—** | **—** |
| 7 | **700 hPa** | **70 hPa** |
| 8 | **850 hPa** | **—** |
| 9 | **925 hPa** | **—** |
| 0 | **1 000 hPa** | **—** |
| / | **No wind group is included for any standard isobaric surface** | **No wind group is included for any standard isobaric surface** |

* In this case (150 hPa), the wind group relating to the 100-hPa level shall also be included and coded as ///// except when 150 hPa is the highest standard isobaric surface reached by the sounding.

** In this case (250 hPa), the wind group relating to the 200-hPa level shall also be included and coded as ///// except when 250 hPa is the highest standard isobaric surface reached by the sounding.

## 1735

$I_e$ *Intensity of echoes*

| Code figure | Specification | Reflectivity (mm$^6$ m$^{-3}$) |
|---|---|---|
| 0 | Very weak | 0 to 2.30 x 10 |
| 1 | Very weak (estimated) | — |
| 2 | Weak | 2.31 x 10 to 9.40 x 10$^2$ |
| 3 | Weak (estimated) | — |
| 4 | Moderate | 9.41 x 10$^2$ to 3.70 x 10$^4$ |
| 5 | Moderate (estimated) | — |
| 6 | Strong | 3.71 x 10$^4$ to 5.00 x 10$^5$ |
| 7 | Strong (estimated) | — |
| 8 | Very strong | 5.00 x 10$^5$ |
| 9 | Very strong (estimated) | — |
| / | Undetermined | |

## 1741

$I_j$ *Density of points*

| Code figure | | |
|---|---|---|
| 0 | 1, 2 or 3 dots | |
| 1 | Weak | Spread of source 10° or less |
| 2 | Moderate | |
| 3 | Strong | |
| 4 | Weak | Spread of source 10° to 20° |
| 5 | Moderate | |
| 6 | Strong | |
| 7 | Weak | Spread of source 20° to 40° |
| 8 | Moderate | |
| 9 | Strong | |

## 1743

$I_n$ *Possibility that plume will encounter change in wind direction and/or speed*

| Code figure | |
|---|---|
| 0 | No significant change expected within the next six hours |
| 1 | Anticipated significant change expected within the next six hours |
| 2 | Reserved |
| 3 | Missing value |

## 1744

$I_m$ *Indicator for method of calculation of spectral data*

| Code figure | |
|---|---|
| 1 | **Longuet–Higgins (1964)** |
| 2 | **Longuet–Higgins ($F_3$ method)** |
| 3 | **Maximum likelihood method** |
| 4 | **Maximum entropy method** |
| 5–9 | **Reserved** |

## 1747

$I_p$ *Indicator for type of platform*

| Code figure | |
|---|---|
| 0 | **Sea station** |
| 1 | **Automatic data buoy** |
| 2 | **Aircraft** |
| 3 | **Satellite** |

## 1751

$I_s$ *Ice accretion on ships*

| Code figure | |
|---|---|
| 1 | **Icing from ocean spray** |
| 2 | **Icing from fog** |
| 3 | **Icing from spray and fog** |
| 4 | **Icing from rain** |
| 5 | **Icing from spray and rain** |

## 1765

$I_4$ *Data-processing technique used*

| Code figure | |
|---|---|
| 0 | **Processing technique not specified** |
| 1 | **Clear path, using automated statistical regression** |
| 2 | **Partly cloudy path, using automated statistical regression** |
| 3 | **Cloudy path, using automated statistical regression** |
| 4 | **Clear path, using automated statistical regression with interactive quality control** |
| 5 | **Partly cloudy path, using automated statistical regression with interactive quality control** |
| 6 | **Cloudy path, using automated statistical regression with interactive quality control** |
| 7–9 | **Reserved** |

Notes:

(1) Clear path means the sounding has been generated from clear radiances derived from actual clear spot measurements. Tropospheric and stratospheric HIRS data, as well as MSU and SSU data, have been used.

(2) Partly cloudy path means the sounding has been generated from clear radiances which have been calculated from partly cloudy spots. Tropospheric and stratospheric HIRS data, as well as MSU and SSU data, have been used.

(3) Cloudy path means the sounding has been generated only from stratospheric HIRS data, MSU data, and SSU data. Tropospheric HIRS data have not been used because of cloudy conditions.

## 1770

$I_XI_XI_X$ ***Instrument type for XBT, with fall rate equation coefficients***

*(See Common Code table C-3 in Attachment I.)*

## 1800

i ***Intensity or character of the weather element $w_e$ (type of weather)***

**(The column selected from this table depends on the code figures used for symbol $w_e$)**

| Code figure | Height of base of significant cloud in metres | Visibility in metres | Wind force (Beaufort) | Icing | | Turbulence | | Squalls | Snow cover in centimetres |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Less than 50 | Less than 50 | 10 | No specification | | Not specified | | No specification | No snow |
| 1 | 50–99 | 50– 199 | 11 | Light | | Light | | Rain, few | Up to 2 |
| 2 | 100–199 | 200– 499 | 12 | Moderate | In cloud | Moderate | In cloud | Rain, scattered but numerous | Up to 5 |
| 3 | 200–299 | 500– 999 | 3 | Severe | | Severe | | Rain, very numerous | Up to 10 |
| 4 | 300–599 | 1 000– 1 999 | 4 | Light | | Light | | Snow, few | Up to 15 |
| 5 | 600–999 | 1 000– 3 999 | 5 | Moderate | In precipitation | Moderate | In clear air | Snow, scattered but numerous | Up to 25 |
| 6 | 1 000–1 499 | 4 000– 9 999 | 6 | Severe | | Severe | | Rain and snow mixed, few | Up to 50 |
| 7 | 1 500–1 999 | 10 000–19 999 | 7 | | | | | Rain and snow mixed, few | Up to 100 |
| 8 | 2 000–2 499 | 20 000–49 999 | 8 | | | | | Rain and snow, scattered but numerous | Up to 200 |
| 9 | 2 500 or more, or no clouds | 50 000 or more | 9 | | | | | Rain and snow, very numerous | 200 or more |

Note: When $w_e$ = 8 = saturation, 0 shall be reported for i.

## 1806

$i_E$ ***Indicator of type of instrumentation for evaporation measurement or type of crop for which evapotranspiration is reported***

| Code figure | Instrumentation or crop type | Type of data |
|---|---|---|
| 0 | USA open pan evaporimeter (without cover) | |
| 1 | USA open pan evaporimeter (mesh covered) | |
| 2 | GGI-3000 evaporimeter (sunken) | Evaporation |
| 3 | 20-$m^2$ tank | |
| 4 | Others | |
| 5 | Rice | |
| 6 | Wheat | |
| 7 | Maize | Evapotranspiration |
| 8 | Sorghum | |
| 9 | Other crops | |

## 1819

$i_R$ ***Indicator for inclusion or omission of precipitation data***

| Code figure | Precipitation data are reported: | Group $6RRRt_R$ is: |
|---|---|---|
| **0** | **In Sections 1 and 3** | **Included in both sections** |
| **1** | **In Section 1** | **Included** |
| **2** | **In Section 3** | **Included** |
| **3** | **In none of the two Sections 1 and 3** | **Omitted (precipitation amount = 0)** |
| **4** | **In none of the two Sections 1 and 3** | **Omitted (precipitation amount not available)** |

## 1833

$i_c$ ***Indicator for units of sea-surface current speed***

| Code figure | |
|---|---|
| **0** | **Metres per second** |
| **1** | **Knots** |
| **9** | **No sea-current data available** |

## 1840

$i_h$ ***Indicator of sign and unit of elevation/altitude***

| Code figure | |
|---|---|
| **1** | **Elevation at/or above sea level, in metres** |
| **2** | **Elevation at/or above sea level, in feet** |
| **3** | **Elevation below sea level, in metres** |
| **4** | **Elevation below sea level, in feet** |
| **5** | **Altitude of aircraft, in tens of metres** |
| **6** | **Altitude of aircraft, in tens of feet** |
| **7** | **Negative altitude of aircraft, in tens of metres** |
| **8** | **Negative altitude of aircraft, in tens of feet** |

Note: In code figures 5 through 8, aircraft altitude is reported with reference to the standard datum plane 1013.25 hPa (29.92 inches of mercury).

## 1841

$i_j$ ***Indicator for units of wind speed and height or pressure in the jet-stream core***

| Code figure | | |
|---|---|---|
| **0** | **Wind in m $s^{-1}$** | **Geopotential of jet-stream core in hundreds of standard geopotential metres** |
| **1** | **Wind in km $h^{-1}$** | |
| **2** | **Wind in knots** | |
| **4** | **Wind in m $s^{-1}$** | **Pressure in whole hectopascals** |
| **5** | **Wind in km $h^{-1}$** | |
| **6** | **Wind in knots** | |

## 1845

$i_m$ ***Indicator for units of elevation, and confidence factor for accuracy of elevation***

| Code figure | Units used | Confidence factor |
|---|---|---|
| **1** | **Metres** | **Excellent (within 3 metres)** |
| **2** | **Metres** | **Good (within 10 metres)** |
| **3** | **Metres** | **Fair (within 20 metres)** |
| **4** | **Metres** | **Poor (more than 20 metres)** |
| **5** | **Feet** | **Excellent (within 10 feet)** |
| **6** | **Feet** | **Good (within 30 feet)** |
| **7** | **Feet** | **Fair (within 60 feet)** |
| **8** | **Feet** | **Poor (more than 60 feet)** |

## 1851

$i_s$ ***Sign indicator for the data in Section 3***

| Code figure | |
|---|---|
| **1** | **$s_x$ is included** |
| **2** | **$s_x$ is not included; all values positive** |
| **3** | **$s_x$ is not included; all values negative** |
| **4** | **$s_x$ is not included; all values of first element are positive, all values of second element are negative** |
| **5** | **$s_x$ is not included; all values of first element are negative, all values of second element are positive** |
| **6** | **$s_x$ is not included; when the value is negative, the last digit is odd, whereas, when the value is positive, the last digit is even** |

Note: In the case of $i_s$ = 6, the absolute values have been increased by 1, if necessary, to obtain the correct sign indicator.

## 1853

$i_u$ ***Indicator for units of wind speed and type of instrumentation***

| Code figure | Units used | Instruments certified or otherwise |
|---|---|---|
| **0** | **Metres per second** | **Ships with uncertified instruments** |
| **1** | **Knots** | |
| **3** | **Metres per second** | **Land stations, and ships with certified instruments** |
| **4** | **Knots** | |

## 1855

$i_w$ ***Indicator for source and units of wind speed***

| Code figure | | |
|---|---|---|
| **0** | **Wind speed estimated** | **Wind speed in metres per second** |
| **1** | **Wind speed obtained from anemometer** | |
| **3** | **Wind speed estimated** | **Wind speed in knots** |
| **4** | **Wind speed obtained from anemometer** | |

## 1857

**$i_y$** ***Indicator to specify type of reading***

| Code figure | |
|---|---|
| **1** | **Maximum/minimum thermometers** |
| **2** | **Automatic weather station** |
| **3** | **Thermograph** |

## 1859

**$i_z$** ***Stability index***

| Code figure | |
|---|---|
| **0** | **No index available** |
| **1** | **Total totals** |
| **2** | **Showalter** |
| **3** | **KO-index** |
| **4** | **Faust index** |
| **5–9** | **Reserved** |

## 1860

**$i_x$** ***Indicator for type of station operation (manned or automatic) and for present and past weather data***

| Code figure | Type of station operation | Group $7wwW_1W_2$ or $7w_aw_aW_{a1}W_{a2}$ |
|---|---|---|
| **1** | **Manned** | **Included** |
| **2** | **Manned** | **Omitted (no significant phenomenon to report)** |
| **3** | **Manned** | **Omitted (no observation, data not available)** |
| **4** | **Automatic** | **Included using Code tables 4677 and 4561** |
| **5** | **Automatic** | **Omitted (no significant phenomenon to report)** |
| **6** | **Automatic** | **Omitted (no observation, data not available)** |
| **7** | **Automatic** | **Included using Code tables 4680 and 4531** |

Note: Manned station operations use only the group $7wwW_1W_2$ and indicator $i_x$ = 1, 2 and 3. Automatic station operations normally use the group $7w_aw_aW_{a1}W_{a2}$ and indicator $i_x$ = 5, 6 and 7. However, only when an automatic station operation is sufficiently sophisticated and able to cope automatically with Code tables 4677 and 4561 should the group $7wwW_1W_2$ and indicator $i_x$ = 4 be used.

## 1861

**$i_0$** ***Intensity of the phenomenon***

| Code figure | |
|---|---|
| **0** | **Slight** |
| **1** | **Moderate** |
| **2** | **Heavy or strong** |

## 1863

**$i_2$** ***Zone type indicator***

**zzz** ***Zone specification***

| | |
|---|---|
| **$0i_2zzz$** | |
| **00000** | **Up to the turning point indicated by the first group $QL_aL_aL_oL_o$ which appears between the index numbers at the beginning of the message** |
| **$01QL_aL_a$** | **Up to latitude $L_aL_a$** |
| **$02QL_oL_o$** | **Up to longitude $L_oL_o$** |
| **04nnn** | **Up to a point at a distance of nnn kilometres from preceding point** |
| **050ZZ** | **For the area indicated in 5° zone numbers** |
| **$06QL_aL_a$** | **At latitude $L_aL_a$** |
| **$07QL_oL_o$** | **At longitude $L_oL_o$** |
| **09nnn** | **At a point at a distance of nnn kilometres from preceding point** |

## 1864

**$i_3$** ***Indicator for supplementary phenomena***

**nnn** ***Specifications related to supplementary phenomena***

| | | |
|---|---|---|
| **$9i_3nnn$** | | |
| **$91P_2P_2P_2$** | **Forecast lowest mean sea pressure** | |
| **$92F_tL_aL_a$** | **Type of front and its position (track of aircraft approximately N–S)** | |
| **$93F_tL_oL_o$** | **Type of front and its position (track of aircraft approximately E–W)** | |
| **$94F_tGG$** | **Type of front and time of passage** | |
| **951//** | **Gradual change along the route** | **ROFOR only*** |
| **$952L_aL_a$** | **Change at latitude $L_aL_a$ north along the route** | **ROFOR only*** |
| **$953L_aL_a$** | **Change at latitude $L_aL_a$ south along the route** | **ROFOR only*** |
| **$954L_oL_o$** | **Change at longitude $L_oL_o$ east along the route** | **ROFOR only*** |
| **$955L_oL_o$** | **Change at longitude $L_oL_o$ west along the route** | **ROFOR only*** |
| **$96GGG_p$** | **(a) When $G_p$ = 0: a self-contained part of the forecast beginning at GG. All prior forecast conditions are superseded** | |
| | **(b) When $G_p$ = 1 to 4: change at either a regular or irregular rate at an unspecified time within the period beginning at GG and indicated by $G_p$** | |
| **$97GGG_p$** | **Frequent or infrequent temporary fluctuations taking place within the period indicated by $G_p$** | |
| **$9999C_2$** | **(a) When used in combination with $99GGG_p$: probability $C_2$ of occurrence of an alternative value of a forecast element, indicated in tens of per cent** | |
| | **(b) When used in combination with $97GGG_p$: probability $C_2$ of occurrence of temporary fluctuation, indicated in tens of per cent** | |
| **$99GGG_p$** | **Used in combination with $9999C_2$: time period $G_p$ beginning at GG that the alternative value of a forecast element may occur** | |

* In ROFOR, such a change group must be qualified by a change group relative to time.

Note: Local variations in ARFOR and ROFOR may be described, if necessary, by the following expressions:

- LOC – locally (LOC, when used, will always be accompanied by plain language sufficient to identify the locality in which the phenomenon is expected)
- LAN – inland
- COT – at the coast
- MAR – at sea
- VAL – in valleys
- CIT – near or over large towns
- MON – above high ground or mountains
- SCT – scattered (SCT is used when the phenomenon is expected to be scattered in space or time or in both)

*(Code table 1864 – continued)*

**Plain-language alternative terminology for the group $9i_3nnn$**

| | | |
|---|---|---|
| **$91P_2P_2P_2$** | **Forecast lowest QFF (e.g. “Forecast QFF 1002”)** | |
| **$92F_tL_aL_a$** | **The term FRONT should be used; the type is not normally designated; e.g. “FRONT 40 N”** | |
| **$93F_tL_oL_o$** | **The term FRONT should be used; the type is not normally designated; e.g. “FRONT 30 E”** | |
| **$94F_tGG$** | **The term FRONT should be used; the type is not normally designated; e.g. “FRONT 1200 UTC”** | |
| **951//** | **The term BECMG (without the time group) should be used for this type of change** | |
| **$952L_aL_a$** | **The form FM $L_aL_a$N should be used for this type of change where LaLa indicates the latitude (north) at which the change takes place** | |
| **$953L_aL_a$** | **The form FM $L_aL_a$S should be used for this type of change where LaLa indicates the latitude (south) at which the change takes place** | **ROFOR only** |
| **$954L_oL_o$** | **The form FM $L_oL_o$E should be used for this type of change where LoLo indicates the longitude (east) at which the change takes place** | |
| **$955L_oL_o$** | **The form FM $L_oL_o$W should be used for this type of change where LoLo indicates the longitude (west) at which the change takes place** | |

**$96GGG_p$** **(a)** **The form FMGG should be used to indicate the beginning of self-contained part of the forecast indicated by GG. All forecast conditions before FMGG are superseded by the conditions indicated thereafter**

**(b)** **The form BECMG $GGG_eG_e$ should be used to indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period beginning at GG and ending at $G_eG_e$. The duration of the period beginning at GG and ending at $G_eG_e$ shall normally not exceed two hours and in any case shall not exceed four hours**

**$97GGG_p$** **The form TEMPO $GGG_eG_e$ should be used to indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than one hour in each instance and, in the aggregate cover, less than half of the period beginning at GG and ending at $G_eG_e$**

**$9999C_2$** **The form PROB (per cent) should be used for this group, either followed by $GGG_eG_e$ to indicate the probability of occurrence of an alternative value of a forecast element (e.g. PROB30 1216), or followed by TEMPO $GGG_eG_e$ to indicate the probability of occurrence of temporary fluctuations (e.g. PROB30 TEMPO 1216)**

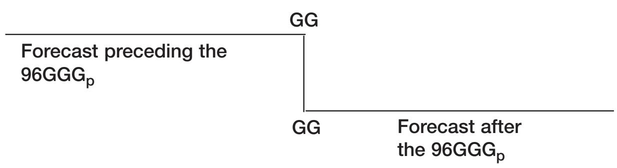
**Pictorial illustration of changes or fluctuations**
**(with time as abscissa and, for example, with $h_sh_sh_s$ as ordinate in the diagrams)**

***$96GGG_p$ – Change at specified time ($G_p$ = 0)***

**Example**

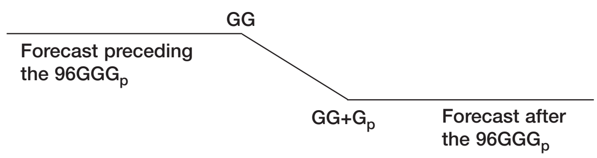
$96GGG_p$ – *Change at specified time* ($G_p$ = 0)

Example



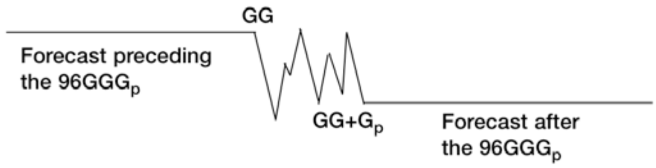

$96GGG_p$ – *Change at unspecified time within indicated time period* ($G_p$ = 1 to 4)

Example (*a*)
(regular change throughout whole period)

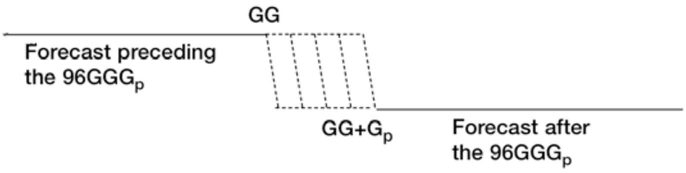


*(Code table 1864 – continued)*

Example (*b*)
(irregular change throughout part or whole of period)

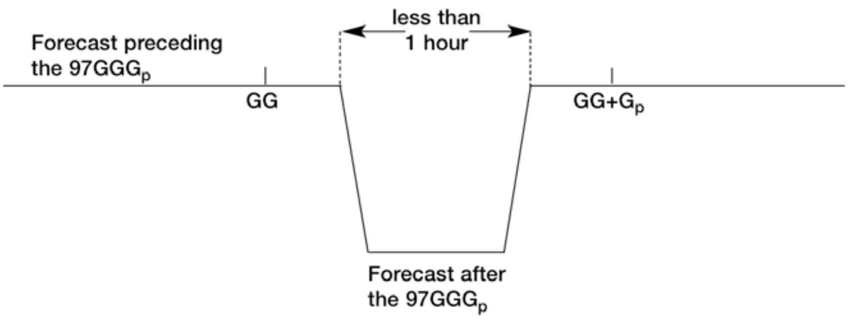



Example (*c*)
(regular change at unspecified time throughout period)

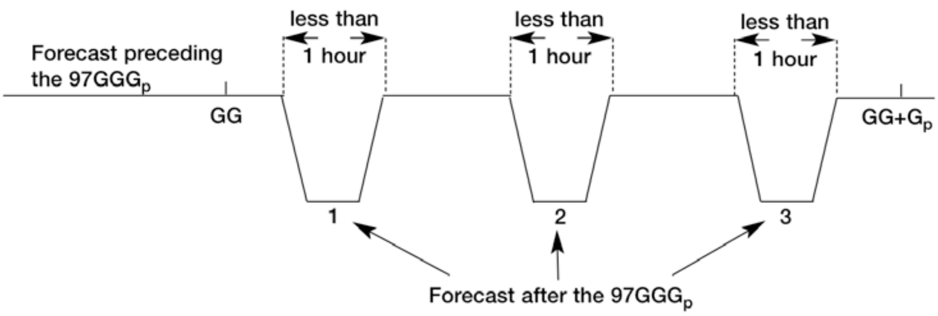



## 97GGG$_p$ – *Temporary fluctuation(s)*

Example (*a*)




Example (*b*)*




*1 + 2 + 3 = should be less than half the time indicated by G$_p$.

**Examples show deteriorating conditions. For improvements, the examples should be taken upside down.**

# 2061

**$j_1$** ***Supplementary information indicator***

**$j_2j_3j_4$** ***Specifications relating to supplementary information***

**$j_5j_6j_7j_8j_9$** ***Supplementary group which follows $5j_1j_2j_3j_4$***

**(a)**

| Code figure | $j_1$ | $j_2$ | $j_3$ | $j_4$ |
|---|---|---|---|---|
| 0<br>1<br>2<br>3 | Tens figure of evaporation or evapotranspiration | Units figure of evaporation or evapotranspiration | Tenths figure of evaporation or evapotranspiration | Indicator of type of instrumentation for evaporation measurement or type of crop for which evapotranspiration is reported |
| 4 | Temperature change data indicator | Period between the time of observation and the time of temperature change | Sign of temperature change | Amount of temperature change |
| 5 | Indicator for sunshine* | Tens figure of duration of sunshine. $j_2$ = 3 indicates that $j_3j_4$ reports duration of sunshine in past hour | Units figure of duration of sunshine | Tenths figure of duration of sunshine |
| | Indicates the following group $j_5j_6j_7j_8j_9$ reports radiation | $j_2$ = 4 indicates the following group $4j_6j_7j_8j_9$ reports radiation during the previous hour. $j_2$ = 5 indicates the following group $5j_6j_7j_8j_9$ reports radiation during the preceding 24 hours | $j_3$ = 0 | $j_4$ = 7 indicates the following group reports net short-wave radiation. $j_4$ = 8 indicates the following group reports direct solar radiation |
| 6 | Indicator for data on direction of cloud drift | Direction from which $C_L$ clouds are moving | Direction from which $C_M$ clouds are moving | Direction from which $C_H$ clouds are moving |
| 7 | Indicator for data on direction and elevation of cloud | Type of orographic clouds or of clouds with vertical development | Direction in which these clouds are seen | Elevation angle of the top of these clouds |
| 8<br>9 | Indicator for data on surface pressure change (8 – positive or zero change; 9 –negative change) | Tens figure of surface pressure change | Units figure of surface pressure change | Tenths figure of surface pressure change |

* In case of $j_1$ = 5, see Regulation 12.4.7.4.2.

**(b)**

| Code figure | $j_5$ | $j_6$ | $j_7$ | $j_8$ | $j_9$ |
|---|---|---|---|---|---|
| 0<br>1 | Sign of net radiation | Thousands figure of net radiation | Hundreds figure of net radiation | Tens figure of net radiation | Units figure of net radiation |
| 2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | Indicator of type of solar or terrestrial radiation (code figures 0–6 used, 7–9 not used) | Thousands figure of solar or terrestrial radiation | Hundreds figure of solar or terrestrial radiation | Tens figure of solar or terrestrial radiation | Units figure of solar or terrestrial radiation |

## 2100

**K** ***Effect of the ice on navigation***

| Code figure | |
|---|---|
| 0 | Navigation unobstructed |
| 1 | Navigation slightly impeded for unstrengthened ships |
| 2 | Navigation difficult for unstrengthened ships and slightly impeded for strengthened ships |
| 3 | Navigation difficult for strengthened ships |
| 4 | Navigation very difficult for strengthened ships |
| 5 | Navigation possible for strengthened ships only with ice-breaker assistance |
| 6 | Channel open in the solid ice |
| 7 | Navigation temporarily closed |
| 8 | Navigation closed |
| 9 | Navigation conditions unknown, e.g. owing to bad weather |

## 2200

**k** ***Indicator for specifying the half-degrees of latitude and longitude***

| Code figure | | |
|---|---|---|
| 0 | Take $L_aL_aL_oL_o$ as sent | east longitude 0° – 99° or west longitude 100° – 180° |
| 1 | Add $^1/_2$ degree to $L_aL_a$ | |
| 2 | Add $^1/_2$ degree to $L_oL_o$ | |
| 3 | Add $^1/_2$ degree to $L_aL_a$ and $L_oL_o$ | |
| 4* | Whole degrees | |
| 5 | Take $L_aL_aL_oL_o$ as sent | west longitude 0° – 99° or east longitude 100° – 180° |
| 6 | Add $^1/_2$ degree to $L_aL_a$ | |
| 7 | Add $^1/_2$ degree to $L_oL_o$ | |
| 8 | Add $^1/_2$ degree to $L_aL_a$ and $L_oL_o$ | |
| 9* | Whole degrees | |

* When k = 4 or 9, the values of $L_aL_a$ and $L_oL_o$ are accurate to the nearest whole degree only; for all other values of k, the accuracy is to the nearest half-degree.

## 2262

**$k_1$** ***Indicator for digitization***

| Code figure | |
|---|---|
| 7 | Values at selected depths (data points fixed by the instrument or selected by any other method) |
| 8 | Values at significant depths (data points taken from traces at significant depths) |

## 2263

**$k_2$** ***Method of salinity/depth measurement***

| Code figure | |
|---|---|
| 0 | No salinity measured |
| 1 | In situ sensor, accuracy better than $0.02^0/_{00}$ |
| 2 | In situ sensor, accuracy less than $0.02^0/_{00}$ |
| 3 | Sample analysis |

## 2264

**$k_3$** ***Duration and time of current measurement (vector or Doppler current profiling method)***

| Code figure | | |
|---|---|---|
| **1** | **Instantaneous** | **between H–1 and H** |
| **2** | **Averaged over 3 minutes or less** | |
| **3** | **Averaged over more than 3 minutes, but 6 at the most** | |
| **4** | **Averaged over more than 6 minutes, but 12 at the most** | |
| **5** | **Instantaneous** | **between H–2 and H–1** |
| **6** | **Averaged over 3 minutes or less** | |
| **7** | **Averaged over more than 3 minutes, but 6 at the most** | |
| **8** | **Averaged over more than 6 minutes, but 12 at the most** | |
| **9** | **Vector or Doppler current profiling method not used** | |

Note: H = time of observation.

## 2265

**$k_4$** ***Period of current measurement (drift method)***

| Code figure | |
|---|---|
| **1** | **1 hour or less** |
| **2** | **More than 1 hour but 2 at the most** |
| **3** | **More than 2 hours but 4 at the most** |
| **4** | **More than 4 hours but 8 at the most** |
| **5** | **More than 8 hours but 12 at the most** |
| **6** | **More than 12 hours but 18 at the most** |
| **7** | **More than 18 hours but 24 at the most** |
| **9** | **Drift method not used** |

## 2266

**$k_5$** ***Indicator for the method of current measurement***

| Code figure | |
|---|---|
| **0** | **Reserved** |
| **1*** | **ADCP (Acoustic Doppler Current Profiler)** |
| **2** | **GEK (Geomagnetic ElectroKinetograph)** |
| **3** | **Ship's set and drift determined by fixes 3–6 hours apart** |
| **4** | **Ship's set and drift determined by fixes more than 6 hours but less than 12 hours apart** |
| **5** | **Drift of buoy** |
| **6** | **ADCP (Acoustic Doppler Current Profiler)** |

* This entry should not be used. Code figure 6 should be used instead.

## 2267

| | |
|---|---|
| $k_6$ | ***Method of removing the velocity and motion of the ship or buoy from current measurement*** |

| Code figure | | |
|---|---|---|
| **0** | **Ship's motion removed by averaging** | **Ship's velocity removed by bottom tracking** |
| **1** | **Ship's motion removed by motion compensation** | |
| **2** | **Ship's motion not removed** | |
| **3** | **Ship's motion removed by averaging** | **Ship's velocity removed by navigation** |
| **4** | **Ship's motion removed by motion compensation** | |
| **5** | **Ship's motion not removed** | |
| **6** | **Doppler current profiling method not used** | |
| **7–9** | **Reserved** | |

Note: Code figures 0, 1, 2 and 6 are also used for drifting buoys.

## 2300

**L** ***Estimated level of wind data***

| Code figure | |
|---|---|
| **2** | **Low-cloud level** |
| **5** | **Middle-cloud level** |
| **8** | **High-cloud level** |

## 2382

$L_iL_i$, $L_jL_j$ ***Type of line or feature being described***

| Code figure | |
|---|---|
| **00** | **No specification** |
| **01** | **North-east of following line*** |
| **02** | **East of following line*** |
| **03** | **South-east of following line*** |
| **04** | **South of following line*** |
| **05** | **South-west of following line*** |
| **06** | **West of following line*** |
| **07** | **North-west of following line*** |
| **08** | **North of following line*** |
| **09** | **Within following lines*** |
| **10** | **Land** |
| **11** | **Radar** |
| **12** | **Satellite** |
| **13** | **Limits of observation** |
| **14** | **Limits of analysis** |
| **15** | **Estimated** |
| **16** | **Compacted edge** |
| **17** | **Diffused edge** |
| **18** | **Area of greater concentration** |
| **19** | **Area of lesser concentration** |

*(Code table 2382 – continued)*

| | |
|---|---|
| **21** | **Ice edge** |
| **22** | **Concentration boundary** |
| **23** | **Fast ice** |
| **24** | **Lead** |
| **25** | **Polynya** |
| **26** | **Belt** |
| **27** | **Patch** |
| **28** | **Field** |
| **29** | **Ridged ice zone** |
| **30** | **Fracture zone** |
| **31** | **Iceberg** |
| **32** | **Scattered icebergs** |
| **33** | **Group of icebergs** |
| **34** | **Ice island** |
| **35** | **(Available for expansion)** |
| **50** | **Whole visual observed area** |
| **51** | **Whole visual observed area outside pack-ice area** |

Note: If only one set of code figure $L_iL_i$ is used, $L_jL_j$ shall be coded as 00.

* The line indicated by the position groups following the group $6L_iL_iL_jL_j$.

## 2538

**$M_h$** ***Character of air mass***

| **Code figure** | |
|---|---|
| **0** | **No specification, or indeterminate** |
| **1** | **Continental (c)** |
| **2** | **Maritime (m)** |

## 2551

**$M_s$** ***Source region of air mass***

| **Code figure** | |
|---|---|
| **0** | **No specification, or indeterminate** |
| **1** | **Arctic (A)** |
| **2** | **Polar (P)** |
| **3** | **Tropical (T)** |
| **4** | **Equatorial (E)** |
| **5** | **Superior (S)** |

## 2552

**$M_t$** ***Thermodynamic character of air mass***

| Code figure | | |
|---|---|---|
| 0 | No specification | |
| 1 | Indeterminate | If *not* followed by another $33M_hM_sM_t$ group, means only one air mass present; if followed by another $33M_hM_sM_t$ group, means "mixed" with air mass described in the second group |
| 2 | Cold (k) | |
| 3 | Warm (w) | |
| 4 | Indeterminate | Is followed by another $33M_hM_sM_t$ group, the air mass reported in the first group being above the air mass of the second group |
| 5 | Cold (k) | |
| 6 | Warm (w) | |
| 7 | Indeterminate | Is followed by another $33M_hM_sM_t$ group, the air mass in the first group being "transitional" or "becoming" the air mass in the second group |
| 8 | Cold (k) | |
| 9 | Warm (w) | |

## 2555

**$M_w$** ***Waterspout(s), tornadoes, whirlwinds, dust devils***

| Code figure | |
|---|---|
| 0 | Waterspout(s) within 3 km of station |
| 1 | Waterspout(s) more than 3 km from station |
| 2 | Tornado clouds within 3 km of station |
| 3 | Tornado clouds more than 3 km from station |
| 4 | Whirlwinds of slight intensity |
| 5 | Whirlwinds of moderate intensity |
| 6 | Whirlwinds of severe intensity |
| 7 | Dust devils of slight intensity |
| 8 | Dust devils of moderate intensity |
| 9 | Dust devils of severe intensity |

## 2562

**$M_1$** ***Month when the period covered by the forecast begins***

**$M_2$** ***Month when the period covered by the forecast ends***

| Code figure | |
|---|---|
| 0 | Current month |
| 1 | First month after the current month |
| 2 | Second month after the current month |
| 3 | Third month after the current month |
| 4 | Fourth month after the current month |
| 5 | Fifth month after the current month |
| 6 | Sixth month after the current month |
| 7 | Seventh month after the current month |
| 8 | Eighth month after the current month |
| 9 | Ninth month after the current month |

# 2582

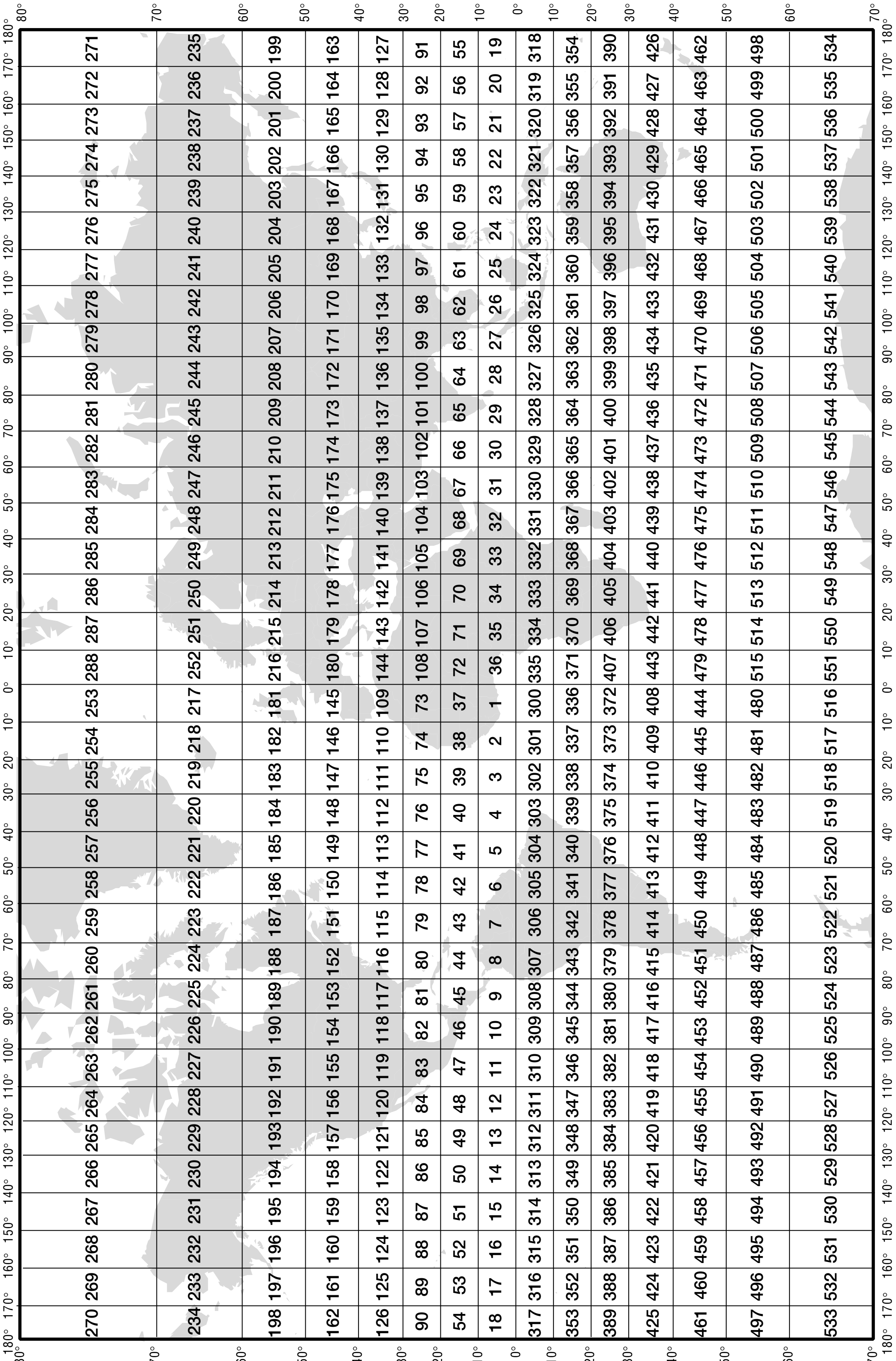
**$M_iM_i$** ***Identification letters of the report***

**$M_jM_j$** ***Identification letters of the part of the report or the version of the code form***

| Code form | | $M_iM_i$ | | | | $M_jM_j$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Land station | Sea station | Aircraft | Satellite | Part A | Part B | Part C | Part D | No distinction |
| FM 12-XIV Ext. | SYNOP | AA | | | | | | | | XX |
| FM 13-XIV Ext. | SHIP | | BB | | | | | | | XX |
| FM 14-XIV Ext. | SYNOP MOBIL | OO | | | | | | | | XX |
| FM 18–XII | BUOY | | ZZ | | | | | | | YY |
| FM 20–VIII | RADOB | FF | GG | | | AA | BB | | | |
| FM 32-XI Ext. | PILOT | PP | | | | AA | BB | CC | DD | |
| FM 33-XI Ext. | PILOT SHIP | | QQ | | | AA | BB | CC | DD | |
| FM 34-XI Ext. | PILOT MOBIL | EE | | | | AA | BB | CC | DD | |
| FM 35-XI Ext. | TEMP | TT | | | | AA | BB | CC | DD | |
| FM 36-XI Ext. | TEMP SHIP | | UU | | | AA | BB | CC | DD | |
| FM 37-XI Ext. | TEMP DROP | | | XX | | AA | BB | CC | DD | |
| FM 38-XI Ext. | TEMP MOBIL | II | | | | AA | BB | CC | DD | |
| FM 39-VI | ROCOB | RR | | | | | | | | XX |
| FM 40-VI | ROCOB SHIP | | SS | | | | | | | XX |
| FM 41-IV | CODAR | | | LL | | | | | | XX |
| FM 62–VIII Ext. | TRACKOB | | NN | | | | | | | XX |
| FM 63-IX | BATHY | | JJ | | | | | | | XX |
| FM 63-X Ext. | BATHY | | JJ | | | | | | | YY |
| FM 63-XI Ext. | BATHY | | JJ | | | | | | | VV |
| FM 64-IX | TESAC | | KK | | | | | | | XX |
| FM 64-XI Ext. | TESAC | | KK | | | | | | | YY |
| FM 65-XI Ext. | WAVEOB | | MM | | | | | | | XX |
| FM 67-VI | HYDRA | HH | | | | | | | | XX |
| FM 85-IX | SAREP | CC | DD | | | AA | BB | | | |
| FM 86-XI | SATEM | | | | VV | AA | BB | CC | DD | |
| FM 87-XI | SARAD | | | | WW | | | | | XX |
| FM 88-XI | SATOB | | | | YY | | | | | XX |

# 2590

**MMM** ***Number of Marsden square in which the station is situated at the time of observation***




Note: For polar zones, see following page.

*(Code table 2590 – continued)*

West longitudes ← 180° 170° 160° 150° 140° 130° 120° 110° 100° 90° 80° 70° 60° 50° 40° 30° 20° 10° 0° 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120° 130° 140° 150° 160° 170° 180° → East longitudes

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North of 80° | 918 | 917 | 916 | 915 | 914 | 913 | 912 | 911 | 910 | 909 | 908 | 907 | 906 | 905 | 904 | 903 | 902 | 901 | 936 | 935 | 934 | 933 | 932 | 931 | 930 | 929 | 928 | 927 | 926 | 925 | 924 | 923 | 922 | 921 | 920 | 919 |
| 70°–80° South | 569 | 568 | 567 | 566 | 565 | 564 | 563 | 562 | 561 | 560 | 559 | 558 | 557 | 556 | 555 | 554 | 553 | 552 | 587 | 586 | 585 | 584 | 583 | 582 | 581 | 580 | 579 | 578 | 577 | 576 | 575 | 574 | 573 | 572 | 571 | 570 |
| South of 80°S | 605 | 604 | 603 | 602 | 601 | 600 | 599 | 598 | 597 | 596 | 595 | 594 | 593 | 592 | 591 | 590 | 589 | 588 | 623 | 622 | 621 | 620 | 619 | 618 | 617 | 616 | 615 | 614 | 613 | 612 | 611 | 610 | 609 | 608 | 607 | 606 |

*(Code table 2590 – continued*

Note: The number to be coded for $U_{La}U_{Lo}$ in the position verifying group $MMMU_{La}U_{Lo}$ is obtained by combining the second figure for $L_a$ and the third figure for $L_o$ in the reported position ($L_aL_aL_a$ $Q_cL_oL_oL_oL_o$). This number $U_{La}U_{Lo}$ is the number of the one-degree subdivision of the Marsden 10-degree square in which the ship is located at the time of observation.

When the ship is on the boundary between two (or four) 10-degree Marsden squares, the number to be coded for MMM is that of the Marsden 10-degree square in which the one-degree subdivision whose number is $U_{La}U_{Lo}$, as defined above, corresponds to the ship's position.

When the ship is on the meridian 0° or 180°, as well as on the Equator, the number used for reporting $Q_c$ shall be taken into account for determining the relevant number of the Marsden 10-degree square.

Examples:

(1) For a ship located at 42.3°N and 30.0°W, the position is coded as follows:

$Q_c$ = 7, $L_aL_aL_a$ = 4**2**3, $L_oL_oL_oL_o$ = 03**0**0

$U_{La}U_{Lo}$ is therefore **20**. The ship is on the boundary line between Marsden squares 147 and 148. The relevant scheme of the annex ($Q_c$ = 7) shows that the one-degree subdivision corresponding to the ship's position would be numbered 29 in Marsden square 147 and **20** in Marsden square 148. MMM is therefore to be coded 148.

(2) For a ship located at 40.0°S and 120.0°E, the position is coded as follows:

$Q_c$ = 3, $L_aL_aL_a$ = 4**0**0, $L_oL_oL_oL_o$ = 12**0**0

$U_{La}U_{Lo}$ is therefore 0**0**. The ship is on the boundary point between Marsden squares 431, 432, 467 and 468. The relevant scheme of the annex ($Q_c$ = 3) shows that the one-degree subdivision corresponding to the ship's position would be 90 in Marsden square 431, 99 in Marsden square 432, **00** in Marsden square 467, and 09 in Marsden square 468. MMM is therefore to be coded 467.

*(See annex.)*

*(Code table 2590 – continued)*

**ANNEX**

**Subdivisions of the Marsden 10-degree squares into one-degree squares for the eight octants (Q) of the globe**

**WEST**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 99 | 98 | 97 | 96 | 95 | 94 | 93 | 92 | 91 | 90 |
| 89 | | | | | | | | | 80 |
| 79 | | | | | | | | | 70 |
| 69 | | | | | | | | | 60 |
| 59 | | | | | | | | | 50 |
| 49 | | | | | | | | | 40 |
| 39 | | | | | | | | | 30 |
| 29 | | | | | | | | | 20 |
| 19 | | | | | | | | | 10 |
| 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |

$Q_C = 7$

**EAST**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
| 80 | | | | | | | | | 89 |
| 70 | | | | | | | | | 79 |
| 60 | | | | | | | | | 69 |
| 50 | | | | | | | | | 59 |
| 40 | | | | | | | | | 49 |
| 30 | | | | | | | | | 39 |
| 20 | | | | | | | | | 29 |
| 10 | | | | | | | | | 19 |
| 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |

$Q_C = 1$

NORTH

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| 19 | | | | | | | | | 10 |
| 29 | | | | | | | | | 20 |
| 39 | | | | | | | | | 30 |
| 49 | | | | | | | | | 40 |
| 59 | | | | | | | | | 50 |
| 69 | | | | | | | | | 60 |
| 79 | | | | | | | | | 70 |
| 89 | | | | | | | | | 80 |
| 99 | 98 | 97 | 96 | 95 | 94 | 93 | 92 | 91 | 90 |

$Q_C = 5$

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 10 | | | | | | | | | 19 |
| 20 | | | | | | | | | 29 |
| 30 | | | | | | | | | 39 |
| 40 | | | | | | | | | 49 |
| 50 | | | | | | | | | 59 |
| 60 | | | | | | | | | 69 |
| 70 | | | | | | | | | 79 |
| 80 | | | | | | | | | 89 |
| 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |

$Q_C = 3$

SOUTH

## 2600

**m** ***Movement***

| Code figure | |
|---|---|
| **0** | **No specification** |
| **1** | **Stationary** |
| **2** | **Little change** |
| **3** | **Becoming stationary** |
| **4** | **Retarding** |
| **5** | **Curving to left** |
| **6** | **Recurving** |
| **7** | **Accelerating** |
| **8** | **Curving to right** |
| **9** | **Expected to recurve** |

## 2604

**$m_S$** ***Averaging period for salinity***

**$m_T$** ***Averaging period for sea temperature***

**$m_c$** ***Averaging period for surface current direction and speed***

| Code figure | |
|---|---|
| **0** | **Spot values** |
| **1** | **Less than 15 minutes** |
| **2** | **From 15 to 45 minutes** |
| **3** | **More than 45 minutes** |
| **9** | **Data not available** |

## 2649

**$m_r$** ***Method of reducing data***

| Code figure | |
|---|---|
| **1** | **Manually – Nomogram** |
| **2** | **Electronic computer** |
| **9** | **Other method** |

Note: Code figure 1 shall be reported if all, or any portion, of the data reduction was manual. Code figure 2 shall be reported only when all the data reduction was by electronic computer.

## 2650

**$m_s$** ***Stage of melting***

| Code figure | |
|---|---|
| **0** | **No melt** |
| **1** | **Discoloured ice** |
| **2** | **Flooded ice** |

*(Code table 2650 – continued)*

| | |
|---|---|
| **3** | **Few puddles** |
| **4** | **Many puddles** |
| **5** | **Puddles with few thaw holes** |
| **6** | **Puddles with many thaw holes** |
| **7** | **Thaw holes, no puddles** |
| **8** | **Rotten ice** |
| **9** | **Refreezing/refrozen puddles** |
| **/** | **Undetermined or unknown** |

## 2677

**mm** ***Procedure or model used to generate the data field***

| Code figure | |
|---|---|
| **00** | **Subjective analysis** |
| **01–09** | **Subjective forecast** |
| **10–19** | **Objective (numerical) analysis** |
| **20–29** | **Barotropic (one layer) numerical forecast based on the primitive equations** |
| **30–39** | **Barotropic (one layer) numerical forecast based on other than the primitive equations** |
| **40–59** | **Baroclinic (multilayer) numerical forecast based on the primitive equations** |
| **60–79** | **Baroclinic (multilayer) numerical forecast based on other than the primitive equations** |
| **80–98** | **Other procedures or models** |
| **99** | **Not mentioned** |

Note: Detailed specifications of each procedure or model are contained in *Weather Reporting* (WMO-No. 9), Volume B.

## 2700

**N** ***Total cloud cover***

**$N_h$** ***Amount of all the $C_L$ cloud present or, if no $C_L$ cloud is present, the amount of all the $C_M$ cloud present***

**$N_s$** ***Amount of individual cloud layer or mass whose genus is indicated by* C**

**N′** ***Amount of cloud whose base is below the level of the station***

| Code figure | | |
|---|---|---|
| **0** | **0** | **0** |
| **1** | **1 okta or less, but not zero** | **$^1/_{10}$ or less, but not zero** |
| **2** | **2 oktas** | **$^2/_{10}$ – $^3/_{10}$** |
| **3** | **3 oktas** | **$^4/_{10}$** |
| **4** | **4 oktas** | **$^5/_{10}$** |
| **5** | **5 oktas** | **$^6/_{10}$** |
| **6** | **6 oktas** | **$^7/_{10}$ – $^8/_{10}$** |
| **7** | **7 oktas or more, but not 8 oktas** | **$^9/_{10}$ or more, but not $^{10}/_{10}$** |
| **8** | **8 oktas** | **$^{10}/_{10}$** |
| **9** | **Sky obscured by fog and/or other meteorological phenomena** | |
| **/** | **Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made** | |

Note: For use of (/), see Regulation 12.1.4.

## 2745

**$N_m$** ***Cloud conditions over mountains and passes***

| Code figure | |
|---|---|
| **0** | **All mountains open, only small amounts of cloud present** |
| **1** | **Mountains partly covered with detached clouds (not more than half the peaks can be seen)** |
| **2** | **All mountain slopes covered, peaks and passes free** |
| **3** | **Mountains open on observer's side (only small amounts of cloud present), but a continuous wall of cloud on the other side** |
| **4** | **Clouds low above the mountains, but all slopes and mountains open (only small amounts of cloud on the slopes)** |
| **5** | **Clouds low above the mountains, peaks partly covered by precipitation trails or clouds** |
| **6** | **All peaks covered but passes open, slopes either open or covered** |
| **7** | **Mountains generally covered but some peaks free, slopes wholly or partially covered** |
| **8** | **All peaks, passes and slopes covered** |
| **9** | **Mountains cannot be seen owing to darkness, fog, snowstorm, precipitation, etc.** |

## 2752

**$N_t$** ***Condensation trails***

| Code figure | |
|---|---|
| **5** | **Non-persistent condensation trails** |
| **6** | **Persistent condensation trails covering less than $^1/_8$ of the sky** |
| **7** | **Persistent condensation trails covering $^1/_8$ of the sky** |
| **8** | **Persistent condensation trails covering $^2/_8$ of the sky** |
| **9** | **Persistent condensation trails covering $^3/_8$ or more of the sky** |

## 2754

**$N_v$** ***Cloud conditions observed from a higher level***

| Code figure | |
|---|---|
| **0** | **No cloud or mist** |
| **1** | **Mist, clear above** |
| **2** | **Fog patches** |
| **3** | **Layer of slight fog** |
| **4** | **Layer of thick fog** |
| **5** | **Some isolated clouds** |
| **6** | **Isolated clouds and fog below** |
| **7** | **Many isolated clouds** |
| **8** | **Sea of clouds** |
| **9** | **Bad visibility obscuring the downward view** |

## 2776

**$N_eN_e$** ***Sequential number of the 60 × 60 km square in the radar coordinate grid***

N

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 00 | 01 | 02 | 03 | 04 | ↑ | 05 | 06 | 07 | 08 | 09 | |
| | 10 | 11 | 12 | 13 | 14 | | 15 | 16 | 17 | 18 | 19 | |
| | 20 | 21 | 22 | 23 | 24 | | 25 | 26 | 27 | 28 | 29 | |
| | 30 | 31 | 32 | 33 | 34 | | 35 | 36 | 37 | 38 | 39 | |
| W ← | 40 | 41 | 42 | 43 | 44 | + | 45 | 46 | 47 | 48 | 49 | → E |
| | 50 | 51 | 52 | 53 | 54 | | 55 | 56 | 57 | 58 | 59 | |
| | 60 | 61 | 62 | 63 | 64 | | 65 | 66 | 67 | 68 | 69 | |
| | 70 | 71 | 72 | 73 | 74 | | 75 | 76 | 77 | 78 | 79 | |
| | 80 | 81 | 82 | 83 | 84 | | 85 | 86 | 87 | 88 | 89 | |
| | 90 | 91 | 92 | 93 | 94 | ↓ | 95 | 96 | 97 | 98 | 99 | |

S

Note: The cross indicates the radar's location.

## 2836

**$n_f$** ***Number of atmospherics observed by the system at the geographical locations that follow, during a 10-minute period within the hour immediately preceding the time of the report***

| Code figure | |
|---|---|
| **0** | **1** |
| **1** | **2 or 3** |
| **2** | **4 to 8** |
| **3** | **9 to 15** |
| **4** | **16 to 24** |
| **5** | **25 to 35** |
| **6** | **36 to 48** |
| **7** | **49 to 63** |
| **8** | **64 to 80** |
| **9** | **81 or more** |
| **/** | **Not specified** |

## 2863

**$n_3$** ***Evolution of clouds***

| Code figure | |
|---|---|
| **0** | **No change** |
| **1** | **Cumulification** |
| **2** | **Slow elevation** |
| **3** | **Rapid elevation** |
| **4** | **Elevation and stratification** |
| **5** | **Slow lowering** |
| **6** | **Rapid lowering** |
| **7** | **Stratification** |
| **8** | **Stratification and lowering** |
| **9** | **Rapid change** |

## 2864

**$n_4$** ***Evolution of clouds observed from a station at a higher level***

| Code figure | |
|---|---|
| **0** | **No change** |
| **1** | **Decrease and elevation** |
| **2** | **Decrease** |
| **3** | **Elevation** |
| **4** | **Decrease and lowering** |
| **5** | **Increase and elevation** |
| **6** | **Lowering** |
| **7** | **Increase** |
| **8** | **Increase and lowering** |
| **9** | **Intermittent fog at the station** |

## 2877

**$n_Bn_B$** ***Number of icebergs within the area***

**$n_Gn_G$** ***Number of growlers and bergy bits within the area***

| Code figure | | Code figure | |
|---|---|---|---|
| **00** | **None** | **15** | **15** |
| **01** | **1** | **16** | **16** |
| **02** | **2** | **17** | **17** |
| **03** | **3** | **18** | **18** |
| **04** | **4** | **19** | **19** |
| **05** | **5** | **20** | **1–9** |
| **06** | **6** | **21** | **0–19** |
| **07** | **7** | **22** | **20–29** |
| **08** | **8** | **23** | **30–39** |
| **09** | **9** | **24** | **40–49** |
| **10** | **10** | **25** | **50–99** |
| **11** | **11** | **26** | **100–199** |
| **12** | **12** | **27** | **200–499** |
| **13** | **13** | **28** | **500 or more** |
| **14** | **14** | **99** | **No indication because counting has been impossible** |

Notes:

(1) If the exact number, 1 to 19, is known, code figures 01 to 19 shall be used.

(2) If the number is more than 19, or if the exact number can only be estimated, code figures 20 to 28 shall be used.

(3) Code figure 99 shall only be used when it is absolutely impossible to make a reasonable estimate of the number.

## 2890

**$n_Tn_T$** ***Indicator of reference code table for type of parameter $a_1a_1a_1$, $a_2a_2a_2$***

| Code figure | |
|---|---|
| **00** | **Code table 0291** |
| **01–99** | **Reserved** |

## 3131

$P_a$ *Countermeasures taken near border*

| Code figure | |
|---|---|
| 0 | No countermeasures |
| 1 | Evacuation |
| 2 | Sheltering |
| 3 | Prophylaxis |
| 4 | Water |
| 5 | Milk |
| 6 | Vegetables |
| 7 | Other food types |
| 8–9 | Reserved |
| / | Missing value |

## 3133

$P_c$ *Character of pressure system*

$h_c$ *Character of topography system*

| Code figure | |
|---|---|
| 0 | No specification |
| 1 | LOW filling or HIGH weakening |
| 2 | Little change |
| 3 | LOW deepening or HIGH intensifying |
| 4 | Complex |
| 5 | Forming or existence suspected (cyclogenesis or anticyclogenesis) |
| 6 | Filling or weakening, but not disappearing |
| 7 | General rise of pressure (or height) |
| 8 | General fall of pressure (or height) |
| 9 | Position doubtful |

## 3139

$P_i$ *Forecast ice phenomenon*

| Code figure | |
|---|---|
| 1 | Appearance of floating ice |
| 2 | Freeze-up in rivers, lakes or reservoirs |
| 3 | Ice break-up in rivers, lakes or reservoirs |
| 4 | Disappearance of ice |

## 3152

**$P_t$** ***Type of pressure system***

**$h_t$** ***Type of topography system***

| Code figure | |
|---|---|
| 0 | Complex LOW |
| 1 | LOW |
| 2 | Secondary |
| 3 | Trough |
| 4 | Wave |
| 5 | HIGH |
| 6 | Area of uniform pressure (or height) |
| 7 | Ridge |
| 8 | Col |
| 9 | Tropical storm |

## 3155

**$P_w$** ***Period of waves***

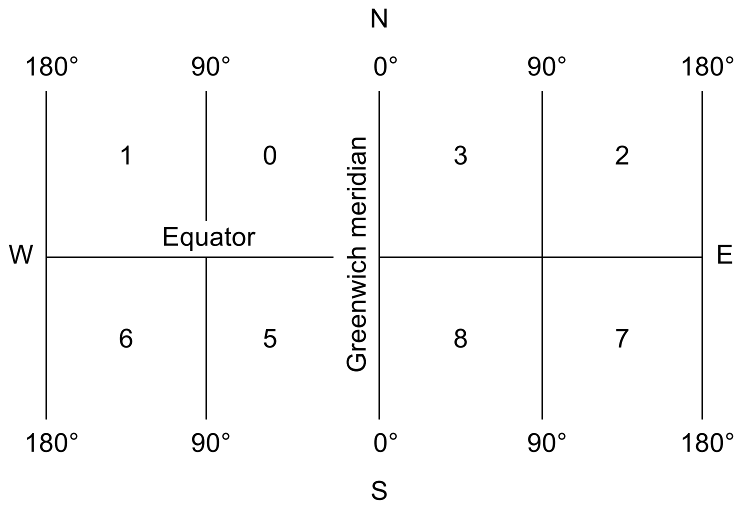
| Code figure | |
|---|---|
| 0 | 10 seconds |
| 1 | 11 seconds |
| 2 | 12 seconds |
| 3 | 13 seconds |
| 4 | 14 seconds or more |
| 5 | 5 seconds or less |
| 6 | 6 seconds |
| 7 | 7 seconds |
| 8 | 8 seconds |
| 9 | 9 seconds |
| / | Calm or period not determined |

## 3300

**Q** ***Octant of the globe***

| Code figure | Longitude | Hemisphere |
|---|---|---|
| 0 | 0° – 90°W | northern |
| 1 | 90° – 180°W | northern |
| 2 | 180° – 90°E | northern |
| 3 | 90° – 0°E | northern |
| 5 | 0° – 90°W | southern |
| 6 | 90° – 180°W | southern |
| 7 | 180° – 90°E | southern |
| 8 | 90° – 0°E | southern |

*(Code table 3300 – continued)*




## 3302

**$Q_A$** ***Location quality class (range of radius of 66% confidence)***

**Code figure**

| | |
|---|---|
| **0** | **Radius ≥ 1500 m** |
| **1** | **500 m ≤ Radius < 1500 m** |
| **2** | **250 m ≤ Radius <   500 m** |
| **3** | **Radius < 250 m** |
| **/** | **Location quality class information not available** |

## 3311

**$Q_L$** ***Quality of location***

**Code figure**

| | |
|---|---|
| **0** | **The value transmitted at the beginning of the report is a reliable value (location made over two satellite passes)** |
| **1** | **The values at the beginning of the report are the latest known values (no location over the corresponding pass)** |
| **2** | **Dubious quality. The location was made over one pass only; a second solution is possible in five per cent of the cases** |

## 3313

**$Q_N$** ***Quality of the buoy satellite transmission***

**Code figure**

| | |
|---|---|
| **0** | **Good quality (several identical reports have been received)** |
| **1** | **Dubious quality (no identical reports)** |

## 3315

**$Q_P$** ***Quality of the pressure measurement***

| Code figure | |
|---|---|
| **0** | **Value within specified limits** |
| **1** | **Value outside specified limits** |

## 3318

**$Q_z$** ***Indicator of depth correction (indication whether probe depths are corrected using hydrostatic pressure or not)***

| Code figure | |
|---|---|
| **0** | **Depth are not corrected** |
| **1** | **Depth are corrected** |
| **/** | **Missing** |

## 3319

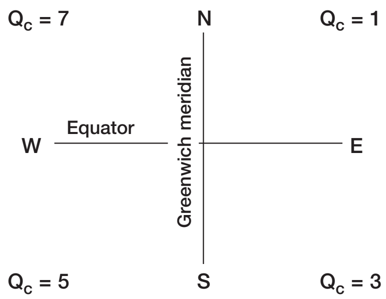
**$Q_{TW}$** ***Quality of the measurement of the water-surface temperature***

| Code figure | |
|---|---|
| **0** | **Value within limits** |
| **1** | **Value outside limits** |

## 3333

**$Q_c$** ***Quadrant of the globe***

| Code figure | Latitude | Longitude |
|---|---|---|
| **1** | **North** | **East** |
| **3** | **South** | **East** |
| **5** | **South** | **West** |
| **7** | **North** | **West** |




Note: The choice is left to the observer in the following cases:

– When the ship is on the Greenwich meridian or the 180th meridian ($L_oL_oL_oL_o$ = 0000 or 1800 respectively):

$Q_c$ = 1 or 7 (northern hemisphere) or

$Q_c$ = 3 or 5 (southern hemisphere);

– When the ship is on the Equator ($L_aL_aL_a$ = 000):

$Q_c$ = 1 or 3 (eastern longitude) or

$Q_c$ = 5 or 7 (western longitude).

## 3334

**$Q_d$** ***Quality control indicator***

**$Q_{d1}$** ***Quality control indicator for temperature/salinity profile***

**$Q_{d2}$** ***Quality control indicator for current profile***

**$Q_l$** ***Quality control indicator for position***

**$Q_t$** ***Quality control indicator for time***

| Code figure | |
|---|---|
| 0 | Data not checked |
| 1 | Data good |
| 2 | Data inconsistent |
| 3 | Data doubtful |
| 4 | Data wrong |
| 5 | Data value has been changed |

Note: These flags are the same as the IGOSS quality control flags.

## 3363

**$Q_2$** ***Quality of the housekeeping parameter (second word in first block of ARGOS platform transmitters terminal sensor data)***

**$Q_4$** ***Quality of the measurement of air temperature***

| Code figure | |
|---|---|
| 0 | Value within limits |
| 1 | Value outside limits |

## 3462

**$q_1$** ***Message contraction and data scanning indicator***

| Code figure | Spaces included between data groups | Data line scanning mode |
|---|---|---|
| 0 | Yes | Normal |
| 1 | Yes | As described in *Weather Reporting* (WMO-No. 9), Volume B |
| 2 | No | Normal |
| 3 | No | As described in *Weather Reporting* (WMO-No. 9), Volume B |

## 3463

**$q_2$** ***Data contraction indicator***

| Code figure | |
|---|---|
| **0** | **All data location groups and, where necessary, the group $999I_0I_0$ included** |
| **1** | **Groups $999I_0I_0$ $k_1k_1n_gn_g$ $i_ai_ai_aj_aj_aj_a$ omitted** |
| **2** | **Groups $999I_0I_0$ $n_gn_g$ $i_ai_ai_aj_aj_aj_a$ omitted** |
| **3** | **Groups $n_gn_g$ $i_ai_ai_aj_aj_aj_a$ omitted** |
| **4** | **Group $i_ai_ai_aj_aj_aj_a$ omitted** |
| **5** | **Group $999I_0I_0$ omitted** |

Notes:

(1) Code figures 1, 2, 3, 4 and 5 for $q_2$ shall be used only when the relevant details are given in the appropriate WMO publication so that the unambiguous reconstruction of the product is possible by using that publication.

(2) When $n_gn_g$ is omitted but $k_1k_1$ is included, no solidi shall be included in the place of $n_gn_g$. The group will therefore be reported in the form of $k_1k_1$.

## 3533

**$R_c$** ***Composition of release***

| Code figure | |
|---|---|
| **0** | **Noble gases** |
| **1** | **Iodines** |
| **2** | **Caesiums** |
| **3** | **Transuranics** |
| **4–9** | **Reserved** |
| **/** | **Missing value** |

## 3534

**$R_d$** ***Frequency group within which*** $R_1R_1R_1R_1$ ***falls***

| Code figure | |
|---|---|
| **0** | **Smaller than any value in the 30-year period** |
| **1** | **In the first quintile** |
| **2** | **In the second quintile** |
| **3** | **In the third quintile** |
| **4** | **In the fourth quintile** |
| **5** | **In the fifth quintile** |
| **6** | **Greater than any value in the 30-year period** |

## 3535

**$R_e$** ***Possibility of significant chemical toxic health effect***

| Code figure | |
|---|---|
| **0** | **No significant chemical toxic health effect** |
| **1** | **Significant chemical toxic health effect possible** |
| **2** | **Reserved** |
| **3** | **Missing value** |

## 3538

**$R_h$** ***Maximum height of ridging***

| Code figure | |
|---|---|
| 0 | Level ice |
| 1 | 1 m |
| 2 | 2 m |
| 3 | 3 m |
| 4 | 4 m |
| 5 | 5 m |
| 6 | 6 m |
| 7 | 7 m |
| 8 | 8 m |
| 9 | 9 m or more |
| / | Undetermined or unknown |

## 3548

**$R_p$** ***Possibility that plume will encounter precipitation in State in which incident occurred***

| Code figure | |
|---|---|
| 0 | Plume will not encounter rain in incident State |
| 1 | Plume will encounter rain in incident State |
| 2 | Reserved |
| 3 | Missing value |

## 3551

**$R_s$** ***Rate of ice accretion on ships***

| Code figure | |
|---|---|
| 0 | Ice not building up |
| 1 | Ice building up slowly |
| 2 | Ice building up rapidly |
| 3 | Ice melting or breaking up slowly |
| 4 | Ice melting or breaking up rapidly |

## 3552

**$R_t$** ***Time at which precipitation given by*** RRR ***began or ended***

| Code figure | |
|---|---|
| 1 | Less than 1 hour before time of observation |
| 2 | 1 to 2 hours before time of observation |
| 3 | 2 to 3 hours before time of observation |
| 4 | 3 to 4 hours before time of observation |
| 5 | 4 to 5 hours before time of observation |
| 6 | 5 to 6 hours before time of observation |
| 7 | 6 to 12 hours before time of observation |
| 8 | More than 12 hours before time of observation |
| 9 | Unknown |

## 3555

$R_w$ *Wave length of the radar*

| Code figure | |
|---|---|
| 1 | 10 to less than 20 mm |
| 3 | 20 to less than 40 mm |
| 5 | 40 to less than 60 mm |
| 7 | 60 to less than 90 mm |
| 8 | 90 to less than 110 mm |
| 9 | 110 mm and greater |

## 3570

RR *Amount of precipitation or water equivalent of solid precipitation, or diameter of solid deposit*

| Code figure | mm | Code figure | mm | Code figure | mm |
|---|---|---|---|---|---|
| 00 | 0 | 34 | 34 | 68 | 180 |
| 01 | 1 | 35 | 35 | 69 | 190 |
| 02 | 2 | 36 | 36 | 70 | 200 |
| 03 | 3 | 37 | 37 | 71 | 210 |
| 04 | 4 | 38 | 38 | 72 | 220 |
| 05 | 5 | 39 | 39 | 73 | 230 |
| 06 | 6 | 40 | 40 | 74 | 240 |
| 07 | 7 | 41 | 41 | 75 | 250 |
| 08 | 8 | 42 | 42 | 76 | 260 |
| 09 | 9 | 43 | 43 | 77 | 270 |
| 10 | 10 | 44 | 44 | 78 | 280 |
| 11 | 11 | 45 | 45 | 79 | 290 |
| 12 | 12 | 46 | 46 | 80 | 300 |
| 13 | 13 | 47 | 47 | 81 | 310 |
| 14 | 14 | 48 | 48 | 82 | 320 |
| 15 | 15 | 49 | 49 | 83 | 330 |
| 16 | 16 | 50 | 50 | 84 | 340 |
| 17 | 17 | 51 | 51 | 85 | 350 |
| 18 | 18 | 52 | 52 | 86 | 360 |
| 19 | 19 | 53 | 53 | 87 | 370 |
| 20 | 20 | 54 | 54 | 88 | 380 |
| 21 | 21 | 55 | 55 | 89 | 390 |
| 22 | 22 | 56 | 60 | 90 | 400 |
| 23 | 23 | 57 | 70 | 91 | 0.1 |
| 24 | 24 | 58 | 80 | 92 | 0.2 |
| 25 | 25 | 59 | 90 | 93 | 0.3 |
| 26 | 26 | 60 | 100 | 94 | 0.4 |
| 27 | 27 | 61 | 110 | 95 | 0.5 |
| 28 | 28 | 62 | 120 | 96 | 0.6 |
| 29 | 29 | 63 | 130 | 97 | A little precipitation, non-measurable |
| 30 | 30 | 64 | 140 | | |
| 31 | 31 | 65 | 150 | 98 | More than 400 mm |
| 32 | 32 | 66 | 160 | 99 | Measurement impossible |
| 33 | 33 | 67 | 170 | | |

## 3590

**RRR** ***Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by*** **$t_R$**

| Code figure | | Code figure | |
|---|---|---|---|
| **000** | **No precipitation** | **990** | **Trace** |
| **001** | **1 mm** | **991** | **0.1 mm** |
| **002** | **2 mm** | **992** | **0.2 mm** |
| **etc.** | **etc.** | **993** | **0.3 mm** |
| **988** | **988 mm** | **994** | **0.4 mm** |
| **989** | **989 mm or more** | **995** | **0.5 mm** |
| | | **996** | **0.6 mm** |
| | | **997** | **0.7 mm** |
| | | **998** | **0.8 mm** |
| | | **999** | **0.9 mm** |
| | | **///** | **Precipitation not measured** |

Note: See Regulations 12.2.5.4, 22.5.2.1 and 22.5.2.2.

## 3596

**RRRR** ***Total amount of precipitation or water equivalent of snow cover on the ground***

**$R_1R_1R_1R_1$** ***Total precipitation for the month***

| Code figure | |
|---|---|
| **0000** | **No precipitation or no measurable water equivalent of snow cover on the ground** |
| **0001** | **1 mm** |
| **0002** | **2 mm** |
| **etc.** | **etc.** |
| **8898** | **8 898 mm** |
| **8899** | **8 899 mm or more** |
| **9999** | **More than zero and less than 1 mm** |

## 3644

**$r_m$** ***Type of rocket motor***

| Code figure | |
|---|---|
| **0** | **114 mm (4.5 in.), end burning** |
| **1** | **76 mm (3.0 in.), internal burning** |
| **2** | **Boosted, 114 mm (4.5 in.), end burning** |
| **3** | **Boosted, 76 mm (3.0 in.), internal burning** |
| **4** | **135 mm (5.3 in.), internal burning** |
| **5** | **160 mm (6.3 in.), internal burning** |

## 3652

$r_t$ ***Distance between the end of the observed outermost spiral band and the centre of the tropical cyclone***

| Code figure | |
|---|---|
| **0** | **0 to less than 100 km** |
| **1** | **100 to less than 200 km** |
| **2** | **200 to less than 300 km** |
| **3** | **300 to less than 400 km** |
| **4** | **400 to less than 500 km** |
| **5** | **500 to less than 600 km** |
| **6** | **600 to less than 800 km** |
| **7** | **800 km or more** |
| **/** | **Doubtful or undetermined** |

## 3685

$r_ar_a$ ***Radiosonde/sounding system used***

*(See common Code table C–2 in Attachment I.)*

## 3700

**S** ***State of the sea***

**S′** ***State of the water surface in an alighting area***

| Code figure | Descriptive terms | Height* in metres |
|---|---|---|
| **0** | **Calm (glassy)** | **0** |
| **1** | **Calm (rippled)** | **0 – 0.1** |
| **2** | **Smooth (wavelets)** | **0.1 – 0.5** |
| **3** | **Slight** | **0.5 – 1.25** |
| **4** | **Moderate** | **1.25 – 2.5** |
| **5** | **Rough** | **2.5 – 4** |
| **6** | **Very rough** | **4 – 6** |
| **7** | **High** | **6 – 9** |
| **8** | **Very high** | **9 – 14** |
| **9** | **Phenomenal** | **Over 14** |

Notes:

(1) * These values refer to well-developed wind waves of the open sea. While priority shall be given to the descriptive terms, these height values may be used for guidance by the observer when reporting the total state of agitation of the sea resulting from various factors such as wind, swell, currents, angle between swell and wind, etc.

(2) The exact bounding height shall be assigned for the lower code figure; e.g. a height of 4 m is coded as 5.

## 3704

**$S_C$** ***Shape and definition of the eye of the tropical cyclone***

| Code figure | | |
|---|---|---|
| **0** | **Circular** | |
| **1** | **Elliptical – the minor axis is at least $^3/_4$ the length of the major axis** | |
| **2** | **Elliptical – the minor axis is less than $^3/_4$ the length of the major axis** | **well defined** |
| **3** | **Apparent double eye** | |
| **4** | **Other shape** | |
| **5** | **Ill defined** | |
| **/** | **Undetermined** | |

## 3738

**$S_h$** ***Type of temperature and height data***

| Code figure | |
|---|---|
| **0** | **Observed air temperature – D-value positive** |
| **2** | **Observed air temperature – D-value negative** |
| **4** | **Observed air temperature – no D-value reported** |
| **6** | **Air temperature reduced to the nearest standard isobaric surface – height reduced to the nearest standard isobaric surface** |

## 3739

**$S_i$** ***Stage of development***

| Code figure | |
|---|---|
| **0** | **New ice only (frazil ice, grease ice, slush, shuga)** |
| **1** | **Nilas or ice rind, less than 10 cm thick** |
| **2** | **Young ice (grey ice, grey-white ice), 10–30 cm thick** |
| **3** | **Predominantly new and/or young ice with some first-year ice** |
| **4** | **Predominantly thin first-year ice with some new and/or young ice** |
| **5** | **All thin first-year ice (30–70 cm thick)** |
| **6** | **Predominantly medium first-year ice (70–120 cm thick) and thick first-year ice (>120 cm thick) with some thinner (younger) first-year ice** |
| **7** | **All medium and thick first-year ice** |
| **8** | **Predominantly medium and thick first-year ice with some old ice (usually more than 2 metres thick)** |
| **9** | **Predominantly old ice** |
| **/** | **Unable to report, because of darkness, lack of visibility or because only ice of land origin is visible or because ship is more than 0.5 nautical mile away from ice edge** |

## 3761

**$S_0$** ***Hoar frost or coloured precipitation***

| Code figure | |
|---|---|
| **0** | **Hoar frost on horizontal surfaces** |
| **1** | **Hoar frost on horizontal and vertical surfaces** |
| **2** | **Precipitation containing sand or desert dust** |
| **3** | **Precipitation containing volcanic ash** |

## 3762

**$S_1$, $S_2$** ***Nature of the zone separated by the line formed by the points following the*** **$2C_sS_1S_2Z_1$** ***group*** ($S_1$ is the part to the right of the line, $S_2$ is the zone inside the line)

| Code figure | |
|---|---|
| 0 | **Sky clear or slightly clouded** |
| 1 | **Sky cloudy or very cloudy** |
| 2 | **Anterior or lateral zone** |
| 3 | **Central zone** |
| 4 | **Posterior zone** |
| 5 | **Thunder zone** |
| 6 | **Fog** |
| 7 | **Connecting zone** |
| 8 | **Instability** |
| 9 | **Stratus (below 800 m) or stratocumulus** |

## 3763

**$S_1$** ***Predominant stage of development of ice***

**$S_2$** ***Secondary stage of development of ice***

**$S_3$** ***Tertiary stage of development of ice***

**$S_4$** ***Quaternary stage of development of ice***

**$S_5$** ***Quintary stage of development of ice***

| Code figure | |
|---|---|
| 0 | **No stage of development** |
| 1 | **New ice** |
| 2 | **Ice rind, dark nilas, light nilas** |
| 3 | **Grey ice** |
| 4 | **Grey-white ice** |
| 5 | **Thin first-year ice** |
| 6 | **Medium first-year ice** |
| 7 | **Thick first-year ice** |
| 8 | **Second-year ice** |
| 9 | **Multi-year ice** |
| / | **Undetermined or unknown** |

## 3764

**$S_6$** *Type of frozen deposit*

**Code figure**

| Code figure | |
|---|---|
| **0** | **Glaze** |
| **1** | **Soft rime** |
| **2** | **Hard rime** |
| **3** | **Snow deposit** |
| **4** | **Wet snow deposit** |
| **5** | **Freezing wet snow deposit** |
| **6** | **Compound deposits (at the same time glazed ice and rime, or rime and freezing wet snow, etc.)** |
| **7** | **Ground ice*** |

* Ice or ice-encrusted snow on the surface of the ground. This forms as a result of freezing liquid precipitation – rain, drizzle, thick fog droplets, wet snow, and also as a result of freezing snowmelt on the surface of the ground. Ground ice also includes snow which is compacted and ice-encrusted as a result of road traffic movement. Ground ice, as distinct from glaze, is observed only on the surface of the ground, and most often on the road.

## 3765

**$S_7$** *Character of snow cover*

| Code figure | |
|---|---|
| **0** | **Light, fresh snow** |
| **1** | **Fresh snow blown into drifts** |
| **2** | **Fresh compact snow** |
| **3** | **Old snow, loose** |
| **4** | **Old snow, firm** |
| **5** | **Old snow, moist** |
| **6** | **Loose snow, with surface crust** |
| **7** | **Firm snow, with surface crust** |
| **8** | **Moist snow, with surface crust** |

## 3766

**$S_8$** *Snowstorm phenomena (snow raised by the wind)*

| Code figure | |
|---|---|
| **0** | **Snow haze** |
| **1** | **Drifting snow, slight or moderate, with or without snow falling** |
| **2** | **Drifting snow, heavy, without snow falling** |
| **3** | **Drifting snow, heavy, with snow falling** |
| **4** | **Blowing snow, slight or moderate, without snow falling** |
| **5** | **Blowing snow, heavy, without snow falling** |
| **6** | **Blowing snow, slight or moderate, with snow falling** |
| **7** | **Blowing snow, heavy, with snow falling** |
| **8** | **Drifting and blowing snow, slight or moderate, impossible to determine whether snow is falling or not** |
| **9** | **Drifting and blowing snow, heavy, impossible to determine whether snow is falling or not** |

## 3775

**$S'_7$** ***Regularity of snow cover***

| Code figure | |
|---|---|
| 0 | Even snow cover, ground frozen, no drifts |
| 1 | Even snow cover, ground soft, no drifts |
| 2 | Even snow cover, state of ground unknown, no drifts |
| 3 | Snow cover moderately uneven, ground frozen, slight drifts |
| 4 | Snow cover moderately uneven, ground soft, slight drifts |
| 5 | Snow cover moderately uneven, state of ground unknown, slight drifts |
| 6 | Snow cover very uneven, ground frozen, deep drifts |
| 7 | Snow cover very uneven, ground soft, deep drifts |
| 8 | Snow cover very uneven, state of ground unknown, deep drifts |

## 3776

**$S'_8$** ***Evolution of drift snow***

| Code figure | |
|---|---|
| 0 | Drift snow ended before the hour of observation |
| 1 | Intensity diminishing |
| 2 | No change |
| 3 | Intensity increasing |
| 4 | Continues, apart from interruption lasting less than 30 minutes |
| 5 | General drift snow has become drift snow near the ground |
| 6 | Drift snow near the ground has become general drift snow |
| 7 | Drift snow has started again after an interruption of more than 30 minutes |

## 3777

**SS** ***Section of front or of pressure system to which NN refers***

| Code figure | |
|---|---|
| 00 | No section specified |
| 01 | North-east section |
| 02 | East section |
| 03 | South-east section |
| 04 | South section |
| 05 | South-west section |
| 06 | West section |
| 07 | North-west section |
| 08 | North section |

# 3778

## $S_PS_Ps_ps_p$ *Supplementary information*

Note: The group $9S_PS_Ps_ps_p$ is used to give (additional) information about certain phenomena occurring at the time of observation and/or during the period covered by ww or $W_1W_2$. The relevant time or time period may be indicated by inclusion of one or more time groups (decile 00–09), when and where appropriate.

**$9S_PS_Ps_ps_p$**

| | |
|---|---|
| **Decile 00–09:** | **Time and variability** |
| **900tt** | **Time of commencement** } **of weather phenomenon reported by ww in group $7wwW_1W_2$** |
| **900zz** | **Variability, location or intensity** } **of weather phenomenon reported by ww in group $7wwW_1W_2$** |
| **901tt** | **Time of ending of weather phenomenon reported by ww in group $7wwW_1W_2$** |
| **902tt** | **Time of commencement** } **of weather phenomenon reported in the following group $9S_PS_Ps_ps_p$** |
| **902zz** | **Variability, location or intensity** } **of weather phenomenon reported in the following group $9S_PS_Ps_ps_p$** |
| **903tt** | **Time of ending of weather phenomenon reported in the preceding group $9S_PS_Ps_ps_p$** |
| **904tt** | **Time of occurrence of weather phenomenon reported in the following group $9S_PS_Ps_ps_p$** |
| **905tt** | **Duration of non-persistent weather phenomenon or time of commencement of persistent weather phenomenon** } **reported by ww in group $7wwW_1W_2$** |
| **906tt** | **Duration of non-persistent weather phenomenon or time of commencement of persistent weather phenomenon** } **reported in the following group $9S_PS_Ps_ps_p$** |
| **907tt** | **Duration of period of reference, ending at the time of observation, of weather phenomenon reported in the following group $9S_PS_Ps_ps_p$** |
| **908** | **Not used** |
| **$909R_td_c$** | **Time at which precipitation given by RRR began or ended and duration and character of precipitation** |

| | |
|---|---|
| **Decile 10–19:** | **Wind and squall** |
| **910ff** | **Highest gust during the 10-minute period immediately preceding the observation** |
| **911ff** | **Highest gust** } **during the period covered by $W_1W_2$ in group $7wwW_1W_2$, unless a different period of reference is indicated by group 907tt; or during the 10-minute period immediately preceding the time of observation indicated by group 904tt** |
| **912ff** | **Highest mean wind speed** } (as above) |
| **913ff** | **Mean wind speed** } (as above) |
| **914ff** | **Lowest mean wind speed** } (as above) |
| **915dd** | **Direction of wind** |
| **916tt** | **Pronounced clockwise shift in wind direction (veering)** |
| **917tt** | **Pronounced anticlockwise shift in wind direction (backing)** |
| **$918s_qD_p$** | **Nature and/or type of squall, and direction from which it approaches the station** |
| **$919M_wD_a$** | **Waterspout(s), tornadoes, whirlwinds, dust devils** |

Notes:

(1) When wind speed reaches or exceeds 99 units (knots or m $s^{-1}$ as indicated by $i_w$), two groups shall be used in the same manner as in Section 1 of the code form. For example, to report a gust of 135 knots during the 10-minute period preceding the observation, the two groups would be coded 91099 00135.

(2) The mean wind speed referred to in groups 912ff and 914ff is defined as time averaged instantaneous wind speed over a 10-minute interval throughout the period covered by $W_1W_2$ or as indicated by a preceding time group.

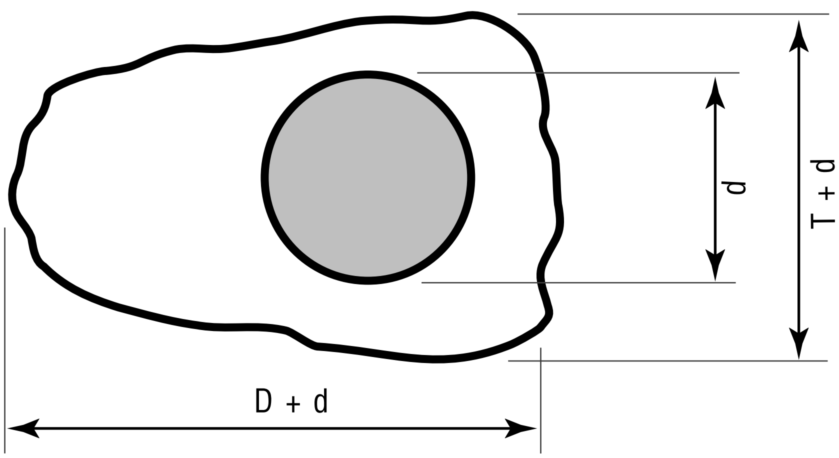
(3) A significant change in wind speed and/or direction is reported by two 913ff and/or 915dd groups giving the speed and/or direction before and after the change. Time of change is given by the group 906tt preceding the second 913ff and/or 915dd groups. Variation in speed and/or direction of light and variable winds would not normally be reported, nor would a gradual change in speed and/or direction of a strong wind; by "significant" change is meant a sudden onset or cessation of a strong wind or a sudden change in speed and/or direction of a strong wind.

*(Code table 3778 – continued)*

| | |
|---|---|
| **Decile 20–29:** | **State of the sea, icing phenomena and snow cover** |
| **920SF$_x$** | **State of the sea and maximum wind force ($F_x$ < 9 Beaufort)** |
| **921SF$_x$** | **State of the sea and maximum wind force ($F_x$ > 9 Beaufort)** |
| **922S´V´$_s$** | **State of the water surface and visibility at a seaplane alighting area** |
| **923SS** | **State of the water surface in the alighting area and state of the sea in the open sea** |
| **924SV$_s$** | **State of the sea and visibility seawards (from a coastal station)** |
| **925T$_w$T$_w$** | **Water temperature at resorts during the bathing season** |
| **926S$_0$i$_0$** | **Hoar frost or coloured precipitation** |
| **927S$_6$T$_w$** | **Frozen deposit** |
| **928S$_7$S´$_7$** | **Character and regularity of snow cover** |
| **929S$_8$S´$_8$** | **Drift snow** |

| | | |
|---|---|---|
| **Decile 30–39:** | **Amount of precipitation or deposit** | |
| **930RR** | **Amount of precipitation** | **during the period covered by W$_1$W$_2$ in group 7wwW$_1$W$_2$, unless a different period of reference is indicated by group 907tt** |
| **931ss** | **Depth of newly fallen snow** | |
| **932RR** | **Maximum diameter of hailstones** | |
| **933RR** | **Water equivalent of solid precipitation on ground** | **at the time of observation** |
| **934RR** | **Diameter of glaze deposit** | |
| **935RR** | **Diameter of rime deposit** | |
| **936RR** | **Diameter of compound deposit** | |
| **937RR** | **Diameter of wet-snow deposit** | |
| **938nn** | **Rate of glaze accrual on a surface, in mm h$^{-1}$** | |
| **939h$_g$h$_g$** | **Height above ground, in metres, at which diameter of deposit reported in the preceding group 9S$_P$S$_P$s$_p$s$_p$ is observed** | |
| **939nn** | **Maximum diameter of hailstones, in millimetres** | |

Note: Diameter of the deposit is taken as the greatest distance along the axis of a cross-section of the deposit minus the diameter of the measuring rod (see figure below):




D – Diameter of glaze or rime deposit;

T – Thickness of glaze or rime deposit;

d – Diameter of measuring rod.

*(Code table 3778 – continued)*

| | |
|---|---|
| **Decile 40–49:** | **Clouds** |
| **940Cn$_3$** | **Evolution of clouds** |
| **941CD$_p$** | **Direction from which clouds are moving** |
| **942CD$_a$** | **Location of maximum concentration of clouds** |
| **943C$_L$D$_p$** | **Direction from which low-level clouds are moving** |
| **944C$_L$D$_a$** | **Location of maximum concentration of low-level clouds** |
| **945h$_t$h$_t$** | **Height of the tops of the lowest clouds or height of the lowest cloud layer or fog** |
| **946C$_c$D$_a$** | **Direction of coloration and/or convergence of clouds associated with a tropical disturbance** |
| **947Ce´** | **Elevation of clouds** |
| **948C$_0$D$_a$** | **Orographic clouds** |
| **949C$_a$D$_a$** | **Clouds of vertical development** |

| | | |
|---|---|---|
| **Decile 50–59:** | **Cloud conditions over mountains and passes, or in valleys or plains observed from a higher level** | |
| **950N$_m$n$_3$** | **Cloud conditions over mountains and passes** | |
| **951N$_v$n$_4$** | **Fog, mist or low cloud in valleys or plains, observed from a station at a higher level** | |
| **952–957** | **Not used** | |
| **958E$_h$D$_a$** | **Location of maximum concentration of cloud** | **reported in the preceding group 9S$_P$S$_P$s$_p$s$_p$** |
| **959v$_p$D$_p$** | **Forward speed and direction from which clouds are moving** | |

| | |
|---|---|
| **Decile 60–69:** | **Present weather and past weather** |
| **960ww** | **Present weather phenomenon observed simultaneously with and/or in addition to weather phenomenon reported by ww in group 7wwW$_1$W$_2$** |
| **961w$_1$w$_1$** | **Present weather phenomenon observed simultaneously with and/or in addition to weather phenomenon reported by ww in group 7wwW$_1$W$_2$, or amplification of present weather phenomenon reported by ww in group 7wwW$_1$W$_2$** |
| **962ww**<br>**963w$_1$w$_1$** | **Amplification of weather phenomenon during preceding hour but not at the time of observation and reported by ww = 20-29 in group 7wwW$_1$W$_2$** |
| **964ww**<br>**965w$_1$w$_1$** | **Amplification of weather phenomenon during the period covered by W$_1$W$_2$ and reported by W$_1$ and/or W$_2$ in group 7wwW$_1$W$_2$** |
| **966ww**<br>**967w$_1$w$_1$** | **Weather phenomenon occurring at the time or during the period indicated by associated 9S$_P$S$_P$s$_p$s$_p$ time groups** |
| **968** | **Not used** |
| **9696D$_a$** | **Rain at the station not associated with thunderstorm in distance, direction D$_a$** |
| **9697D$_a$** | **Snow at the station not associated with thunderstorm in distance, direction D$_a$** |
| **9698D$_a$** | **Shower at the station not associated with thunderstorm in distance, direction D$_a$** |

| | | |
|---|---|---|
| **Decile 70–79:** | **Location and movement of phenomena** | |
| **970E$_h$D$_a$** | **Location of maximum concentration phenomenon reported by** | **ww in group 7wwW$_1$W$_2$** |
| **971E$_h$D$_a$** | | **ww in group 960ww** |
| **972E$_h$D$_a$** | | **w$_1$w$_1$ in group 961w$_1$w$_1$** |
| **973E$_h$D$_a$** | | **W$_1$ in group 7wwW$_1$W$_2$** |
| **974E$_h$D$_a$** | | **W$_2$ in group 7wwW$_1$W$_2$** |
| **975v$_p$D$_p$** | **Forward speed and direction from which it is moving, phenomenon reported by** | **ww in group 7wwW1W$_2$** |
| **976v$_p$D$_p$** | | **ww in group 960ww** |
| **977v$_p$D$_p$** | | **w$_1$w$_1$ in group 961w$_1$w$_1$** |
| **978v$_p$D$_p$** | | **W$_1$ in group 7wwW$_1$W$_2$** |
| **979v$_p$D$_p$** | | **W$_2$ in group 7wwW$_1$W$_2$** |

*(Code table 3778 – continued)*

| | |
|---|---|
| **Decile 80–89:** | **Visibility** |
| **980$V_sV_s$** | **Visibility towards the sea** |
| **981VV** | **Visibility to NE** |
| **982VV** | **Visibility to E** |
| **983VV** | **Visibility to SE** |
| **984VV** | **Visibility to S** |
| **985VV** | **Visibility to SW** |
| **986VV** | **Visibility to W** |
| **987VV** | **Visibility to NW** |
| **988VV** | **Visibility to N** |
| **989$V_bD_a$** | **Variation of visibility during the hour preceding the time of observation and the direction in which this variation has been observed** |
| **Decile 90–99:** | **Optical phenomena and miscellaneous** |
| **990$Z_0i_0$** | **Optical phenomena** |
| **991$AD_a$** | **Mirage** |
| **99190** | **St Elmo's fire** |
| **992$N_tt_w$** | **Condensation trails** |
| **993$C_SD_a$** | **Special clouds** |
| **994$A_3D_a$** | **Day darkness** |
| **995nn** | **Lowest atmospheric pressure reduced to mean sea level during the period covered by $W_1W_2$ unless otherwise indicated by associated 9$S_PS_Ps_ps_p$ time group(s), in tens and units of hectopascals** |
| **996$T_vT_v$** | **Sudden rise in air temperature, in whole degrees Celsius** |
| **997$T_vT_v$** | **Sudden fall in air temperature, in whole degrees Celsius** |
| **998$U_vU_v$** | **Sudden rise in relative humidity, in per cent** |
| **999$U_vU_v$** | **Sudden fall in relative humidity, in per cent** |

Note: Groups 996$T_vT_v$, 997$T_vT_v$, 998$U_vU_v$ and 999$U_vU_v$ should *not* be used to report normal diurnal changes in temperature or humidity.

## 3780

**$S_fS_f$** ***Synoptic interpretation of significant features***

| Code figure | |
|---|---|
| **00** | **Low-level ridge** |
| **01** | **Upper-level ridge, sharp** |
| **02** | **Upper-level ridge, medium** |
| **03** | **Upper-level ridge, broad** |
| **10** | **Quasi-stationary front, broken cloud pattern** |
| **11** | **Quasi-stationary front, continuous cloud mass** |
| **12** | **Cold front, broken cloud pattern** |
| **13** | **Cold front, continuous cloud mass** |
| **14** | **Warm front, broken cloud pattern** |
| **15** | **Warm front, continuous cloud mass** |
| **16** | **Occluded front** |
| **17** | **Squall-line** |
| **18** | **Non-frontal extra-tropical cloud band** |
| **20** | **Widening area in frontal cloud band** |
| **21** | **Well-developed frontal wave** |
| **22** | **Initial vortex associated with a front** |
| **23** | **Vortex occluding, cold air intrusion** |

*(Code table 3780 – continued)*

| | |
|---|---|
| **24** | **Mature vortex, fully occluded** |
| **25** | **Decaying vortex** |
| **26** | **Clouds forming due to waves forming to the lee of mountain ranges or other obstacles** |
| **27** | **Clouds due to eddies to the lee of islands or isolated obstacles** |
| **28** | **Clear area due to orographic föhn processes** |
| **29** | **Orographic cloud system** |
| **30** | **Positive vorticity advection maximum, enhanced Cu or Cb** |
| **31** | **Positive vorticity advection maximum (solid), cloud mass** |
| **32** | **Vorticity maximum, comma shape, without clear area downstream** |
| **33** | **Vorticity maximum, comma shape, with clear area downstream** |
| **34** | **Cut-off vortex** |
| **35** | **Secondary vorticity centre, spiralling Cu or Cb without cirrus plumes** |
| **36** | **Secondary vorticity centre, spiralling Cu or Cb with cirrus plumes** |
| **40** | **Low-level trough** |
| **41** | **Upper-level trough, determined through cold-frontal cloud mass** |
| **42** | **Upper-level trough, associated with a major cloud mass** |
| **43** | **Upper-level trough, preceded by crescent cloud formation** |
| **44** | **Upper-level trough, determined by cirrus plumes** |
| **50** | **Jet stream, determined by cirrus shadow or edge** |
| **51** | **Same as 50, with transversal streaks** |
| **52** | **Jet stream, determined through cirrus streaks** |
| **53** | **Same as 52, with transversal streaks** |
| **54** | **Jet stream, determined from a change in the cloud texture** |
| **55** | **Jet stream, determined from a change in the cellular cloud pattern** |
| **60** | **Area of isolated Cb, Ci-plumes extend less than 1° latitude from the source** |
| **61** | **Same as 60, Ci-plumes extend more than 1° latitude from the source** |
| **62** | **Area of Cb clusters, Ci-plumes extend less than 1° latitude from the source** |
| **63** | **Same as 62, Ci-plumes extend more than 1° latitude from the source** |
| **70** | **Intertropical convergence zone (ITCZ) without specification of characteristics** |
| **71** | **ITCZ as uniformly bright band of cumulonimbus with cirrus cover** |
| **72** | **ITCZ as an accumulation of cumulonimbus** |
| **73** | **ITCZ as banks of cumuliform clouds gathering along the axis of convergence lying along the direction of the trade winds** |
| **74** | **Bank of tropical clouds without cumulonimbus (Cb)** |
| **75** | **Bank of tropical clouds with Cb** |
| **76** | **Tropical wave** |
| **77** | **Wind shear line** |
| **88** | **Area of widespread sandstorm or duststorm** |
| **89** | **Area of widespread smoke** |
| **90** | **Ridge** |
| **91** | **Frontal cloud band** |
| **92** | **Frontal wave** |
| **93** | **Vortex** |
| **94** | **Convergence zone (including ITCZ)** |
| **95** | **Jet stream** |
| **96** | **Positive vorticity advection maximum (comma formation, enhanced convection, etc.)** |
| **97** | **Trough** |
| **98** | **Major cloud system** |
| **99** | **Synoptic interpretation of significant features is undetermined** |

Notes:

(1) Code figures 90 to 99 may be used when more detailed synoptic interpretation is not possible.

(2) In case of $S_fS_f$ = 88, 89 or 98, the position groups in Section 2 delineate a major cloud system, an area of widespread sandstorm or duststorm or an area of smoke.

## 3790

**$S_tS_t$** ***Intensity of the tropical cyclone***

| Code figure | Current Intensity (CI Number) | Maximum sustained wind speed (knots) | Maximum sustained wind speed (m $s^{-1}$) |
|---|---|---|---|
| **00** | **Decaying** | | |
| **15** | **1.5** | **25** | **13** |
| **20** | **2** | **30** | **15** |
| **25** | **2.5** | **35** | **18** |
| **30** | **3** | **45** | **23** |
| **35** | **3.5** | **55** | **28** |
| **40** | **4** | **65** | **33** |
| **45** | **4.5** | **77** | **39** |
| **50** | **5** | **90** | **46** |
| **55** | **5.5** | **102** | **52** |
| **60** | **6** | **115** | **59** |
| **65** | **6.5** | **127** | **65** |
| **70** | **7** | **140** | **72** |
| **75** | **7.5** | **155** | **79** |
| **80** | **8** | **170** | **87** |
| **99** | **Becoming extratropical** | | |
| **//** | **Undetermined** | | |

Note: The procedures for determining the Current Intensity (CI) Number from satellite imagery are explained in the *Guide on the Global Data-processing System* (WMO–No. 305).

## 3833

**$s_c$** ***Nature of snow or ice interpreted from satellite information***

| Code figure | | |
|---|---|---|
| **0** | **Snow cover** | **partial** |
| **1** | **Snow cover** | **continuous** |
| **2** | **Shore ice** | |
| **3** | **Snow-covered ice** | |
| **4** | **Shelf ice** | |
| **5** | **Sea ice** | **compact** |
| **6** | **Sea ice** | **broken** |
| **7** | **Sea ice** | **scattered** |
| **8** | **Channel in sea ice** | |
| **9** | **Iceberg(s)** | |
| **/** | **Nature of snow or ice undertermined** | |

## 3845

$s_n$ ***Sign of the data, and relative humidity indicator***

$s_n$ ***Sign of the exponent***

$s_n$ ***Sign of the reference value indicated by* rrrrrrr**

| Code figure | |
|---|---|
| **0** | **Positive or zero** |
| **1** | **Negative** |
| **9** | **Relative humidity follows** |

Notes:

(1) Code figures 2 to 8 are not used.

(2) See Regulation 12.2.3.3.1 for the use of code figure 9.

## 3847

$s_p$ ***Pasquill–Gifford stability category***

| Code figure | | Code figure | |
|---|---|---|---|
| **0** | **Not available** | **5** | **C** |
| **1** | **A** | **6** | **D** |
| **2** | **A–B** | **7** | **E** |
| **3** | **B** | **8** | **F** |
| **4** | **B–C** | **9** | **G** |

## 3848

$s_q$ ***Nature and/or type of squall***

| Code figure | |
|---|---|
| **0** | **Calm or light wind followed by a squall** |
| **1** | **Calm or light wind followed by a succession of squalls** |
| **2** | **Gusty weather followed by a squall** |
| **3** | **Gusty weather followed by a succession of squalls** |
| **4** | **Squall followed by gusty weather** |
| **5** | **General gusty weather with squall at intervals** |
| **6** | **Squall approaching station** |
| **7** | **Line squall** |
| **8** | **Squall with drifting or blowing dust or sand** |
| **9** | **Line squall with drifting or blowing dust or sand** |

## 3849

$s_r$ ***Solar and infrared radiation correction***

| Code figure | |
|---|---|
| 0 | No correction |
| 1 | CIMO solar corrected and CIMO infrared corrected |
| 2 | CIMO solar corrected and infrared corrected |
| 3 | CIMO solar corrected only |
| 4 | Solar and infrared corrected automatically by radiosonde system |
| 5 | Solar corrected automatically by radiosonde system |
| 6 | Solar and infrared corrected as specified by country |
| 7 | Solar corrected as specified by country |

## 3850

$s_s$ ***Indicator for sign and type of measurement of sea-surface temperature***

| Code figure | Sign | Type of measurement |
|---|---|---|
| 0 | Positive or 0 | Intake |
| 1 | Negative | Intake |
| 2 | Positive or 0 | Bucket |
| 3 | Negative | Bucket |
| 4 | Positive or 0 | Hull contact sensor |
| 5 | Negative | Hull contact sensor |
| 6 | Positive or 0 | Other |
| 7 | Negative | Other |

## 3855

$s_w$ ***Indicator for the sign and type of wet-bulb temperature reported***

| Code figure | |
|---|---|
| 0 | Positive or zero measured wet-bulb temperature |
| 1 | Negative measured wet-bulb temperature |
| 2 | Iced bulb measured wet-bulb temperature |
| 5 | Positive or zero computed wet-bulb temperature |
| 6 | Negative computed wet-bulb temperature |
| 7 | Iced bulb computed wet-bulb temperature |

## 3856

**$s_x$** ***Sign indicator for the data group which follows (Section 3) and for the Cartesian coordinates of the Pole (Section 2)***

| Code figure | First element (if any) | Second element (if any) |
|---|---|---|
| 0 | Positive or zero | Positive or zero |
| 1 | Negative | Positive or zero |
| 2 | Positive or zero | Negative |
| 3 | Negative | Negative |

## 3866

**$s_1$** ***Type of navigation system***

| Code figure | |
|---|---|
| 0 | Inertial navigation system |
| 1 | OMEGA |

## 3867

**$s_2$** ***Type of system used***

| Code figure | |
|---|---|
| 0 | ASDAR |
| 1 | ASDAR (ACARS also available but not operative) |
| 2 | ASDAR (ACARS also available and operative) |
| 3 | ACARS |
| 4 | ACARS (ASDAR also available but not operative) |
| 5 | ACARS (ASDAR also available and operative) |

## 3868

**$s_3$** ***Temperature precision***

| Code figure | |
|---|---|
| 1 | Low (precision near 2.0°C) |
| 0 | High (precision near 1.0°C) |

## 3870

**ss** ***Depth of newly fallen snow***

| Code figure | mm | Code figure | mm | Code figure | mm |
|---|---|---|---|---|---|
| 00 | 0 | 34 | 340 | 68 | 1 800 |
| 01 | 10 | 35 | 350 | 69 | 1 900 |
| 02 | 20 | 36 | 360 | 70 | 2 000 |
| 03 | 30 | 37 | 370 | 71 | 2 100 |
| 04 | 40 | 38 | 380 | 72 | 2 200 |
| 05 | 50 | 39 | 390 | 73 | 2 300 |
| 06 | 60 | 40 | 400 | 74 | 2 400 |
| 07 | 70 | 41 | 410 | 75 | 2 500 |
| 08 | 80 | 42 | 420 | 76 | 2 600 |
| 09 | 90 | 43 | 430 | 77 | 2 700 |
| 10 | 100 | 44 | 440 | 78 | 2 800 |
| 11 | 110 | 45 | 450 | 79 | 2 900 |
| 12 | 120 | 46 | 460 | 80 | 3 000 |
| 13 | 130 | 47 | 470 | 81 | 3 100 |
| 14 | 140 | 48 | 480 | 82 | 3 200 |
| 15 | 150 | 49 | 490 | 83 | 3 300 |
| 16 | 160 | 50 | 500 | 84 | 3 400 |
| 17 | 170 | 51 | 510 | 85 | 3 500 |
| 18 | 180 | 52 | 520 | 86 | 3 600 |
| 19 | 190 | 53 | 530 | 87 | 3 700 |
| 20 | 200 | 54 | 540 | 88 | 3 800 |
| 21 | 210 | 55 | 550 | 89 | 3 900 |
| 22 | 220 | 56 | 600 | 90 | 4 000 |
| 23 | 230 | 57 | 700 | 91 | 1 |
| 24 | 240 | 58 | 800 | 92 | 2 |
| 25 | 250 | 59 | 900 | 93 | 3 |
| 26 | 260 | 60 | 1 000 | 94 | 4 |
| 27 | 270 | 61 | 1 100 | 95 | 5 |
| 28 | 280 | 62 | 1 200 | 96 | 6 |
| 29 | 290 | 63 | 1 300 | 97 | Less than 1 mm |
| 30 | 300 | 64 | 1 400 | 98 | More than 4 000 mm |
| 31 | 310 | 65 | 1 500 | 99 | Measurement impossible or inaccurate |
| 32 | 320 | 66 | 1 600 | | |
| 33 | 330 | 67 | 1 700 | | |

## 3872

**$s_as_a$** ***Tracking technique/status of system used***

*(See Common table C-7 in Attachment I.)*

## 3889

**sss** ***Total depth of snow***

| Code figure | |
|---|---|
| **000** | **Not used** |
| **001** | **1 cm** |
| **etc.** | **etc.** |
| **996** | **996 cm** |
| **997** | **Less than 0.5 cm** |
| **998** | **Snow cover, not continuous** |
| **999** | **Measurement impossible or inaccurate** |

Note: See Regulations 12.4.6.1 and 12.4.6.2.

## 3931

**$T_a$** ***Approximate tenths value and sign (plus or minus) of the air temperature at the level given by*** **$P_aP_aP_a$**

**$T_a$** ***Approximate tenths value and sign of temperature***

**$T_{at}$** ***Approximate tenths value and sign (plus or minus) of the air temperature at the tropopause level***

**$T_{a0}$, $T_{a1}$, . . . $T_{an}$** ***Approximate tenths value and sign (plus or minus) of:***
***(a) The air temperature at specified levels starting with station level***
***(b) Equivalent blackbody temperature***

| Tenths figure of observed air temperature | Code figure | |
|---|---|---|
| | Positive temperature | Negative temperature |
| 0, 1 | 0 | 1 |
| 2, 3 | 2 | 3 |
| 4, 5 | 4 | 5 |
| 6, 7 | 6 | 7 |
| 8, 9 | 8 | 9 |

## 3933

**$T_c$** ***Tropical system characteristics***

| Code figure | |
|---|---|
| **0** | **No specification** |
| **1** | **Diffuse** |
| **2** | **Sharply defined** |
| **3** | **Quasi-stationary** |
| **4** | **Existence certain** |
| **5** | **Existence uncertain** |
| **6** | **Formation suspected** |
| **7** | **Position certain** |
| **8** | **Position uncertain** |
| **9** | **Movement doubtful** |

## 3939

**$T_i$** ***Tropical system intensity when* $T_t$ = 0–8**

| Code figure | |
|---|---|
| 0 | **No specification** |
| 1 | **Weak, decreasing** |
| 2 | **Weak, little or no change** |
| 3 | **Weak, increasing** |
| 4 | **Moderate, decreasing** |
| 5 | **Moderate, little or no change** |
| 6 | **Moderate, increasing** |
| 7 | **Strong, decreasing** |
| 8 | **Strong, little or no change** |
| 9 | **Strong, increasing** |

## 3940

**$T_i$** ***Tropical system intensity when* $T_t$ = 9**

| Code figure | Beaufort scale | Mean speed in knots | Mean speed in m $s^{-1}$ | Mean speed in km $h^{-1}$ |
|---|---|---|---|---|
| 0 | Force 10 | 48–55 | 24.5–28.4 | 89–102 |
| 1 | 11 | 56–63 | 28.5–32.6 | 103–117 |
| 2 | 12 | 64–71 | 32.7–36.9 | 118–133 |
| 3 | 12 | 72–80 | 37.0–41.4 | 134–149 |
| 4 | 12 | 81 or over | 41.5 or over | 150 or over |
| 5 | 5 | 17–21 | 8.0–10.7 | 29–38 |
| 6 | 6 | 22–27 | 10.8–13.8 | 39–49 |
| 7 | 7 | 28–33 | 13.9–17.1 | 50–61 |
| 8 | 8 | 34–40 | 17.2–20.7 | 62–74 |
| 9 | 9 | 41–47 | 20.8–24.4 | 75–88 |

Note: When $T_t$ = 9, the code figure given for $T_i$ indicates the force of the strongest wind in the reported cyclonic circulation or, in the case of a prognosis, the strongest wind force expected at the time of the prognosis.

## 3952

**$T_t$** ***Tropical circulation type***

| Code figure | |
|---|---|
| 0 | **Intertropical convergence zone** |
| 1 | **Shear line** |
| 2 | **Line or zone of convergence** |
| 3 | **Axis of doldrum belt** |
| 4 | **Trough in westerlies** |
| 5 | **Trough in easterlies** |
| 6 | **Low area** |
| 7 | **Surge line** |
| 8 | **Line or zone of divergence** |
| 9 | **Tropical cyclonic circulation** |

## 3955

$T_w$ *Variation of temperature during the period covered by* $W_1W_2$*, associated with glaze or rime*

| Code figure | |
|---|---|
| 0 | Temperature steady |
| 1 | Temperature falling, without going below 0°C |
| 2 | Temperature rising, without going above 0°C |
| 3 | Temperature falling to a value below 0°C |
| 4 | Temperature rising to a value above 0°C |
| 5 | Irregular variation, oscillations of temperature passing through 0°C |
| 6 | Irregular variation, oscillations of temperature not passing through 0°C |
| 7 | Variation of temperature not observed |
| 8 | Not allocated |
| 9 | Variation of temperature unknown owing to lack of thermograph |

## 3956

$T_n$ *Minimum air temperature*

$T_x$ *Maximum air temperature*

| Code figure | Temperature in degrees Celsius |
|---|---|
| 0 | Less than –10 |
| 1 | –10 to –5 |
| 2 | –5 to –1 |
| 3 | About 0 (to nearly ± 1) |
| 4 | 1 to 5 |
| 5 | 5 to 10 |
| 6 | 10 to 20 |
| 7 | 20 to 30 |
| 8 | Greater than 30 |
| 9 | Temperature not forecast |

## 3962

$T_1$ *Topography of greatest extent*

$T_2$ *Topography of second greatest extent*

| Code figure | |
|---|---|
| 0 | Level ice |
| 1 | Rafted ice |
| 2 | Finger-rafted ice |
| 3 | Hummocks |
| 4 | New ridges |
| 5 | Weathered ridges |
| 6 | Very weathered ridges |
| 7 | Aged ridges |
| 8 | Consolidated ridges |
| 9 | Standing floe |
| / | Undetermined or unknown |

## 4001

**t** ***Nature of the temperature reading, the value of which is indicated by*** **$s_nT_tT_tT_t$**

| Code figure | |
|---|---|
| **1** | **Air temperature at the time of measurement** |
| **2** | **Dew-point temperature at the time of measurement** |
| **3** | **Maximum temperature of air during the preceding 24 hours** |
| **4** | **Minimum temperature of air during the preceding 24 hours** |
| **5** | **Water temperature at the time of measurement** |

Note: Regional Associations may use the figures 6 to 9 for other specifications.

## 4006

**$t_E$** ***Thickness of the predominant form of ice, snow depth not included***

| Code figure | |
|---|---|
| **0** | **Less than 5 cm** |
| **1** | **5 – 9 cm** |
| **2** | **10 – 19 cm** |
| **3** | **20 – 29 cm** |
| **4** | **30 – 39 cm** |
| **5** | **40 – 59 cm** |
| **6** | **60 – 89 cm** |
| **7** | **90 – 149 cm** |
| **8** | **150 – 249 cm** |
| **9** | **250 cm or more** |
| **/** | **Undetermined or unknown** |

## 4013

**$t_L$** ***Thickness of layer***

| Code figure | |
|---|---|
| **0** | **Up to top of cloud** |
| **1** | **300 m** |
| **2** | **600 m** |
| **3** | **900 m** |
| **4** | **1 200 m** |
| **5** | **1 500 m** |
| **6** | **1 800 m** |
| **7** | **2 100 m** |
| **8** | **2 400 m** |
| **9** | **2 700 m** |

## 4019

**$t_R$** ***Duration of period of reference for amount of precipitation, ending at the time of the report***

| Code figure | |
|---|---|
| **1** | **Total precipitation during the 6 hours preceding the observation** |
| **2** | **Total precipitation during the 12 hours preceding the observation** |
| **3** | **Total precipitation during the 18 hours preceding the observation** |
| **4** | **Total precipitation during the 24 hours preceding the observation** |
| **5** | **Total precipitation during the 1 hour preceding the observation** |
| **6** | **Total precipitation during the 2 hours preceding the observation** |
| **7** | **Total precipitation during the 3 hours preceding the observation** |
| **8** | **Total precipitation during the 9 hours preceding the observation** |
| **9** | **Total precipitation during the 15 hours preceding the observation** |

Notes:

(1) If the duration of the period of reference is not covered by Code table 4019 or the period does not end at the time of the report, $t_R$ shall be coded 0.

(2) Members are recommended to avoid any deviations from international practices which require the use of code figure 0. The specification of code figure 0 should be indicated in Volume II of the *Manual on Codes* under national coding procedures.

## 4035

**$t_e$** ***Time interval over which the movement of the centre or the eye of the tropical cyclone has been calculated***

| Code figure | |
|---|---|
| **0–2** | **Not used** |
| **3** | **During the preceding 15 minutes** |
| **4** | **During the preceding 30 minutes** |
| **5** | **During the preceding 1 hour** |
| **6** | **During the preceding 2 hours** |
| **7** | **During the preceding 3 hours** |
| **8** | **During the preceding 6 hours** |
| **9** | **During a period of more than 6 hours** |
| **/** | **Undetermined** |

## 4044

$t_m$ ***Time interval over which the movement of the tropical cyclone has been calculated***

| Code figure | |
|---|---|
| 0 | **Less than 1 hour** |
| 1 | **1 to less than 2 hours** |
| 2 | **2 to less than 3 hours** |
| 3 | **3 to less than 6 hours** |
| 4 | **6 to less than 9 hours** |
| 5 | **9 to less than 12 hours** |
| 6 | **12 to less than 15 hours** |
| 7 | **15 to less than 18 hours** |
| 8 | **18 to less than 21 hours** |
| 9 | **21 to less than 30 hours** |
| / | **Movement group is not included** |

## 4047

$t_p$ ***Period to which measurement of precipitation refers, and/or time at which water equivalent of snow is measured, both coded by*** **RRRR**

| Code figure | |
|---|---|
| 0 | **Total precipitation during the 1 hour preceding the observation** |
| 1 | **Total precipitation during the 2 hours preceding the observation** |
| 2 | **Total precipitation during the 3 hours preceding the observation** |
| 3 | **Total precipitation during the 6 hours preceding the observation** |
| 4 | **Total precipitation during the 12 hours preceding the observation** |
| 5 | **Total precipitation during the 24 hours preceding the observation** |
| 6 | **Total precipitation during the 48 hours preceding the observation** |
| 7 | **Total precipitation during the last 10 days** |
| 8 | **Total precipitation during the calendar month preceding the observation** |
| 9 | **Water equivalent of the snow pack at the time of measurement** |
| / | **Water equivalent of the snow which has fallen during the 24 hours preceding the time of observation** |

## 4055

$t_w$ ***Time of commencement of a phenomenon before the hour of observation***

| Code figure | |
|---|---|
| 0 | **0 to $^1/_2$ hour** |
| 1 | **$^1/_2$ to 1 hour** |
| 2 | **1 to $1^1/_2$ hours** |
| 3 | **$1^1/_2$ to 2 hours** |
| 4 | **2 to $2^1/_2$ hours** |
| 5 | **$2^1/_2$ to 3 hours** |
| 6 | **3 to $3^1/_2$ hours** |
| 7 | **$3^1/_2$ to 4 hours** |
| 8 | **4 to 5 hours** |
| 9 | **5 to 6 hours** |

# 4077

**tt** ***Time before observation or duration of phenomena***

**zz** ***Variation, location or intensity of phenomena***

| Code figure | | Code figure | |
|---|---|---|---|
| 00 | At observation | 36 | 3 hours 36 minutes |
| 01 | 0 hour 6 minutes | 37 | 3 hours 42 minutes |
| 02 | 0 hour 12 minutes | 38 | 3 hours 48 minutes |
| 03 | 0 hour 18 minutes | 39 | 3 hours 54 minutes |
| 04 | 0 hour 24 minutes | 40 | 4 hours 0 minute |
| 05 | 0 hour 30 minutes | 41 | 4 hours 6 minutes |
| 06 | 0 hour 36 minutes | 42 | 4 hours 12 minutes |
| 07 | 0 hour 42 minutes | 43 | 4 hours 18 minutes |
| 08 | 0 hour 48 minutes | 44 | 4 hours 24 minutes |
| 09 | 0 hour 54 minutes | 45 | 4 hours 30 minutes |
| 10 | 1 hour 0 minute | 46 | 4 hours 36 minutes |
| 11 | 1 hour 6 minutes | 47 | 4 hours 42 minutes |
| 12 | 1 hour 12 minutes | 48 | 4 hours 48 minutes |
| 13 | 1 hour 18 minutes | 49 | 4 hours 54 minutes |
| 14 | 1 hour 24 minutes | 50 | 5 hours 0 minute |
| 15 | 1 hour 30 minutes | 51 | 5 hours 6 minutes |
| 16 | 1 hour 36 minutes | 52 | 5 hours 12 minutes |
| 17 | 1 hour 42 minutes | 53 | 5 hours 18 minutes |
| 18 | 1 hour 48 minutes | 54 | 5 hours 24 minutes |
| 19 | 1 hour 54 minutes | 55 | 5 hours 30 minutes |
| 20 | 2 hours 0 minute | 56 | 5 hours 36 minutes |
| 21 | 2 hours 6 minutes | 57 | 5 hours 42 minutes |
| 22 | 2 hours 12 minutes | 58 | 5 hours 48 minutes |
| 23 | 2 hours 18 minutes | 59 | 5 hours 54 minutes |
| 24 | 2 hours 24 minutes | 60 | 6 hours 0 minute |
| 25 | 2 hours 30 minutes | 61 | 6 to 7 hours |
| 26 | 2 hours 36 minutes | 62 | 7 to 8 hours |
| 27 | 2 hours 42 minutes | 63 | 8 to 9 hours |
| 28 | 2 hours 48 minutes | 64 | 9 to 10 hours |
| 29 | 2 hours 54 minutes | 65 | 10 to 11 hours |
| 30 | 3 hours 0 minute | 66 | 11 to 12 hours |
| 31 | 3 hours 6 minutes | 67 | 12 to 18 hours |
| 32 | 3 hours 12 minutes | 68 | More than 18 hours |
| 33 | 3 hours 18 minutes | 69 | Time unknown |
| 34 | 3 hours 24 minutes | 70 | Began during observation |
| 35 | 3 hours 30 minutes | 71 | Ended during observation |

*(Code table 4077 – continued)*

| Code figure | |
|---|---|
| **72** | **Began and ended during observation** |
| **73** | **Changed considerably during observation** |
| **74** | **Began after observation** |
| **75** | **Ended after observation** |
| **76** | **At station** |
| **77** | **At station, but not in distance** |
| **78** | **In all directions** |
| **79** | **In all directions, but not at station** |
| **80** | **Approaching station** |
| **81** | **Receding from station** |
| **82** | **Passing station in distance** |
| **83** | **Seen in distance** |
| **84** | **Reported in vicinity, but not at station** |
| **85** | **Aloft, but not near ground** |
| **86** | **Near ground, but not aloft** |
| **87** | **Occasional; occasionally** |
| **88** | **Intermittent; intermittently** |
| **89** | **Frequent; frequently; at frequent intervals** |
| **90** | **Steady; steady in intensity; steadily; no appreciable change** |
| **91** | **Increasing; increasing in intensity; has increased** |
| **92** | **Decreasing; decreasing in intensity; has decreased** |
| **93** | **Fluctuating; variable** |
| **94** | **Continuous; continuously** |
| **95** | **Very light; very weak; greatly below normal; very thin; very poor** |
| **96** | **Light; weak; below normal; thin; poor** |
| **97** | **Moderate; normal; average thickness; fair; gradually** |
| **98** | **Heavy; severe; thick; above normal; good; suddenly** |
| **99** | **Very heavy; killing; very severe; dense; greatly above normal; very thick; very good** |

Notes:

(1) Code figures 00 to 69, which are used exclusively for tt, refer to the standard time of observation or, when duration of a phenomenon is reported, to the time period between its commencement and cessation.

(2) Code figures 70 to 75, which combine time and variation, refer to the actual time the elements were observed.

(3) Code figures 76 to 99, which are used exclusively for zz, refer to:

- (a) The location of the phenomenon in relation to the station (76 to 86);
- (b) Variation (87 to 94);
- (c) Intensity (95 to 99).

## 4200

**u** ***Scale factor***

| Code figure | |
|---|---|
| 0 | 1 |
| 1 | 10 |
| 2 | 100 |
| 3 | 1 000 |
| 4 | 10 000 |
| 5 | 0.1 |
| 6 | 0.01 |
| 7 | 0.001 |
| 8 | 0.000 1 |
| 9 | 0.000 01 |

## 4232

**$u_b$** ***Unit of time for averaging period or data change period, expressed by*** **$t_bt_bt_b$**

| Code figure | | |
|---|---|---|
| 0–3 | Not used | |
| 4 | Hour | Averaging period |
| 5 | Day | Averaging period |
| 6 | Month | Averaging period |
| 7 | Hour | Data change period |
| 8 | Day | Data change period |
| 9 | Month | Data change period |

## 4242

**$u_p$** ***Unit of thickness of sublayers***

| Code figure | |
|---|---|
| 1 | 0.1 hPa |
| 2 | 1 hPa |
| 3 | 2 hPa |
| 4 | 5 hPa |
| 5 | 10 hPa |
| 6 | 20 hPa |
| 7 | 30 hPa |
| 8 | 50 hPa |
| 9 | 100 hPa |

## 4252

**$u_t$** ***Unit of time for*** **ttt**

| Code figure | |
|---|---|
| 1 | Hour |
| 2 | Day |
| 3 | Month |

## 4300

| | |
|---|---|
| **V** | ***Forecast surface visibility*** |
| **$V_s$** | ***Visibility seawards (from a coastal station)*** |
| **$V'_s$** | ***Visibility over the water surface of an alighting area*** |

| Code figure | |
|---|---|
| 0 | Less than 50 m |
| 1 | 50–200 m |
| 2 | 200–500 m |
| 3 | 500–1 000 m |
| 4 | 1–2 km |
| 5 | 2–4 km |
| 6 | 4–10 km |
| 7 | 10–20 km |
| 8 | 20–50 km |
| 9 | 50 km or more |

## 4332

**$V_b$** ***Variation of visibility during the hour preceding the observation***

| Code figure | | |
|---|---|---|
| 0 | Visibility has not varied (sun* visible) | towards direction $D_a$ |
| 1 | Visibility has not varied (sun* invisible) | towards direction $D_a$ |
| 2 | Visibility has increased (sun* visible) | towards direction $D_a$ |
| 3 | Visibility has increased (sun* invisible) | towards direction $D_a$ |
| 4 | Visibility has decreased (sun* visible) | towards direction $D_a$ |
| 5 | Visibility has decreased (sun* invisible) | towards direction $D_a$ |
| 6 | Fog coming from direction $D_a$ | |
| 7 | Fog has lifted, without dissipating | without regard to direction |
| 8 | Fog has dispersed | without regard to direction |
| 9 | Moving patches or banks of fog | without regard to direction |

* Or sky (if sun is low), or moon or stars at night.

## 4377

**VV** ***Horizontal visibility at surface***

**$V_sV_s$** ***Visibility towards the sea***

| Code figure | km | Code figure | km | Code figure | km |
|---|---|---|---|---|---|
| 00 | < 0.1 | 34 | 3.4 | 68 | 18 |
| 01 | 0.1 | 35 | 3.5 | 69 | 19 |
| 02 | 0.2 | 36 | 3.6 | 70 | 20 |
| 03 | 0.3 | 37 | 3.7 | 71 | 21 |
| 04 | 0.4 | 38 | 3.8 | 72 | 22 |
| 05 | 0.5 | 39 | 3.9 | 73 | 23 |
| 06 | 0.6 | 40 | 4 | 74 | 24 |
| 07 | 0.7 | 41 | 4.1 | 75 | 25 |
| 08 | 0.8 | 42 | 4.2 | 76 | 26 |
| 09 | 0.9 | 43 | 4.3 | 77 | 27 |
| 10 | 1 | 44 | 4.4 | 78 | 28 |
| 11 | 1.1 | 45 | 4.5 | 79 | 29 |
| 12 | 1.2 | 46 | 4.6 | 80 | 30 |
| 13 | 1.3 | 47 | 4.7 | 81 | 35 |
| 14 | 1.4 | 48 | 4.8 | 82 | 40 |
| 15 | 1.5 | 49 | 4.9 | 83 | 45 |
| 16 | 1.6 | 50 | 5 | 84 | 50 |
| 17 | 1.7 | 51 | Not used | 85 | 55 |
| 18 | 1.8 | 52 | Not used | 86 | 60 |
| 19 | 1.9 | 53 | Not used | 87 | 65 |
| 20 | 2 | 54 | Not used | 88 | 70 |
| 21 | 2.1 | 55 | Not used | 89 | > 70 |
| 22 | 2.2 | 56 | 6 | 90 | < 0.05 |
| 23 | 2.3 | 57 | 7 | 91 | 0.05 |
| 24 | 2.4 | 58 | 8 | 92 | 0.2 |
| 25 | 2.5 | 59 | 9 | 93 | 0.5 |
| 26 | 2.6 | 60 | 10 | 94 | 1 |
| 27 | 2.7 | 61 | 11 | 95 | 2 |
| 28 | 2.8 | 62 | 12 | 96 | 4 |
| 29 | 2.9 | 63 | 13 | 97 | 10 |
| 30 | 3 | 64 | 14 | 98 | 20 |
| 31 | 3.1 | 65 | 15 | 99 | ≥ 50 |
| 32 | 3.2 | 66 | 16 | | |
| 33 | 3.3 | 67 | 17 | | |

## 4448

$v_p$ *Forward speed of phenomenon*

| Code figure | | | |
|---|---|---|---|
| 0 | Less than 5 knots | Less than 9 km $h^{-1}$ | Less than 2 m $s^{-1}$ |
| 1 | 5–14 knots | 10– 25 km $h^{-1}$ | 3– 7 m $s^{-1}$ |
| 2 | 15–24 knots | 26– 44 km $h^{-1}$ | 8–12 m $s^{-1}$ |
| 3 | 25–34 knots | 45– 62 km $h^{-1}$ | 13–17 m $s^{-1}$ |
| 4 | 35–44 knots | 63– 81 km $h^{-1}$ | 18–22 m $s^{-1}$ |
| 5 | 45–54 knots | 82–100 km $h^{-1}$ | 23–27 m $s^{-1}$ |
| 6 | 55–64 knots | 101–118 km $h^{-1}$ | 28–32 m $s^{-1}$ |
| 7 | 65–74 knots | 119–137 km $h^{-1}$ | 33–38 m $s^{-1}$ |
| 8 | 75–84 knots | 138–155 km $h^{-1}$ | 39–43 m $s^{-1}$ |
| 9 | 85 knots or more | 156 km $h^{-1}$ or more | 44 m $s^{-1}$ or more |

## 4451

$v_s$ *Ship's average speed made good during the three hours preceding the time of observation*

| Code figure | | |
|---|---|---|
| 0 | 0 knot | 0 km $h^{-1}$ |
| 1 | 1– 5 knots | 1–10 km $h^{-1}$ |
| 2 | 6–10 knots | 11–19 km $h^{-1}$ |
| 3 | 11–15 knots | 20–28 km $h^{-1}$ |
| 4 | 16–20 knots | 29–37 km $h^{-1}$ |
| 5 | 21–25 knots | 38–47 km $h^{-1}$ |
| 6 | 26–30 knots | 48–56 km $h^{-1}$ |
| 7 | 31–35 knots | 57–65 km $h^{-1}$ |
| 8 | 36–40 knots | 66–75 km $h^{-1}$ |
| 9 | Over 40 knots | Over 75 km $h^{-1}$ |
| / | Not applicable (report from a coastal land station) or not reported (see Regulation 12.3.1.2 (b)). | |

## 4504

$W_C$ *Diameter or length of major axis of the eye of the tropical cyclone*

| Code figure | |
|---|---|
| 0 | Less than 5 km |
| 1 | 5 to less than 10 km |
| 2 | 10 to less than 15 km |
| 3 | 15 to less than 20 km |
| 4 | 20 to less than 25 km |
| 5 | 25 to less than 30 km |
| 6 | 30 to less than 35 km |
| 7 | 35 to less than 40 km |
| 8 | 40 to less than 50 km |
| 9 | 50 km and greater |
| / | Undetermined |

## 4530

**$W_R$** ***Type of weather phenomenon or cloud in the 60 × 60 km square detected by radar***

| Code figure | |
|---|---|
| **1** | **Stratiform cloud without precipitation** |
| **2** | **Convective cloud without phenomena** |
| **3** | **Continuous precipitation** |
| **4** | **Showers** |
| **5** | **Showers and continuous precipitation** |
| **6** | **Thunderstorm or thunderstorm and showers** |
| **7** | **Thunderstorm and continuous precipitation** |
| **8** | **Hail** |
| **9** | **Hail and other phenomena** |
| **/** | **Undetermined** |

## 4531

**$\left.\begin{array}{l}W_{a1}\\W_{a2}\end{array}\right\}$** ***Past weather reported from an automatic weather station***

| Code figure | |
|---|---|
| **0** | **No significant weather observed** |
| **1** | **VISIBILITY REDUCED** |
| **2** | **Blowing phenomena, visibility reduced** |
| **3** | **FOG** |
| **4** | **PRECIPITATION** |
| **5** | **Drizzle** |
| **6** | **Rain** |
| **7** | **Snow or ice pellets** |
| **8** | **Showers or intermittent precipitation** |
| **9** | **Thunderstorm** |

Note: The weather descriptions in this table are progressively complex, to accommodate the different levels of weather discrimination capability of various automatic stations. Stations having only basic sensing capability may use the lower code figures and basic generic descriptions (shown in capital letters). Stations with progressively higher discrimination capability shall use the more detailed descriptions (higher codes).

## 4536

$W_f$ ***Mean width or mean diameter of the feature specified by*** $S_fS_f$***, or mean diameter of the overcast cloud of the tropical cyclone***

| Code figure | |
|---|---|
| **0** | **<1° of latitude** |
| **1** | **1° to less than 2° of latitude** |
| **2** | **2° to less than 3° of latitude** |
| **3** | **3° to less than 4° of latitude** |
| **4** | **4° to less than 5° of latitude** |
| **5** | **5° to less than 6° of latitude** |
| **6** | **6° to less than 7° of latitude** |
| **7** | **7° to less than 8° of latitude** |
| **8** | **8° to less than 9° of latitude** |
| **9** | **9° of latitude or more** |
| **/** | **Undetermined** |

## 4544

$W_m$ ***Forecast weather***

| Code figure | |
|---|---|
| **0** | **Moderate to good visibility (greater than 5 km)** |
| **1** | **Risk of accumulation of ice on superstructures (air temperature between 0 and –5°C)** |
| **2** | **Strong risk of accumulation of ice on superstructures (air temperature below –5°C)** |
| **3** | **Mist (visibility 1–5 km)** |
| **4** | **Fog (visibility less than 1 km)** |
| **5** | **Drizzle** |
| **6** | **Rain** |
| **7** | **Snow or rain and snow** |
| **8** | **Squally weather with or without showers** |
| **9** | **Thunderstorms** |

## 4552

$W_t$ ***Type of opening in the ice***

| Code figure | |
|---|---|
| **0** | **No openings** |
| **1** | **Crack** |
| **2** | **Very small fracture (0–49 m)** |
| **3** | **Small fracture (50–199 m)** |
| **4** | **Medium fracture (200–499 m)** |
| **5** | **Large fracture (500 m or more)** |
| **6** | **Lead, shore lead, flaw lead** |
| **7** | **Polynya, shore polynya, flaw polynya** |
| **8** | **Recurring polynya** |
| **9** | **Water between floes** |
| **/** | **Undetermined or unknown** |

## 4561

**W** ***Weather during past hour***

**$W_1$**
**$W_2$** } ***Past weather***

| Code figure | |
|---|---|
| **0** | **Cloud covering $^1/_2$ or less of the sky throughout the appropriate period** |
| **1** | **Cloud covering more than $^1/_2$ of the sky during part of the appropriate period and covering $^1/_2$ or less during part of the period** |
| **2** | **Cloud covering more than $^1/_2$ of the sky throughout the appropriate period** |
| **3** | **Sandstorm, duststorm or blowing snow** |
| **4** | **Fog or ice fog or thick haze** |
| **5** | **Drizzle** |
| **6** | **Rain** |
| **7** | **Snow, or rain and snow mixed** |
| **8** | **Shower(s)** |
| **9** | **Thunderstorm(s) with or without precipitation** |

## 4635

**$w_e$** ***Weather***

| Code figure | |
|---|---|
| **1** | **Height of base of significant cloud** |
| **2** | **Visibility** |
| **3** | **Wind force** |
| **4** | **Icing** |
| **5** | **Turbulence** |
| **6** | **Squalls** |
| **7** | **Snow cover** |
| **8** | **Saturation (area of 100% relative humidity; i = 0)** |

Note: See Code table 1800 for intensity or character of $w_e$.

## 4639

**$w_i$** ***Method by which winds were determined***

| Code figure | |
|---|---|
| **1** | **Wind derived from cloud motion observed in the infrared channel** |
| **2** | **Wind derived from cloud motion observed in the visible channel** |
| **3** | **Wind derived from motion observed in the water vapour channel** |
| **4** | **Wind derived from motion observed in a combination of spectral channels** |

# 4677

**ww** ***Present weather reported from a manned weather station***

| | | |
|---|---|---|
| **ww = 00–49** | | **No precipitation at the station at the time of observation** |
| **ww = 00–19** | | **No precipitation, fog, ice fog (except for 11 and 12), duststorm, sandstorm, drifting or blowing snow at the station* at the time of observation or, except for 09 and 17, during the preceding hour** |
| | **Code figure** | |
| **No meteors except photometeors** | **00** | **Cloud development not observed or not observable** |
| | **01** | **Clouds generally dissolving or becoming less developed** |
| | **02** | **State of sky on the whole unchanged** |
| | **03** | **Clouds generally forming or developing** |
| | | **(00–03: Characteristic change of the state of sky during the past hour)** |
| **Haze, dust, sand or smoke** | **04** | **Visibility reduced by smoke, e.g. veldt or forest fires, industrial smoke or volcanic ashes** |
| | **05** | **Haze** |
| | **06** | **Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation** |
| | **07** | **Dust or sand raised by wind at or near the station at the time of observation, but no well-developed dust whirl(s) or sand whirl(s), and no duststorm or sandstorm seen; or, in the case of ships, blowing spray at the station** |
| | **08** | **Well-developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm** |
| | **09** | **Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour** |
| | **10** | **Mist** |
| | **11** | **Patches** |
| | **12** | **More or less continuous** |
| | | **(11–12: shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea)** |
| | **13** | **Lightning visible, no thunder heard** |
| | **14** | **Precipitation within sight, not reaching the ground or the surface of the sea** |
| | **15** | **Precipitation within sight, reaching the ground or the surface of the sea, but distant, i.e. estimated to be more than 5 km from the station** |
| | **16** | **Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station** |
| | **17** | **Thunderstorm, but no precipitation at the time of observation** |
| | **18** | **Squalls** |
| | **19** | **Funnel cloud(s)**** |
| | | **(18–19: at or within sight of the station during the preceding hour or at the time of observation)** |
| **ww = 20–29** | | **Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation** |
| | **20** | **Drizzle (not freezing) or snow grains** |
| | **21** | **Rain (not freezing)** |
| | **22** | **Snow** |
| | **23** | **Rain and snow or ice pellets** |
| | **24** | **Freezing drizzle or freezing rain** |
| | | **(20–24: not falling as shower(s))** |
| | **25** | **Shower(s) of rain** |
| | **26** | **Shower(s) of snow, or of rain and snow** |
| | **27** | **Shower(s) of hail,*** or of rain and hail***** |
| | **28** | **Fog or ice fog** |
| | **29** | **Thunderstorm (with or without precipitation)** |

*(Code table 4677 – continued)*

| Code figure | | |
|---|---|---|
| **ww = 30–39** | **Duststorm, sandstorm, drifting or blowing snow** | |
| 30 | Slight or moderate duststorm or sandstorm | – has decreased during the preceding hour |
| 31 | | – no appreciable change during the preceding hour |
| 32 | | – has begun or has increased during the preceding hour |
| 33 | Severe duststorm or sandstorm | – has decreased during the preceding hour |
| 34 | | – no appreciable change during the preceding hour |
| 35 | | – has begun or has increased during the preceding hour |
| 36 | Slight or moderate drifting snow | generally low below eye level) |
| 37 | Heavy drifting snow | |
| 38 | Slight or moderate blowing snow | generally high (above eye level) |
| 39 | Heavy blowing snow | |
| **ww = 40–49** | **Fog or ice fog at the time of observation** | |
| 40 | Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer | |
| 41 | Fog or ice fog in patches | |
| 42 | Fog or ice fog, sky visible | has become thinner during the preceding hour |
| 43 | Fog or ice fog, sky invisible | |
| 44 | Fog of ice fog, sky visible | no appreciable change during the preceding hour |
| 45 | Fog or ice fog, sky invisible | |
| 46 | Fog or ice fog, sky visible | has begun or has become thicker during the preceding hour |
| 47 | Fog or ice fog, sky invisible | |
| 48 | Fog, depositing rime, sky visible | |
| 49 | Fog, depositing rime, sky invisible | |
| **ww = 50–99** | **Precipitation at the station at the time of observation** | |
| **ww = 50–59** | **Drizzle** | |
| 50 | Drizzle, not freezing, intermittent | slight at time of observation |
| 51 | Drizzle, not freezing, continuous | |
| 52 | Drizzle, not freezing, intermittent | moderate at time of observation |
| 53 | Drizzle, not freezing, continuous | |
| 54 | Drizzle, not freezing, intermittent | heavy (dense) at time of observation |
| 55 | Drizzle, not freezing, continuous | |
| 56 | Drizzle, freezing, slight | |
| 57 | Drizzle, freezing, moderate or heavy (dense) | |
| 58 | Drizzle and rain, slight | |
| 59 | Drizzle and rain, moderate or heavy | |
| **ww = 60–69** | **Rain** | |
| 60 | Rain, not freezing, intermittent | slight at time of observation |
| 61 | Rain, not freezing, continuous | |
| 62 | Rain, not freezing, intermittent | moderate at time of observation |
| 63 | Rain, not freezing, continuous | |
| 64 | Rain, not freezing, intermittent | heavy at time of observation |
| 65 | Rain, not freezing, continuous | |

*(Code table 4677 – continued)*

| | Code figure | | |
|---|---|---|---|
| | 66 | **Rain, freezing, slight** | |
| | 67 | **Rain, freezing, moderate or heavy** | |
| | 68 | **Rain or drizzle and snow, slight** | |
| | 69 | **Rain or drizzle and snow, moderate or heavy** | |
| **ww = 70–79** | | **Solid precipitation not in showers** | |
| | 70 | **Intermittent fall of snowflakes** | **slight at time of observation** |
| | 71 | **Continuous fall of snowflakes** | |
| | 72 | **Intermittent fall of snowflakes** | **moderate at time of observation** |
| | 73 | **Continuous fall of snowflakes** | |
| | 74 | **Intermittent fall of snowflakes** | **heavy at time of observation** |
| | 75 | **Continuous fall of snowflakes** | |
| | 76 | **Diamond dust (with or without fog)** | |
| | 77 | **Snow grains (with or without fog)** | |
| | 78 | **Isolated star-like snow crystals (with or without fog)** | |
| | 79 | **Ice pellets** | |
| **ww = 80–99** | | **Showery precipitation, or precipitation with current or recent thunderstorm** | |
| | 80 | **Rain shower(s), slight** | |
| | 81 | **Rain shower(s), moderate or heavy** | |
| | 82 | **Rain shower(s), violent** | |
| | 83 | **Shower(s) of rain and snow mixed, slight** | |
| | 84 | **Shower(s) of rain and snow mixed, moderate or heavy** | |
| | 85 | **Snow shower(s), slight** | |
| | 86 | **Snow shower(s), moderate or heavy** | |
| | 87 | **Shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed** | **– slight** |
| | 88 | | **– moderate or heavy** |
| | 89 | **Shower(s) of hail,**** with or without rain or rain and snow mixed, not associated with thunder** | **– slight** |
| | 90 | | **– moderate or heavy** |
| | 91 | **Slight rain at time of observation** | **Thunderstorm during the preceding hour but not at time of observation** |
| | 92 | **Moderate or heavy rain at time of observation** | |
| | 93 | **Slight snow, or rain and snow mixed or hail*** at time of observation** | |
| | 94 | **Moderate or heavy snow, or rain and snow mixed or hail*** at time of observation** | |
| | 95 | **Thunderstorm, slight or moderate, without hail,*** but with rain and/or snow at time of observation** | **Thunderstorm at time of observation** |
| | 96 | **Thunderstorm, slight or moderate, with hail*** at time of observation** | |
| | 97 | **Thunderstorm, heavy, without hail, *** but with rain and/or snow at time of observation** | |
| | 98 | **Thunderstorm combined with duststorm or sandstorm at time of observation** | |
| | 99 | **Thunderstorm, heavy, with hail*** at time of observation** | |

* The expression “at the station” refers to a land station or a ship.

** Tornado cloud or waterspout.

*** Hail, small hail, snow pellets. French: grêle, grésil ou neige roulée.

**** French: grêle.

# 4678

**w′w′** ***Significant present and forecast weather***

| QUALIFIER | | | | WEATHER PHENOMENA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| INTENSITY OR PROXIMITY | | DESCRIPTOR | | PRECIPITATION | | OBSCURATION | | OTHER | |
| 1 | | 2 | | 3 | | 4 | | 5 | |
| **–** | **Light** | **MI** | **Shallow** | **DZ** | **Drizzle** | **BR** | **Mist** | **PO** | **Dust/sand whirls (dust devils)** |
| | **Moderate (no qualifier)** | **BC** | **Patches** | **RA** | **Rain** | **FG** | **Fog** | **SQ** | **Squalls** |
| **+** | **Heavy (well developed in the case of dust/sand whirls (dust devils) and funnel clouds)** | **PR** | **Partial (covering part of the aerodrome)** | **SN** | **Snow** | **FU** | **Smoke** | **FC** | **Funnel cloud(s) (tornado or waterspout)** |
| **VC** | **In the vicinity** | **DR** | **Low drifting** | **SG** | **Snow grains** | **VA** | **Volcanic ash** | **SS** | **Sandstorm** |
| | | **BL** | **Blowing** | **PL** | **Ice pellets** | **DU** | **Widespread dust** | **DS** | **Duststorm** |
| | | **SH** | **Shower(s)** | **GR** | **Hail** | **SA** | **Sand** | | |
| | | **TS** | **Thunderstorm** | **GS** | **Small hail and/or snow pellets** | **HZ** | **Haze** | | |
| | | **FZ** | **Freezing (supercooled)** | **UP** | **Unknown precipitation** | | | | |

**The w´w´ groups shall be constructed by considering columns 1 to 5 in the table above in sequence, that is, intensity, followed by description, followed by weather phenomena. An example could be: +SHRA (heavy shower(s) of rain).**

Notes:

(1) Entries in this code table are based on the descriptions of hydrometeors and lithometeors found in the *International Cloud Atlas* (WMO-No 407), Volume I.

(2) Regulation 15.8 shall apply.

(3) More than one form of precipitation shall be combined, the dominant type of precipitation being reported first, for example +SNRA.

(4) More than one phenomenon other than a precipitation combination noted shall be reported in separate w´w´ groups in the order of the columns, for example –DZ FG.

(5) Intensity shall be indicated only with precipitation, precipitation associated with showers and/or thunderstorms, duststorm or sandstorm, and funnel clouds.

(6) Not more than one descriptor shall be included in a w´w´ group, for example –FZDZ.

(7) The descriptors MI, BC and PR shall be used only in combination with the letter abbreviation FG, for example MIFG.

(8) The descriptor DR (low drifting) shall be used for dust, sand or snow raised by the wind to less than two metres above the ground. BL (blowing) shall be used to indicate dust, sand or snow raised by the wind to a height of two metres or more above the ground. The descriptors DR and BL shall be used only in combination with the letter abbreviations DU, SA and SN, for example BLSN.

(9) When blowing snow is observed with snow falling from cloud, both phenomena are reported, e.g. SN BLSN. When due to blowing snow the observer cannot determine whether or not snow is also falling from cloud, then only BLSN shall be reported.

*(Code table 4678 – continued)*

(10) The descriptor SH shall be used only in combination with one or more of the letter abbreviations RA, SN, GS, GR and UP to indicate precipitation of the shower type at the time of observation, for example SHSN.

(11) The descriptor TS, if not used on its own, shall be used only in combination with one or more of the letter abbreviations RA, SN, GS, GR and UP to indicate thunderstorm with precipitation at the aerodrome, for example TSSNGS.

(12) The descriptor FZ shall be used only in combination with the letter abbreviations FG, DZ, RA and UP for example FZRA.

(13) The proximity qualifier VC shall be used only in combination with the letter abbreviations TS, DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN and VA.

(14) UP is to be used only in reports from fully automated stations unable to distinguish precipitation type.

## 4680

**$w_aw_a$** ***Present weather reported from an automatic weather station***

| Code figure | |
|---|---|
| **00** | **No significant weather observed** |
| **01** | **Clouds generally dissolving or becoming less developed during the past hour** |
| **02** | **State of sky on the whole unchanged during the past hour** |
| **03** | **Clouds generally forming or developing during the past hour** |
| **04** | **Haze or smoke, or dust in suspension in the air, visibility equal to, or greater than, 1 km** |
| **05** | **Haze or smoke, or dust in suspension in the air, visibility less than 1 km** |
| **06–09** | **Reserved** |
| **10** | **Mist** |
| **11** | **Diamond dust** |
| **12** | **Distant lightning** |
| **13–17** | **Reserved** |
| **18** | **Squalls** |
| **19** | **Reserved** |

**Code figures 20–26 are used to report precipitation, fog (or ice fog) or thunderstorm at the station during the preceding hour but not at the time of observation.**

| | |
|---|---|
| **20** | **Fog** |
| **21** | **PRECIPITATION** |
| **22** | **Drizzle (not freezing) or snow grains** |
| **23** | **Rain (not freezing)** |
| **24** | **Snow** |
| **25** | **Freezing drizzle or freezing rain** |
| **26** | **Thunderstorm (with or without precipitation)** |
| **27** | **BLOWING OR DRIFTING SNOW OR SAND** |
| **28** | **Blowing or drifting snow or sand, visibility equal to, or greater than, 1 km** |
| **29** | **Blowing or drifting snow or sand, visibility less than 1 km** |
| **30** | **FOG** |
| **31** | **Fog or ice fog in patches** |
| **32** | **Fog or ice fog, has become thinner during the past hour** |
| **33** | **Fog or ice fog, no appreciable change during the past hour** |
| **34** | **Fog or ice fog, has begun or become thicker during the past hour** |
| **35** | **Fog, depositing rime** |
| **36–39** | **Reserved** |

*(Code table 4680 – continued)*

| | |
|---|---|
| **40** | **PRECIPITATION** |
| **41** | **Precipitation, slight or moderate** |
| **42** | **Precipitation, heavy** |
| **43** | **Liquid precipitation, slight or moderate** |
| **44** | **Liquid precipitation, heavy** |
| **45** | **Solid precipitation, slight or moderate** |
| **46** | **Solid precipitation, heavy** |
| **47** | **Freezing precipitation, slight or moderate** |
| **48** | **Freezing precipitation, heavy** |
| **49** | **Reserved** |
| **50** | **DRIZZLE** |
| **51** | **Drizzle, not freezing, slight** |
| **52** | **Drizzle, not freezing, moderate** |
| **53** | **Drizzle, not freezing, heavy** |
| **54** | **Drizzle, freezing, slight** |
| **55** | **Drizzle, freezing, moderate** |
| **56** | **Drizzle, freezing, heavy** |
| **57** | **Drizzle and rain, slight** |
| **58** | **Drizzle and rain, moderate or heavy** |
| **59** | **Reserved** |
| **60** | **RAIN** |
| **61** | **Rain, not freezing, slight** |
| **62** | **Rain, not freezing, moderate** |
| **63** | **Rain, not freezing, heavy** |
| **64** | **Rain, freezing, slight** |
| **65** | **Rain, freezing, moderate** |
| **66** | **Rain, freezing, heavy** |
| **67** | **Rain (or drizzle) and snow, slight** |
| **68** | **Rain (or drizzle) and snow, moderate or heavy** |
| **69** | **Reserved** |
| **70** | **SNOW** |
| **71** | **Snow, slight** |
| **72** | **Snow, moderate** |
| **73** | **Snow, heavy** |
| **74** | **Ice pellets, slight** |
| **75** | **Ice pellets, moderate** |
| **76** | **Ice pellets, heavy** |
| **77** | **Snow grains** |
| **78** | **Ice crystals** |
| **79** | **Reserved** |
| **80** | **SHOWER(S) or INTERMITTENT PRECIPITATION** |
| **81** | **Rain shower(s) or intermittent rain, slight** |
| **82** | **Rain shower(s) or intermittent rain, moderate** |
| **83** | **Rain shower(s) or intermittent rain, heavy** |
| **84** | **Rain shower(s) or intermittent rain, violent** |

*(Code table 4680 – continued)*

| | |
|---|---|
| **85** | **Snow shower(s) or intermittent snow, slight** |
| **86** | **Snow shower(s) or intermittent snow, moderate** |
| **87** | **Snow shower(s) or intermittent snow, heavy** |
| **88** | **Reserved** |
| **89** | **Hail** |
| **90** | **THUNDERSTORM** |
| **91** | **Thunderstorm, slight or moderate, with no precipitation** |
| **92** | **Thunderstorm, slight or moderate, with rain showers and/or snow showers** |
| **93** | **Thunderstorm, slight or moderate, with hail** |
| **94** | **Thunderstorm, heavy, with no precipitation** |
| **95** | **Thunderstorm, heavy, with rain showers and/or snow showers** |
| **96** | **Thunderstorm, heavy, with hail** |
| **97–98** | **Reserved** |
| **99** | **Tornado** |

Notes:

(1) This code table includes terms on several levels to cover simple and increasingly complex stations.

(2) Generic terms for weather (e.g. fog, drizzle) are intended for use at stations capable of determining types of weather but no other information. Generic terms are included in the code table using all capital letters.

(3) Code figures for generic precipitation (code figures 40–48) are arranged in order of increasing complexity. For example, a very simple station that can sense only the presence or absence of precipitation would use code figure 40 (precipitation). At the next level, a station capable of sensing amount but not type would use code figure 41 or 42. A station capable of sensing gross type (liquid, solid, freezing) and amount would use code figures 43–48. A station capable of reporting actual types of precipitation (e.g. drizzle or rain), but not the amount, would use the appropriate whole decile number (e.g. 50 for generic drizzle, 60 for generic rain).

## 4683

**$w_sw_s$** ***Significant weather***

| **Code figure** | |
|---|---|
| **00** | **Area of heavy swell** |
| **11** | **Area of strong winds (6 and 7 Beaufort)** |
| **22** | **Area of medium cloud** |
| **33** | **Area of low cloud** |
| **44** | **Area of poor visibility** |
| **55** | **Area of gales (8 Beaufort or more)** |
| **66** | **Area of continuous precipitation** |
| **77** | **Area of squally weather** |
| **88** | **Area of heavy showers** |
| **99** | **Area of thunderstorms** |

# 4687

**$w_1w_1$** ***Present weather phenomenon not specified in Code table 4677, or specification of present weather phenomenon in addition to group*** $7wwW_1W_2$

**Code figure**

**Decile 00–09**

| | |
|---|---|
| **00–03** | **Not used** |
| **04** | **Volcanic ash suspended in the air aloft** |
| **05** | **Not used** |
| **06** | **Thick dust haze, visibility less than 1 km** |
| **07** | **Blowing spray at the station** |
| **08** | **Drifting dust (sand)** |
| **09** | **Wall of dust or sand in distance (like haboob)** |

**Decile 10–19**

| | |
|---|---|
| **10** | **Snow haze** |
| **11** | **Whiteout** |
| **12** | **Not used** |
| **13** | **Lightning, cloud to surface** |
| **14–16** | **Not used** |
| **17** | **Dry thunderstorm** |
| **18** | **Not used** |
| **19** | **Tornado cloud (destructive) at or within sight of the station during preceding hour or at the time of observation** |

**Decile 20–29**

| | |
|---|---|
| **20** | **Deposition of volcanic ash** |
| **21** | **Deposition of dust or sand** |
| **22** | **Deposition of dew** |
| **23** | **Deposition of wet snow** |
| **24** | **Deposition of soft rime** |
| **25** | **Deposition of hard rime** |
| **26** | **Deposition of hoar frost** |
| **27** | **Deposition of glaze** |
| **28** | **Deposition of ice crust (ice slick)** |
| **29** | **Not used** |

**Decile 30–39**

| | |
|---|---|
| **30** | **Duststorm or sandstorm with temperature below 0°C** |
| **31–38** | **Not used** |
| **39** | **Blowing snow, impossible to determine whether snow is falling or not** |

**Decile 40–49**

| | |
|---|---|
| **40** | **Not used** |
| **41** | **Fog on sea** |
| **42** | **Fog in valleys** |
| **43** | **Arctic or Antarctic sea smoke** |
| **44** | **Steam fog (sea, lake or river)** |
| **45** | **Steam fog (land)** |
| **46** | **Fog over ice or snow cover** |
| **47** | **Dense fog, visibility 60–90 m** |
| **48** | **Dense fog, visibility 30–60 m** |
| **49** | **Dense fog, visibility less than 30 m** |

*(Code table 4687 – continued*

**Decile 50–59**

| | | | |
|---|---|---|---|
| **50** | **Drizzle, rate of fall** | **less than 0.10 mm h$^{-1}$** | |
| **51** | | **0.10–0.19 mm h$^{-1}$** | |
| **52** | | **0.20–0.39 mm h$^{-1}$** | |
| **53** | | **0.40-0.79 mm h$^{-1}$** | |
| **54** | | **0.80-1.59 mm h$^{-1}$** | |
| **55** | | **1.60–3.19 mm h$^{-1}$** | |
| **56** | | **3.20–6.39 mm h$^{-1}$** | |
| **57** | | **6.4 mm h$^{-1}$ or more** | |
| **58** | **Not used** | | |
| **59** | **Drizzle and snow (ww = 68 or 69)** | | |

**Decile 60–69**

| | | |
|---|---|---|
| **60** | **Rain, rate of fall** | **less than 1.0 mm h$^{-1}$** |
| **61** | | **1.0–1.9 mm h$^{-1}$** |
| **62** | | **2.0–3.9 mm h$^{-1}$** |
| **63** | | **4.0–7.9 mm h$^{-1}$** |
| **64** | | **8.0–15.9 mm h$^{-1}$** |
| **65** | | **16.0–31.9 mm h$^{-1}$** |
| **66** | | **32.0–63.9 mm h$^{-1}$** |
| **67** | | **64.0 mm h$^{-1}$ or more** |
| **68–69** | **Not used** | |

**Decile 70–79**

| | | |
|---|---|---|
| **70** | **Snow, rate of fall** | **less than 1.0 cm h$^{-1}$** |
| **71** | | **1.0–1.9 cm h$^{-1}$** |
| **72** | | **2.0–3.9 cm h$^{-1}$** |
| **73** | | **4.0–7.9 cm h$^{-1}$** |
| **74** | | **8.0–15.9 cm h$^{-1}$** |
| **75** | | **16.0–31.9 cm h$^{-1}$** |
| **76** | | **32.0–63.9 cm h$^{-1}$** |
| **77** | | **64.0 cm h$^{-1}$ or more** |
| **78** | **Snow or ice crystal precipitation from a clear sky** | |
| **79** | **Wet snow, freezing on contact** | |

**Decile 80–99**

| | | |
|---|---|---|
| **80** | **Precipitation of rain (ww = 87–99)** | |
| **81** | **Precipitation of rain, freezing (ww = 80–82)** | |
| **82** | **Precipitation of rain and snow mixed** | **(ww = 26–27)<br>(ww = 68 or 69)<br>(ww = 87–99)** |
| **83** | **Precipitation of snow** | |
| **84** | **Precipitation of snow pellets or small hail** | |
| **85** | **Precipitation of snow pellets or small hail, with rain** | |
| **86** | **Precipitation of snow and snow mixed pellets or small hail, with rain** | |
| **87** | **Precipitation of snow pellets or small hail, with snow** | |
| **88** | **Precipitation of hail** | |
| **89** | **Precipitation of hail, with rain** | |
| **90** | **Precipitation of hail, with rain and snow mixed** | |
| **91** | **Precipitation of hail, with snow** | |
| **92** | **Shower(s) or thunderstorm over sea** | |
| **93** | **Shower(s) or thunderstorm over mountains** | |
| **94–99** | **Not used** | |

## 4691

**$w_1w_1w_1$** ***Forecast weather***

| Code figure | Abbreviation | |
|---|---|---|
| 111 | TS | Thunderstorm |
| 222 | TRS | Tropical cyclone |
| 333 | LSQ | Severe line squall |
| 444 | HAIL | Hail |
| 555 | MTW | Marked mountain waves |
| 666 | SAND | Widespread sandstorm |
| 777 | DUST | Widespread duststorm |
| 888 | FZR | Freezing rain |

## 4700

**X** ***Time of measurement or period of reference and tendency of the element measured, the value of which is indicated by*** $H_sH_sH_sH_s$ ***or*** $QQQe_Q$

| Code figure | Nature and time or period of measurement | Tendency during the three hours preceding the observation |
|---|---|---|
| 0 | Value at time of observation | Stationary |
| 1 | Value at time of observation | Falling |
| 2 | Value at time of observation | Rising |
| 3 | Value at 3 hours before the observation | |
| 4 | Value at 6 hours before the observation | |
| 5 | Value at 12 hours before the observation | |
| 6 | Value at 24 hours before the observation | |
| 7 | Mean value on the preceding day | |
| 8 | Maximum value during preceding 24 hours | |
| 9 | Minimum value during preceding 24 hours | |
| / | Value at time of observation | Unknown |

## 4770

**$X_RX_R$** ***Recorder type***

*(See Common Code table C–4 in Attachment I.)*

# 4780

**$X_tX_t$** ***Type of drogue***

| Code figure | |
|---|---|
| **0** | **Unspecified drogue** |
| **1** | **Holey sock** |
| **2** | **TRISTAR** |
| **3** | **Window shade** |
| **4** | **Parachute** |
| **5** | **Non-Lagrangian sea anchor** |
| **6–30** | **Reserved (to be developed)** |
| **//** | **Missing value (coded 31 in BUFR)** |

# 4800

**x** ***Exponent for spectral wave data***

| Code figure | |
|---|---|
| **0** | $10^{-5}$ |
| **1** | $10^{-4}$ |
| **2** | $10^{-3}$ |
| **3** | $10^{-2}$ |
| **4** | $10^{-1}$ |
| **5** | $10^{0}$ |
| **6** | $10^{1}$ |
| **7** | $10^{2}$ |
| **8** | $10^{3}$ |
| **9** | $10^{4}$ |

# 4865

**$x_4$** ***Hemisphere indicator***

| Code figure | |
|---|---|
| **0** | **Northern hemisphere** |
| **1** | **Southern hemisphere** |

# 4887

**$x_1x_1$** ***Form in which point position groups are given***

| Code figure | |
|---|---|
| **00** | **Positions in form $L_aL_aL_oL_ok$ (northern hemisphere)** |
| **11** | **Positions in form $L_aL_aL_oL_ok$ (southern hemisphere)** |
| **22** | **Positions in form $L_aL_aL_oL_ok$ (equatorial)** |
| **66** | **Positions in form $iiiD_1s_1$** |
| **88** | **Positions in form $QL_aL_aL_oL_o$** |

## 4892

**$x_2x_2x_2$** ***Type of analysis***

**$x_3x_3x_3$** ***Value designator of a given chart or analysis***

| Code figure | $x_2x_2x_2$ | $x_3x_3x_3$ |
|---|---|---|
| **000** | **Jet-stream analysis** | **—** |
| **111** | **Constant level chart** | **In tens of standard geopotential metres** |
| **222** | **Isobaric (constant pressure) surface** | **In whole hectopascals (except that for the 1 000-hPa chart, $x_3x_3x_3$ = 000)** |
| **333** | **Isentropic chart** | **In whole kelvins** |
| **444** | **Cross-section chart** | **—** |
| **555** | **Thickness pattern chart** | **To be followed by two 00$x_3x_3x_3$ groups giving the pressure of the upper and lower isobaric surfaces respectively in whole hectopascals (except that for the 1 000-hPa chart, $x_3x_3x_3$ = 000)** |
| **666** | **Pressure or geopotential change chart** | **In whole hectopascals, or in tens of standard geopotential metres** |
| **777** | **Isothermal chart** | **In whole degrees Celsius (add 500 for minus values)** |
| **888** | **Flow analysis** | **In whole hectopascals $x_3x_3x_3$ is indicated by ///** |
| **999** | **Tropopause analysis** | **$x_3x_3x_3$ is indicated by ///** |
| **///** | **Upper-wind analysis** | **—** |

Note: When $x_2x_2x_2$ = 666, the 86668 group shall be followed by either 81118 or 82228 to indicate whether the chart is for a constant level or a constant pressure surface.

## 4900

**Y** ***Day of the week (UTC)***

| Code figure | | Code figure | |
|---|---|---|---|
| **1** | **Sunday** | **5** | **Thursday** |
| **2** | **Monday** | **6** | **Friday** |
| **3** | **Tuesday** | **7** | **Saturday** |
| **4** | **Wednesday** | | |

## 5122

**$z_T$** ***Character of the temperature reported by*** **TT**

| Code figure | |
|---|---|
| **0** | **0° or higher** |
| **5** | **–1° to –99° inclusive** |
| **6** | **–100° to –199° inclusive** |
| **/** | **Missing** |

## 5161

**$Z_0$** ***Optical phenomena***

| Code figure | |
|---|---|
| **0** | **Brocken spectre** |
| **1** | **Rainbow** |
| **2** | **Solar or lunar halo** |
| **3** | **Parhelia or anthelia** |
| **4** | **Sun pillar** |
| **5** | **Corona** |
| **6** | **Twilight glow** |
| **7** | **Twilight glow on the mountains (*Alpenglühen*)** |
| **8** | **Mirage** |
| **9** | **Zodiacal light** |

## 5162

**$Z_1$** ***Nature of evolution of zone*** $S_2$

| Code figure | |
|---|---|
| **0** | **No change** |
| **1** | **Increasing in intensity without extension** |
| **2** | **Extending without increase of intensity** |
| **3** | **Extending and increasing in intensity** |
| **4** | **Stopped by the high ground** |
| **5** | **Weakening as it advances** |
| **6** | **Weakening in position** |
| **7** | **Disintegrating or rapidly dissipating** |
| **8** | **Dissipating in the valleys** |
| **9** | **Dissipating on the heights** |

## 5177

**ZZ** ***Meteorological zone number by 5 degrees of longitude or latitude***

| | EAST-WEST ZONES | | | NORTH-SOUTH ZONES |
|---|---|---|---|---|
| **Zone No.** | **Longitude west** | **Longitude east** | **Zone No.** | **Latitude** |
| 01 | 0°– 5° | 180° – 175° | 51 | 90°N – 85°N |
| 02 | 5° – 10° | 175° – 170° | 52 | 85°N – 80°N |
| 03 | 10° – 15° | 170° – 165° | 53 | 80°N – 75°N |
| 04 | 15° – 20° | 165° – 160° | 54 | 75°N – 70°N |
| 05 | 20° – 25° | 160° – 155° | 55 | 70°N – 65°N |
| 06 | 25° – 30° | 155° – 150° | 56 | 65°N – 60°N |
| 07 | 30° – 35° | 150° – 145° | 57 | 60°N – 55°N |
| 08 | 35° – 40° | 145° – 140° | 58 | 55°N – 50°N |
| 09 | 40° – 45° | 140° – 135° | 59 | 50°N – 45°N |
| 10 | 45° – 50° | 135° – 130° | 60 | 45°N – 40°N |
| 11 | 50° – 55° | 130° – 125° | 61 | 40°N – 35°N |
| 12 | 55° – 60° | 125° – 120° | 62 | 35°N – 30°N |
| 13 | 60° – 65° | 120° – 115° | 63 | 30°N – 25°N |
| 14 | 65° – 70° | 115° – 110° | 64 | 25°N – 20°N |
| 15 | 70° – 75° | 110° – 105° | 65 | 20°N – 15°N |
| 16 | 75° – 80° | 105° – 100° | 66 | 15°N – 10°N |
| 17 | 80° – 85° | 100° – 95° | 67 | 10°N – 5°N |
| 18 | 85° – 90° | 95° – 90° | 68 | 5°N – 0° |
| 19 | 90° – 95° | 90° – 85° | 69 | 0° – 5°S |
| 20 | 95° – 100° | 85° – 80° | 70 | 5°S – 10°S |
| 21 | 100° – 105° | 80° – 75° | 71 | 10°S – 15°S |
| 22 | 105° – 110° | 75° – 70° | 72 | 15°S – 20°S |
| 23 | 110° – 115° | 70° – 65° | 73 | 20°S – 25°S |
| 24 | 115° – 120° | 65° – 60° | 74 | 25°S – 30°S |
| 25 | 120° – 125° | 60° – 55° | 75 | 30°S – 35°S |
| 26 | 125° – 130° | 55° – 50° | 76 | 35°S – 40°S |
| 27 | 130° – 135° | 50° – 45° | 77 | 40°S – 45°S |
| 28 | 135° – 140° | 45° – 40° | 78 | 45°S – 50°S |
| 29 | 140° – 145° | 40° – 35° | 79 | 50°S – 55°S |
| 30 | 145° – 150° | 35° – 30° | 80 | 55°S – 60°S |
| 31 | 150° – 155° | 30° – 25° | 81 | 60°S – 65°S |
| 32 | 155° – 160° | 25° – 20° | 82 | 65°S – 70°S |
| 33 | 160° – 165° | 20° – 15° | 83 | 70°S – 75°S |
| 34 | 165° – 170° | 15° – 10° | 84 | 75°S – 80°S |
| 35 | 170° – 175° | 10°– 5° | 85 | 80°S – 85°S |
| 36 | 175° – 180° | 5°– 0° | 86 | 85°S – 90°S |

## 5239

**$z_i$** ***Present ice situation and trend of conditions over preceding three hours***

| Code figure | | | |
|---|---|---|---|
| **0** | **Ship in open water with floating ice in sight** | | |
| **1** | **Ship in easily penetrable ice; conditions improving** | | **Ship in ice** |
| **2** | **Ship in easily penetrable ice; conditions not changing** | | **Ship in ice** |
| **3** | **Ship in easily penetrable ice; conditions worsening** | | **Ship in ice** |
| **4** | **Ship in ice difficult to penetrate; conditions improving** | | **Ship in ice** |
| **5** | **Ship in ice difficult to penetrate; conditions not changing** | | **Ship in ice** |
| **6** | **Ice forming and floes freezing together** | **Ship in ice difficult to penetrate and conditions worsening** | **Ship in ice** |
| **7** | **Ice under slight pressure** | **Ship in ice difficult to penetrate and conditions worsening** | **Ship in ice** |
| **8** | **Ice under moderate or severe pressure** | **Ship in ice difficult to penetrate and conditions worsening** | **Ship in ice** |
| **9** | **Ship beset** | **Ship in ice difficult to penetrate and conditions worsening** | **Ship in ice** |
| **/** | **Unable to report, because of darkness or lack of visibility** | | |

## Section D

# SYSTEM OF STATION INDEX NUMBERS

a. **Meteorological observing stations**

b. **Hydrological observing stations**

# a. METEOROLOGICAL OBSERVING STATIONS

A station index number in the form IIiii is included in the reports of meteorological observations made at land meteorological stations or aboard lightships using land code forms. This group permits the identification of the meteorological station at which the observation has been made.

The station index number is composed of the *block number* (II) and the *station number* (iii).

The block number defines the area in which the reporting station is situated. The station index numbers have been allocated as follows:

| | | |
|---|---|---|
| Region I: | Africa | 60001 – 69998 |
| Region II: | Asia | 20001 – 20099<br>20200 – 21998<br>23001 – 25998<br>28001 – 32998<br>35001 – 36998<br>38001 – 39998<br>40350 – 48599<br>48800 – 49998<br>50001 – 59998 |
| Region III: | South America | 80001 – 88998 |
| Region IV: | North America, Central America and the Caribbean | 70001 – 79998 |
| Region V: | South-West Pacific | 48600 – 48799<br>90001 – 98998 |
| Region VI: | Europe | 00001 – 19998<br>20100 – 20199<br>22001 – 22998<br>26001 – 27998<br>33001 – 34998<br>37001 – 37998<br>40001 – 40349 |
| Stations in the Antarctic | | 89001 – 89998 |

Block numbers are allotted to the services within each Region by regional agreement.

Station numbers (iii) corresponding to a common block number (II) except 89 are usually distributed so that the zone covered by this block number is divided into horizontal strips; e.g., one or several degrees of latitude. Where possible, station numbers within each strip increase from west to east and the first figure of the three-figure station number increases from north to south.

Station index numbers for stations in the Antarctic are allocated by the Secretary-General in accordance with the following scheme:

Each station has an international number 89xxy, where xx indicates the nearest 10° meridian which is numerically lower than the station longitude. For east longitudes, 50 is added; e.g., 89124 indicates a station between 120° and 130°W and 89654 indicates a station between longitudes 150° and 160°E. The figure “y” is allocated roughly according to the latitude of the station with “y” increasing towards the south.

For stations for which international numbers are no longer available within the above scheme, the algorithm will be expanded by adding 20 to xx for west longitudes (range of index numbers 200–380) and 70 for east longitudes (range of index numbers 700–880) to provide new index numbers.

Antarctic stations which held numbers before the introduction of this scheme in 1957 retain their previously allocated index numbers.

**Station index numbers consisting of one figure repeated five times, e.g. 55555, 77777, etc., or ending with 000 or 999, or duplicating special code indicators used in code forms including station index numbers, shall not be assigned to meteorological stations (see list of these special code indicators in the note hereafter).**

**Modifications to the index numbers of synoptic land stations or aeronautical meteorological stations on land, the reports of which are included in international exchanges, shall be made effective on 1 January or 1 July. They shall be communicated to the Secretariat at least six months prior to becoming effective.**

**Other information relating to station index numbers shall be sent to the Secretariat at least two months prior to becoming effective.**

The general list of station index numbers is published by the WMO Secretariat in a separate volume (*Weather Reporting* (WMO–No. 9), Volume A).

Positions of reporting ships or aircraft are given as geographical coordinates by position groups in the appropriate code forms. However, in order that a meteorological service or centre may follow and recognize the successive reports of a given ship, it is recommended that additional information be given in the report, permitting the identification of the ship. This information is given, whenever possible, by the inclusion of the call sign of ships. These call signs shall also be included in all collective messages of reports from selected and supplementary ships. In cases where the inclusion of the call signs is not possible, selected and supplementary ships are identified by name or by special numbers.

In the case of transport aircraft and for this same purpose, provision is made for the necessary identification information in the first group of the report.

**Note: Figure groups used as special code indicators in FM 20, FM 32, FM 35 and FM 85 and which shall not be assigned to meteorological stations, in addition to groups consisting of one figure repeated five times and those ending with 000 or 999:**

| | |
|---|---|
| **21212** | **Data for fixed regional and/or significant levels with respect to wind follow. (FM 32)** |
| **21212** | **Data for significant levels with respect to wind follow. (FM 35)** |
| **31313** | **Data on sounding system, launch time and sea-surface temperature follow. (FM 35)** |
| **41414** | **Cloud information follows. (FM 35)** |
| **51515<br>52525<br>53535<br>54545<br>55555<br>56565<br>57575<br>58585<br>59595** | **Additional data in regional code follow. (FM 20, FM 32, FM 35, FM 85)** |
| **61616<br>62626<br>63636<br>64646<br>65656<br>66666<br>67676<br>68686<br>69696** | **Additional data in national code follow. (FM 20, FM 32, FM 35)** |

# b. HYDROLOGICAL OBSERVING STATIONS

An international hydrological observing station identification number in the form ($000AC_i$) $BBi_Hi_Hi_H$ is included in the reports of hydrological observation for a hydrological station and in a hydrological forecast. The two groups permit the identification of the WMO Region (A), country ($C_i$), river basin or group of basins (BB) and the station ($i_Hi_Hi_H$).

The allocation of identification numbers is the responsibility of regional associations, for $C_i$ and BB, and Member countries, for $i_Hi_Hi_H$.

A Region may have a maximum of 99 indicators for large basins or groups of small basins. The number BB = 00 is not used.

If a country straddles several basins (BB), it should nevertheless have only one and the same figure for $C_i$.

If a basin BB comprises all or part of the territory of more than ten countries, $C_i$ should be allocated starting with the largest countries, giving joint national numbers to others (the smallest). In the latter case, the national identification numbers of the station ($i_Hi_Hi_H$) should be allocated by regional agreement.

Alternatively large river basins composed of more than nine countries may be divided into several sub-basins, each one of which may be allocated a separate BB; thus the number of countries will be less than ten in each BB.

In each country and for a portion of a basin BB, the national identification numbers of stations ($i_Hi_Hi_H$) increase from 010 to 999 from west to east and from north to south. The numbers from $i_Hi_Hi_H$ = 000 to $i_Hi_Hi_H$ = 009 may be reserved to designate the identification of hydrological forecast centres.

**Modifications to the identification numbers of hydrological observing stations, the reports of which are included in international exchanges, shall be made effective on 1 January or 1 July. They shall be communicated to the Secretariat at least six months prior to becoming effective.**

**Other information relating to station identification numbers shall be sent to the Secretariat at least two months prior to becoming effective.**

The lists of $C_i$ and BB are published in Volume II of the *Manual on Codes* (WMO–No. 306) and the lists of $i_Hi_Hi_H$ will be published in a separate volume (Operational Hydrology Report No. . . ., WMO–No. . . .). (This publication will appear at a later stage.)

## Section E

# BEAUFORT SCALE OF WIND

# BEAUFORT SCALE OF WIND

| BEAUFORT NUMBER | DESCRIPTIVE TERM | VELOCITY EQUIVALENT AT A STANDARD HEIGHT OF 10 METRES ABOVE OPEN FLAT GROUND | | | | SPECIFICATIONS | | | Probable wave height* in metres | Probable wave height* in feet |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean velocity in knots | m $s^{-1}$ | km $h^{-1}$ | m.p.h. | Land | Sea | Coast | | |
| 0 | Calm | < 1 | 0–0.2 | < 1 | < 1 | Calm; smoke rises vertically | Sea like a mirror | Calm | — | — |
| 1 | Light air | 1–3 | 0.3–1.5 | 1–5 | 1–3 | Direction of wind shown by smoke drift but not by wind vanes | Ripples with the appearance of scales are formed, but without foam crests | Fishing smack just has steerage way | 0.1 (0.1) | $\frac{1}{4}$ ($\frac{1}{4}$) |
| 2 | Light breeze | 4–6 | 1.6–3.3 | 6–11 | 4–7 | Wind felt on face; leaves rustle; ordinary vanes moved by wind | Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break | Wind fills the sails of smacks which then travel at about 1–2 knots | 0.2 (0.3) | $\frac{1}{2}$ (1) |
| 3 | Gentle breeze | 7–10 | 3.4–5.4 | 12–19 | 8–12 | Leaves and small twigs in constant motion; wind extends light flag | Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses | Smacks begin to careen and travel about 3–4 knots | 0.6 (1) | 2 (3) |
| 4 | Moderate breeze | 11–16 | 5.5–7.9 | 20–28 | 13–18 | Raises dust and loose paper; small branches are moved | Small waves, becoming longer; fairly frequent white horses | Good working breeze, smacks carry all canvas with good list | 1 (1.5) | $3\frac{1}{2}$ (5) |
| 5 | Fresh breeze | 17–21 | 8.0–10.7 | 29–38 | 19–24 | Small trees in leaf begin to sway; crested wavelets form on inland waters | Moderate waves, taking a more pronounced long form; many white horses are formed (chance of some spray) | Smacks shorten sail | 2 (2.5) | 6 ($8\frac{1}{2}$) |
| 6 | Strong breeze | 22–27 | 10.8–13.8 | 39–49 | 25–31 | Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty | Large waves begin to form; the white foam crests are more extensive everywhere (probably some spray) | Smacks have double reef in mainsail; care required when fishing | 3 (4) | $9\frac{1}{2}$ (13) |
| 7 | Near gale | 28–33 | 13.9–17.1 | 50–61 | 32–38 | Whole trees in motion; inconvenience felt when walking against wind | Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind | Smacks remain in harbour and those at sea lie to | 4 (5.5) | $13\frac{1}{2}$ (19) |
| 8 | Gale | 34–40 | 17.2–20.7 | 62–74 | 39–46 | Breaks twigs off trees; generally impedes progress | Moderately high waves of greater length; edges of crests begin to break into the spindrift; the foam is blown in well-marked streaks along the direction of the wind | All smacks make for harbour, if near | 5.5 (7.5) | 18 (25) |
| 9 | Strong gale | 41–47 | 20.8–24.4 | 75–88 | 47–54 | Slight structural damage occurs (chimney pots and slates removed) | High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble and roll over; spray may affect visibility | — | 7 (10) | 23 (32) |
| 10 | Storm | 48–55 | 24.5–28.4 | 89–102 | 55–63 | Seldom experienced inland; trees uprooted; considerable structural damage occurs | Very high waves with long overhanging crests; the resulting foam, in great patches, is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes on a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected | — | 9 (12.5) | 29 (41) |
| 11 | Violent storm | 56–63 | 28.5–32.6 | 103–117 | 64–72 | Very rarely experienced; accompanied by widespread damage | Exceptionally high waves (small and medium-sized ships might be for a time lost to view behind the waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected | — | 11.5 (16) | 37 (52) |
| 12 | Hurricane | 64 and over | 32.7 and over | 118 and over | 73 and over | — | The air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected | — | 14 (—) | 45 (—) |

* This table is only intended as a guide to show roughly what may be expected in the open sea, remote from land. It should never be used in the reverse way; i.e., for logging or reporting the state of the sea. In enclosed waters, or when near land, with an offshore wind, wave heights will be smaller and the waves steeper. Figures in brackets indicate the probable maximum height of waves.

# APPENDIX

**National practices regarding the coding of certain elements in reports, analyses or forecasts for international exchange**

# NATIONAL PRACTICES REGARDING THE CODING OF CERTAIN ELEMENTS IN REPORTS, ANALYSES OR FORECASTS FOR INTERNATIONAL EXCHANGE

### Reporting of horizontal visibility at surface in meteorological reports

By WMO circular letter W/SY/CO (PR-3195) of 16 September 1980, Members were invited to inform the Secretariat of their national practices regarding the coding of horizontal visibility at surface (VV) in meteorological reports.

The information received is given below. This table will be kept up to date through supplements.

| *Member* | *Practices conform to Regulation 12.2.1.3.1* | *Other procedures used* | *No information available* |
|---|---|---|---|
| Afghanistan | X | | |
| Albania | | | X |
| Algeria | | | X |
| Angola | | | X |
| Antigua and Barbuda | | | X |
| Argentina | X | | |
| Armenia | X | | |
| Australia | | X | |
| Austria | X | | |
| Azerbaijan | X | | |
| Bahamas | X | | |
| Bahrain | X | | |
| Bangladesh | | | X |
| Barbados | | | X |
| Belarus | X | | |
| Belgium | X | | |
| Belize | | | X |
| Benin | X | | |
| Bolivia (Plurinational State of) | | | X |
| Bosnia and Herzegovina | | | X |
| Botswana | | | X |
| Brazil | X | | |
| British Caribbean Territories | | | X |
| Brunei Darussalam | | | X |
| Bulgaria | X | | |
| Burkina Faso | X | | |
| Burundi | | | X |
| Cambodia | | | X |
| Cameroon | X | | |
| Canada | | X | |
| Cabo Verde | X | | |
| Central African Republic | X | | |
| Chad | | | X |
| Chile | | | X |
| China | | X | |
| Colombia | X | | |
| Comoros | | | X |
| Congo | | | X |
| Costa Rica | | | X |
| Côte d'Ivoire | X | | |

| *Member* | *Practices conform to Regulation 12.2.1.3.1* | *Other procedures used* | *No information available* |
|---|---|---|---|
| Croatia | | | X |
| Cuba | | | X |
| Curaçao and Sint Maarten | X | | |
| Cyprus | X | | |
| Czech Republic | X | | |
| Democratic People's Republic of Korea | | | X |
| Democratic Republic of the Congo | X | | |
| Denmark | | X | |
| Djibouti | | | X |
| Dominica | | | X |
| Dominican Republic | X | | |
| Ecuador | | | X |
| Egypt | X | | |
| El Salvador | X | | |
| Eritrea | | | X |
| Estonia | | | X |
| Eswatini | | | X |
| Ethiopia | X | | |
| Fiji | | | X |
| Finland | | X | |
| France | X | | |
| French Polynesia | X | | |
| Gabon | X | | |
| Gambia | | | X |
| Georgia | X | | |
| Germany | | X | |
| Ghana | X | | |
| Greece | X | | |
| Guatemala | | | X |
| Guinea | | | X |
| Guinea-Bissau | | | X |
| Guyana | | | X |
| Haiti | | | X |
| Honduras | | | X |
| Hong Kong, China | X | | |
| Hungary | X | | |
| Iceland | | X | |
| India | X | | |
| Indonesia | X | | |
| Iran, Islamic Republic of | | | X |
| Iraq | | | X |
| Ireland | X | | |
| Israel | X | | |
| Italy | X | | |
| Jamaica | | | X |
| Japan | X | | |
| Jordan | X | | |
| Kazakhstan | X | | |

| *Member* | *Practices conform to Regulation 12.2.1.3.1* | *Other procedures used* | *No information available* |
|---|---|---|---|
| Kenya | X | | |
| Kuwait | X | | |
| Kyrgyzstan | X | | |
| Lao People's Democratic Republic | | | X |
| Latvia | | | X |
| Lebanon | | | X |
| Lesotho | | | X |
| Liberia | | | X |
| Libya | X | | |
| Lithuania | | | X |
| Luxembourg | X | | |
| Macao, China | | | X |
| Madagascar | X | | |
| Malawi | X | | |
| Malaysia | X | | |
| Maldives | | | X |
| Mali | X | | |
| Malta | X | | |
| Mauritania | X | | |
| Mauritius | X | | |
| Mexico | X | | |
| Micronesia, Federated States of | | | X |
| Monaco | | | X |
| Mongolia | | | X |
| Montenegro | | | |
| Morocco | X | | |
| Mozambique | X | | |
| Myanmar | X | | |
| Namibia | | | X |
| Nepal | | | X |
| Netherlands | X | | |
| New Caledonia | | | X |
| New Zealand | | X | |
| Nicaragua | | | X |
| Niger | X | | |
| Nigeria | | | X |
| Niue | | | X |
| Norway | | X | |
| Oman | X | | |
| Pakistan | X | | |
| Panama | X | | |
| Papua New Guinea | | | X |
| Paraguay | | | X |
| Peru | | | X |
| Philippines | X | | |
| Poland | | | X |
| Portugal | X | | |
| Qatar | | | X |

| *Member* | *Practices conform to Regulation 12.2.1.3.1* | *Other procedures used* | *No information available* |
|---|---|---|---|
| Republic of Korea | X | | |
| Republic of Moldova | X | | |
| Romania | X | | |
| Russian Federation | X | | |
| Rwanda | | X | |
| Saint Lucia | | | X |
| Sao Tome and Principe | | | X |
| Saudi Arabia | X | | |
| Senegal | | | X |
| Serbia | | | |
| Seychelles | X | | |
| Sierra Leone | | | X |
| Singapore | | | X |
| Slovakia | X | | |
| Slovenia | | | X |
| Solomon Islands | | | X |
| Somalia | | | X |
| South Africa | | | X |
| Spain | | | X |
| Sri Lanka | X | | |
| Sudan | X | | |
| Suriname | | | X |
| Sweden | | X | |
| Switzerland | | | X |
| Syrian Arab Republic | X | | |
| Tajikistan | X | | |
| Thailand | X | | |
| The former Yugoslav Republic of Macedonia | X | | |
| Togo | X | | |
| Tonga | | | X |
| Trinidad and Tobago | X | | |
| Tunisia | X | | |
| Turkey | X | | |
| Turkmenistan | X | | |
| Uganda | | | X |
| Ukraine | X | | |
| United Arab Emirates | | | X |
| United Kingdom of Great Britain and Northern Ireland | X | | |
| United Republic of Tanzania | X | | |
| United States of America | | X | |
| Uruguay | | | X |
| Uzbekistan | X | | |
| Vanuatu | X | | |
| Venezuela (Bolivarian Republic of) | X | | |
| Viet Nam | X | | |
| Yemen | | | X |
| Zambia | X | | |
| Zimbabwe | | | X |

Information on the procedures used by Members other than those specified by Regulation 12.2.1.3.1 is given below:

*Australia:* When the horizontal visibility is not the same in different directions, the greatest distance prevailing over half or more of the horizon is given for VV. Significant reductions of visibility in other sectors are given in plain language at the end of the report.

*Canada:* The horizontal visibility which is reported in all surface observations is the "prevailing visibility" which is defined as the maximum visibility value common to sectors comprising one-half or more of the horizon circle.

*China:* The effective visibility is defined as the longest distance of visibility over more than one-half of all the directions.

*Denmark:* At manually operated stations if the horizontal visibility is not the same in different directions, the shorter distance is given for VV. However, if local phenomena reduce the visibility in a sector covering less than one-quarter of the horizon, this sector is disregarded provided that the visibility in it is 1 km or more. At automatic stations the visibility is given as a short distance – or a point – measurement.

*Finland:* When the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV. However, visibility reduction in one or several small sectors caused by local phenomena is disregarded.

*Germany:* If the horizontal visibility is not the same in different directions, the shorter distance is given for VV. However, small sectors of the horizon in which local phenomena reduce visibility are disregarded, provided the extent of the sector or sectors concerned is not more than 30 degrees of the horizon circle in whole.

*Iceland:* When the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV. Reduction of visibility confined to a sector of not more than 45 degrees shall not influence the selection of the code figure for VV. This reduction in visibility may be caused, for example, by precipitation, fog or haze not present at the observing station at the time of observation.

*New Zealand:* If the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV or VVVV. However, if in one or more small sectors visibility is reduced, these are disregarded, provided the extent of the sector or sectors concerned is not more than one-quarter of the horizon circle in whole. When the horizontal visibility is 10 km or more, VVVV is coded in the form V´V´KM, where V´V´ is the visibility in whole kilometres.

*Norway:* If the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV. However, small sectors of the horizon in which local phenomena such as showers or distant fog reduce the visibility are disregarded. The total of such small sectors should be less than 45 degrees.

*Rwanda:* If the horizontal visibility is not the same in different directions, the shorter distance is given for VV. However, if in one or more small sectors visibility is reduced, these are disregarded, provided the extent of the sector or sectors concerned is not more than one-quarter of the horizon circle.

*Sweden:* Regulation 12.2.1.3.1 is practiced with the following restriction: a reduction of the visibility within a limited area, extended at most 45 degrees of the horizon, shall not influence the choice of the code figure for VV. This reduction of the visibility can be caused by precipitation, fog or mist which is not present at the station at the time of observation.

*United States of America:* The national practice is to report the greatest visibility equalled or exceeded throughout at least half the horizon circle, which needs not necessarily be continuous. If this distance is between two values given in the code table, the code figure for the lower code table value will be reported.

# ATTACHMENTS

I. **Common code tables to binary and alphanumeric codes (copy of Volume I.2, Part C/c.: Common Features to Binary and Alphanumeric Codes)**

II. **List of alphanumeric code tables related to BUFR Table B**

III. **International Seismic Code**

## ATTACHMENT I

# COMMON CODE TABLES TO BINARY AND ALPHANUMERIC CODES

**COMMON CODE TABLE C–1:** ***Identification of originating/generating centre***

$F_1F_2$ for alphanumeric codes

$F_3F_3F_3$ for alphanumeric codes

Code table 0 in GRIB Edition 1/Code table 0 01 033 in BUFR Edition 3

Octet 5 in Section 1 of GRIB Edition 1/Octet 6 in Section 1 of BUFR Edition 3

**COMMON CODE TABLE C–2:** ***Radiosonde/sounding system used***

Code table 3685 – $r_ar_a$ (Radiosonde/sounding system used) – for alphanumeric codes

Code table 0 02 011 (Radiosonde type) in BUFR

**COMMON CODE TABLE C–3:** ***Instrument make and type for water temperature profile measurement with fall rate equation coefficients***

Code table 1770 – $I_XI_XI_X$ (Instrument type for XBT, with fall rate equation coefficients) – for alphanumeric codes

Code table 0 22 067 (Instrument type for water temperature/salinity profile measurement) in BUFR

**COMMON CODE TABLE C–4:** ***Water temperature profile recorder types***

Code table 4770 – $X_RX_R$ (Recorder type) – for alphanumeric codes

Code table 0 22 068 (Water temperature profile recorder types) in BUFR

**COMMON CODE TABLE C–5:** ***Satellite identifier***

$I_6I_6I_6$ for alphanumeric codes

Code table 0 01 007 in BUFR

Code used in GRIB Edition 2

**COMMON CODE TABLE C–6:** ***List of international units***

(Used only in Volume I.2, Parts B and C)

**COMMON CODE TABLE C–7:** ***Tracking technique/status of system used***

Code table 3872 – $s_as_a$ for alphanumeric code

Code table 0 02 014 in BUFR

**COMMON CODE TABLE C–1:** ***Identification of originating/generating centre***

Common Code table
- $F_1F_2$ for alphanumeric codes
- $F_3F_3F_3$ for alphanumeric codes
- Code table 0 in GRIB Edition 1/Code table 0 01 033 in BUFR Edition 3
- Octet 5 in Section 1 of GRIB Edition 1/Octet 6 in Section 1 of BUFR Edition 3

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| 00 | 000 | 0 | WMO Secretariat |
| | | | **01–09: WMCs** |
| 01 | 001 | 1 | Melbourne |
| 02 | 002 | 2 | Melbourne |
| 03 | 003 | 3 | ) |
| 04 | 004 | 4 | Moscow |
| 05 | 005 | 5 | Moscow |
| 06 | 006 | 6 | ) |
| 07 | 007 | 7 | US National Weather Service – National Centres for Environmental Prediction (NCEP) |
| 08 | 008 | 8 | US National Weather Service Telecommunications Gateway (NWSTG) |
| 09 | 009 | 9 | US National Weather Service – Other |
| | | | **10–25: Centres in Region I** |
| 10 | 010 | 10 | Cairo (RSMC) |
| 11 | 011 | 11 | ) |
| 12 | 012 | 12 | Dakar (RSMC) |
| 13 | 013 | 13 | ) |
| 14 | 014 | 14 | Nairobi (RSMC) |
| 15 | 015 | 15 | ) |
| 16 | 016 | 16 | Casablanca (RSMC) |
| 17 | 017 | 17 | Tunis (RSMC) |
| 18 | 018 | 18 | Tunis-Casablanca (RSMC) |
| 19 | 019 | 19 | ) |
| 20 | 020 | 20 | Las Palmas |
| 21 | 021 | 21 | Algiers (RSMC) |
| 22 | 022 | 22 | ACMAD |
| 23 | 023 | 23 | Mozambique (NMC) |
| 24 | 024 | 24 | Pretoria (RSMC) |
| 25 | 025 | 25 | La Réunion (RSMC) |
| | | | **26–40: Centres in Region II** |
| 26 | 026 | 26 | Khabarovsk (RSMC) |
| 27 | 027 | 27 | ) |
| 28 | 028 | 28 | New Delhi (RSMC) |
| 29 | 029 | 29 | ) |
| 30 | 030 | 30 | Novosibirsk (RSMC) |
| 31 | 031 | 31 | ) |
| 32 | 032 | 32 | Tashkent (RSMC) |
| 33 | 033 | 33 | Jeddah (RSMC) |
| 34 | 034 | 34 | Tokyo (RSMC), Japan Meteorological Agency |
| 35 | 035 | 35 | ) |

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| 36 | 036 | 36 | Bangkok |
| 37 | 037 | 37 | Ulaanbaatar |
| 38 | 038 | 38 | Beijing (RSMC) |
| 39 | 039 | 39 | ) |
| 40 | 040 | 40 | Seoul |
| | | | **41–50: Centres in Region III** |
| 41 | 041 | 41 | Buenos Aires (RSMC) |
| 42 | 042 | 42 | ) |
| 43 | 043 | 43 | Brasilia (RSMC) |
| 44 | 044 | 44 | ) |
| 45 | 045 | 45 | Santiago |
| 46 | 046 | 46 | Brazilian Space Agency – INPE |
| 47 | 047 | 47 | Colombia (NMC) |
| 48 | 048 | 48 | Ecuador (NMC) |
| 49 | 049 | 49 | Peru (NMC) |
| 50 | 050 | 50 | Venezuela (Bolivarian Republic of) (NMC) |
| | | | **51–63: Centres in Region IV** |
| 51 | 051 | 51 | Miami (RSMC) |
| 52 | 052 | 52 | Miami (RSMC), National Hurricane Centre |
| 53 | 053 | 53 | MSC Monitoring |
| 54 | 054 | 54 | Montreal (RSMC) |
| 55 | 055 | 55 | San Francisco |
| 56 | 056 | 56 | ARINC Centre |
| 57 | 057 | 57 | US Air Force – Air Force Global Weather Central |
| 58 | 058 | 58 | Fleet Numerical Meteorology and Oceanography Center, Monterey, CA, United States |
| 59 | 059 | 59 | The NOAA Forecast Systems Laboratory, Boulder, CO, United States |
| 60 | 060 | 60 | United States National Center for Atmospheric Research (NCAR) |
| 61 | 061 | 61 | Service ARGOS – Landover |
| 62 | 062 | 62 | US Naval Oceanographic Office |
| 63 | 063 | 63 | International Research Institute for Climate and Society (IRI) |
| | | | **64–73: Centres in Region V** |
| 64 | 064 | 64 | Honolulu (RSMC) |
| 65 | 065 | 65 | Darwin (RSMC) |
| 66 | 066 | 66 | ) |
| 67 | 067 | 67 | Melbourne (RSMC) |
| 68 | 068 | 68 | Reserved |
| 69 | 069 | 69 | Wellington (RSMC) |
| 70 | 070 | 70 | ) |
| 71 | 071 | 71 | Nadi (RSMC) |
| 72 | 072 | 72 | Singapore |
| 73 | 073 | 73 | Malaysia (NMC) |
| | | | **74–99: Centres in Region VI** |
| 74 | 074 | 74 | UK Meteorological Office – Exeter (RSMC) |
| 75 | 075 | 75 | ) |

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| 76 | 076 | 76 | Moscow (RSMC) |
| 77 | 077 | 77 | Reserved |
| 78 | 078 | 78 | Offenbach (RSMC) |
| 79 | 079 | 79 | ) |
| 80 | 080 | 80 | Rome (RSMC) |
| 81 | 081 | 81 | ) |
| 82 | 082 | 82 | Norrköping |
| 83 | 083 | 83 | ) |
| 84 | 084 | 84 | Toulouse (RSMC) |
| 85 | 085 | 85 | Toulouse (RSMC) |
| 86 | 086 | 86 | Helsinki |
| 87 | 087 | 87 | Belgrade |
| 88 | 088 | 88 | Oslo |
| 89 | 089 | 89 | Prague |
| 90 | 090 | 90 | Episkopi |
| 91 | 091 | 91 | Ankara |
| 92 | 092 | 92 | Frankfurt/Main |
| 93 | 093 | 93 | London (WAFC) |
| 94 | 094 | 94 | Copenhagen |
| 95 | 095 | 95 | Rota |
| 96 | 096 | 96 | Athens |
| 97 | 097 | 97 | European Space Agency (ESA) |
| 98 | 098 | 98 | European Centre for Medium-Range Weather Forecasts (ECMWF) (RSMC |
| 99 | 099 | 99 | De Bilt |
| | | | **Additional Centres** |
| Not applicable | 100 | 100 | Brazzaville |
| Not applicable | 101 | 101 | Abidjan |
| Not applicable | 102 | 102 | Libya (NMC) |
| Not applicable | 103 | 103 | Madagascar (NMC) |
| Not applicable | 104 | 104 | Mauritius (NMC) |
| Not applicable | 105 | 105 | Niger (NMC) |
| Not applicable | 106 | 106 | Seychelles (NMC) |
| Not applicable | 107 | 107 | Uganda (NMC) |
| Not applicable | 108 | 108 | United Republic of Tanzania (NMC) |
| Not applicable | 109 | 109 | Zimbabwe (NMC) |
| Not applicable | 110 | 110 | Hong Kong, China |
| Not applicable | 111 | 111 | Afghanistan (NMC) |
| Not applicable | 112 | 112 | Bahrain (NMC) |
| Not applicable | 113 | 113 | Bangladesh (NMC) |
| Not applicable | 114 | 114 | Bhutan (NMC) |
| Not applicable | 115 | 115 | Cambodia (NMC) |
| Not applicable | 116 | 116 | Democratic People’s Republic of Korea (NMC) |
| Not applicable | 117 | 117 | Islamic Republic of Iran (NMC) |
| Not applicable | 118 | 118 | Iraq (NMC) |
| Not applicable | 119 | 119 | Kazakhstan (NMC) |
| Not applicable | 120 | 120 | Kuwait (NMC) |

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| Not applicable | 121 | 121 | Kyrgyzstan (NMC) |
| Not applicable | 122 | 122 | Lao People’s Democratic Republic (NMC) |
| Not applicable | 123 | 123 | Macao, China |
| Not applicable | 124 | 124 | Maldives (NMC) |
| Not applicable | 125 | 125 | Myanmar (NMC) |
| Not applicable | 126 | 126 | Nepal (NMC) |
| Not applicable | 127 | 127 | Oman (NMC) |
| Not applicable | 128 | 128 | Pakistan (NMC) |
| Not applicable | 129 | 129 | Qatar (NMC) |
| Not applicable | 130 | 130 | Yemen (NMC) |
| Not applicable | 131 | 131 | Sri Lanka (NMC) |
| Not applicable | 132 | 132 | Tajikistan (NMC) |
| Not applicable | 133 | 133 | Turkmenistan (NMC) |
| Not applicable | 134 | 134 | United Arab Emirates (NMC) |
| Not applicable | 135 | 135 | Uzbekistan (NMC) |
| Not applicable | 136 | 136 | Viet Nam (NMC) |
| Not applicable | 137–139 | 137–139 | Reserved for other centres |
| Not applicable | 140 | 140 | Bolivia (Plurinational State of) (NMC) |
| Not applicable | 141 | 141 | Guyana (NMC) |
| Not applicable | 142 | 142 | Paraguay (NMC) |
| Not applicable | 143 | 143 | Suriname (NMC) |
| Not applicable | 144 | 144 | Uruguay (NMC) |
| Not applicable | 145 | 145 | French Guiana |
| Not applicable | 146 | 146 | Brazilian Navy Hydrographic Centre |
| Not applicable | 147 | 147 | National Commission on Space Activities (CONAE) – Argentina |
| Not applicable | 148–149 | 148–149 | Reserved for other centres |
| Not applicable | 150 | 150 | Antigua and Barbuda (NMC) |
| Not applicable | 151 | 151 | Bahamas (NMC) |
| Not applicable | 152 | 152 | Barbados (NMC) |
| Not applicable | 153 | 153 | Belize (NMC) |
| Not applicable | 154 | 154 | British Caribbean Territories Centre |
| Not applicable | 155 | 155 | San José |
| Not applicable | 156 | 156 | Cuba (NMC) |
| Not applicable | 157 | 157 | Dominica (NMC) |
| Not applicable | 158 | 158 | Dominican Republic (NMC) |
| Not applicable | 159 | 159 | El Salvador (NMC) |
| Not applicable | 160 | 160 | US NOAA/NESDIS |
| Not applicable | 161 | 161 | US NOAA Office of Oceanic and Atmospheric Research |
| Not applicable | 162 | 162 | Guatemala (NMC) |
| Not applicable | 163 | 163 | Haiti (NMC) |
| Not applicable | 164 | 164 | Honduras (NMC) |
| Not applicable | 165 | 165 | Jamaica (NMC) |
| Not applicable | 166 | 166 | Mexico City |
| Not applicable | 167 | 167 | Curaçao and Sint Maarten (NMC) |
| Not applicable | 168 | 168 | Nicaragua (NMC) |
| Not applicable | 169 | 169 | Panama (NMC) |
| Not applicable | 170 | 170 | Saint Lucia (NMC) |

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| Not applicable | 171 | 171 | Trinidad and Tobago (NMC) |
| Not applicable | 172 | 172 | French Departments in RA IV |
| Not applicable | 173 | 173 | US National Aeronautics and Space Administration (NASA) |
| Not applicable | 174 | 174 | Integrated Science Data Management/Marine Environmental Data Service (ISDM/MEDS) – Canada |
| Not applicable | 175 | 175 | University Corporation for Atmospheric Research (UCAR) – United States |
| Not applicable | 176 | 176 | Cooperative Institute for Meteorological Satellite Studies (CIMSS) – United States |
| Not applicable | 177 | 177 | NOAA National Ocean Service – United States |
| Not applicable | 178 | 178 | Spire Global, Inc. |
| Not applicable | 179–189 | 179–189 | Reserved for other centres |
| Not applicable | 190 | 190 | Cook Islands (NMC) |
| Not applicable | 191 | 191 | French Polynesia (NMC) |
| Not applicable | 192 | 192 | Tonga (NMC) |
| Not applicable | 193 | 193 | Vanuatu (NMC) |
| Not applicable | 194 | 194 | Brunei Darussalam (NMC) |
| Not applicable | 195 | 195 | Indonesia (NMC) |
| Not applicable | 196 | 196 | Kiribati (NMC) |
| Not applicable | 197 | 197 | Federated States of Micronesia (NMC) |
| Not applicable | 198 | 198 | New Caledonia (NMC) |
| Not applicable | 199 | 199 | Niue |
| Not applicable | 200 | 200 | Papua New Guinea (NMC) |
| Not applicable | 201 | 201 | Philippines (NMC) |
| Not applicable | 202 | 202 | Samoa (NMC) |
| Not applicable | 203 | 203 | Solomon Islands (NMC) |
| Not applicable | 204 | 204 | National Institute of Water and Atmospheric Research (NIWA – New Zealand) |
| Not applicable | 205–209 | 205–209 | Reserved |
| Not applicable | 210 | 210 | Frascati (ESA/ESRIN) |
| Not applicable | 211 | 211 | Lannion |
| Not applicable | 212 | 212 | Lisbon |
| Not applicable | 213 | 213 | Reykjavik |
| Not applicable | 214 | 214 | Madrid |
| Not applicable | 215 | 215 | Zurich |
| Not applicable | 216 | 216 | Service ARGOS – Toulouse |
| Not applicable | 217 | 217 | Bratislava |
| Not applicable | 218 | 218 | Budapest |
| Not applicable | 219 | 219 | Ljubljana |
| Not applicable | 220 | 220 | Warsaw |
| Not applicable | 221 | 221 | Zagreb |
| Not applicable | 222 | 222 | Albania (NMC) |
| Not applicable | 223 | 223 | Armenia (NMC) |
| Not applicable | 224 | 224 | Austria (NMC) |
| Not applicable | 225 | 225 | Azerbaijan (NMC) |
| Not applicable | 226 | 226 | Belarus (NMC) |
| Not applicable | 227 | 227 | Belgium (NMC) |
| Not applicable | 228 | 228 | Bosnia and Herzegovina (NMC) |

| Code figure for $F_1F_2$ | Code figure for $F_3F_3F_3$ | Octet 5 in Section 1 of GRIB Edition 1 Octet 6 in Section 1 of BUFR Edition 3 | |
|---|---|---|---|
| Not applicable | 229 | 229 | Bulgaria (NMC) |
| Not applicable | 230 | 230 | Cyprus (NMC) |
| Not applicable | 231 | 231 | Estonia (NMC) |
| Not applicable | 232 | 232 | Georgia (NMC) |
| Not applicable | 233 | 233 | Dublin |
| Not applicable | 234 | 234 | Israel (NMC) |
| Not applicable | 235 | 235 | Jordan (NMC) |
| Not applicable | 236 | 236 | Latvia (NMC) |
| Not applicable | 237 | 237 | Lebanon (NMC) |
| Not applicable | 238 | 238 | Lithuania (NMC) |
| Not applicable | 239 | 239 | Luxembourg |
| Not applicable | 240 | 240 | Malta (NMC) |
| Not applicable | 241 | 241 | Monaco |
| Not applicable | 242 | 242 | Romania (NMC) |
| Not applicable | 243 | 243 | Syrian Arab Republic (NMC) |
| Not applicable | 244 | 244 | The former Yugoslav Republic of Macedonia (NMC) |
| Not applicable | 245 | 245 | Ukraine (NMC) |
| Not applicable | 246 | 246 | Republic of Moldova (NMC) |
| Not applicable | 247 | 247 | Operational Programme for the Exchange of weather RAdar information (OPERA) – EUMETNET |
| Not applicable | 248 | 248 | Montenegro (NMC) |
| Not applicable | 249 | 249 | Barcelona Dust Forecast Center |
| Not applicable | 250 | 250 | COnsortium for Small scale MOdelling (COSMO) |
| Not applicable | 251 | 251 | Meteorological Cooperation on Operational NWP (MetCoOp) |
| Not applicable | 252 | 252 | Max Planck Institute for Meteorology (MPI-M) |
| Not applicable | 253 | 253 | Reserved for others centres |
| Not applicable | 254 | 254 | EUMETSAT Operation Centre |
| Not applicable | 255 | 255 | Missing value |
| Not applicable | 256–999 | Not applicable | Not used |

Notes:

(1) The closed bracket sign) indicates that the corresponding code figure is reserved for the previously named centre.

(2) With GRIB or BUFR, to indicate whether the originating/generating centre is a sub-centre or not, the following procedure should be applied:

In GRIB edition 1, use octet 26 of section 1, or in BUFR edition 3, use octet 5 of section 1, with the following meaning:

| Code figure | |
|---|---|
| 0 | Not a sub-centre, the originating/generating centre is the centre defined by octet 5 in section 1 of GRIB edition 1, or by octet 6 in section 1 of BUFR edition 3. |
| 1 to 254 | Identifier of the sub-centre which is the originating/generating centre. The identifier of the sub-centre is allocated by the associated centre which is defined by octet 5 in section 1 of GRIB edition 1, or by octet 6 in section 1 of BUFR edition 3. The sub-centre identifiers should be supplied to the WMO Secretariat by the associated centre(s) for publication. |

(3) For the definitions of sub-centres provided to the WMO Secretariat, see Common code table C-12.

## COMMON CODE TABLE C–2: *Radiosonde/sounding system used*

Common Code table { Code table 3685 – $r_ar_a$ (Radiosonde/sounding system used) – for alphanumeric codes
Code table 0 02 011 (Radiosonde type) in BUFR

| Date of assignment of number (necessary after 30/06/2007) | Code figure for $r_ar_a$ (Code table 3685) | Code figure for BUFR (Code table 0 02 011) | |
|---|---|---|---|
| Not applicable | 00 | 0 | Reserved |
| Before | 01 | 1 | iMet-1-BB (United States) |
| Not applicable | 02 | 2 | No radiosonde – passive target (e.g. reflector) |
| Not applicable | 03 | 3 | No radiosonde – active target (e.g. transponder) |
| Not applicable | 04 | 4 | No radiosonde – passive temperature-humidity profiler |
| Not applicable | 05 | 5 | No radiosonde – active temperature-humidity profiler |
| Not applicable | 06 | 6 | No radiosonde – radio-acoustic sounder |
| Before | 07 | 7 | iMet-1-AB (United States) |
| Not applicable | 08 | 8 | No radiosonde – . . . (reserved) |
| Not applicable | 09 | 9 | No radiosonde – system unknown or not specified |
| Before | 10 | 10 | VIZ type A pressure-commutated (United States) |
| Before | 11 | 11 | VIZ type B time-commutated (United States) |
| Before | 12 | 12 | RS SDC (Space Data Corporation – United States) |
| Before | 13 | 13 | Astor (no longer made – Australia) |
| Before | 14 | 14 | VIZ MARK I MICROSONDE (United States) |
| Before | 15 | 15 | EEC Company type 23 (United States) |
| Before | 16 | 16 | Elin (Austria) |
| Before | 17 | 17 | Graw G. (Germany) |
| Before | 18 | 18 | Graw DFM-06 (Germany) |
| Before | 19 | 19 | Graw M60 (Germany) |
| Before | 20 | 20 | Indian Meteorological Service MK3 (India) |
| Before | 21 | 21 | VIZ/Jin Yang MARK I MICROSONDE (Republic of Korea) |
| Before | 22 | 22 | Meisei RS2-80 (Japan) |
| Before | 23 | 23 | Mesural FMO 1950A (France) |
| Before | 24 | 24 | Mesural FMO 1945A (France) |
| Before | 25 | 25 | Mesural MH73A (France) |
| Before | 26 | 26 | Meteolabor Basora (Switzerland) |
| Before | 27 | 27 | AVK-MRZ (Russian Federation) |
| Before | 28 | 28 | Meteorit MARZ2-1 (Russian Federation) |
| Before | 29 | 29 | Meteorit MARZ2-2 (Russian Federation) |
| Before | 30 | 30 | Oki RS2-80 (Japan) |
| Before | 31 | 31 | VIZ/Valcom type A pressure-commutated (Canada) |
| Before | 32 | 32 | Shanghai Radio (China) |
| Before | 33 | 33 | UK Met Office MK3 (UK) |
| Before | 34 | 34 | Vinohrady (Czech Republic) |
| Before | 35 | 35 | Vaisala RS18 (Finland) |
| Before | 36 | 36 | Vaisala RS21 (Finland) |

| Date of assignment of number (necessary after 30/06/2007) | Code figure for $r_ar_a$ (Code table 3685) | Code figure for BUFR (Code table 0 02 011) | |
|---|---|---|---|
| Before | 37 | 37 | Vaisala RS80 (Finland) |
| Before | 38 | 38 | VIZ LOCATE Loran-C (United States) |
| Before | 39 | 39 | Sprenger E076 (Germany) |
| Before | 40 | 40 | Sprenger E084 (Germany) |
| Before | 41 | 41 | Sprenger E085 (Germany) |
| Before | 42 | 42 | Sprenger E086 (Germany) |
| Before | 43 | 43 | AIR IS – 4A – 1680 (United States) |
| Before | 44 | 44 | AIR IS – 4A – 1680 X (United States) |
| Before | 45 | 45 | RS MSS (United States) |
| Before | 46 | 46 | AIR IS – 4A – 403 (United States) |
| Before | 47 | 47 | Meisei RS2-91 (Japan) |
| Before | 48 | 48 | VALCOM (Canada) |
| Before | 49 | 49 | VIZ MARK II (United States) |
| Before | 50 | 50 | Graw DFM-90 (Germany) |
| Before | 51 | 51 | VIZ–B2 (United States) |
| Before | 52 | 52 | Vaisala RS80-57H |
| Before | 53 | 53 | AVK-RF95 (Russian Federation) |
| Before | 54 | 54 | Graw DFM-97 (Germany) |
| Before | 55 | 55 | Meisei RS-01G (Japan) |
| Before | 56 | 56 | M2K2 (France) |
| Before | 57 | 57 | Modem M2K2–DC (France) |
| Before | 58 | 58 | AVK-BAR (Russian Federation) |
| Before | 59 | 59 | Modem M2K2-R 1680 MHz RDF radiosonde with pressure sensor chip (France) |
| Before | 60 | 60 | Vaisala RS80/MicroCora (Finland) |
| Before | 61 | 61 | Vaisala RS80/Loran/Digicora I, II or Marwin (Finland) |
| Before | 62 | 62 | Vaisala RS80/PCCora (Finland) |
| Before | 63 | 63 | Vaisala RS80/Star (Finland) |
| Before | 64 | 64 | Orbital Sciences Corporation, Space Data Division, transponder radiosonde, type 909-11-XX, where XX corresponds to the model of the instrument (United States) |
| Before | 65 | 65 | VIZ transponder radiosonde, model number 1499–520 (United States) |
| Before | 66 | 66 | Vaisala RS80/Autosonde (Finland) |
| Before | 67 | 67 | Vaisala RS80/Digicora III (Finland) |
| Before | 68 | 68 | AVK-RZM-2 (Russian Federation) |
| Before | 69 | 69 | MARL-A or Vektor-M-RZM-2 (Russian Federation) |
| Before | 70 | 70 | Vaisala RS92/Star (Finland) |
| Before | 71 | 71 | Vaisala RS90/Loran/Digicora I, II or Marwin (Finland) |
| Before | 72 | 72 | Vaisala RS90/PC–Cora (Finland) |
| Before | 73 | 73 | Vaisala RS90/Autosonde (Finland) |
| Before | 74 | 74 | Vaisala RS90/Star (Finland) |

| Date of assignment of number (necessary after 30/06/2007) | Code figure for $r_ar_a$ (Code table 3685) | Code figure for BUFR (Code table 0 02 011) | |
|---|---|---|---|
| Before | 75 | 75 | AVK-MRZ-ARMA (Russian Federation) |
| Before | 76 | 76 | AVK-RF95-ARMA (Russian Federation) |
| Before | 77 | 77 | GEOLINK GPSonde GL98 (France) |
| Before | 78 | 78 | Vaisala RS90/Digicora III (Finland) |
| Before | 79 | 79 | Vaisala RS92/Digicora I, II or Marwin (Finland) |
| Before | 80 | 80 | Vaisala RS92/Digicora III (Finland) |
| Before | 81 | 81 | Vaisala RS92/Autosonde (Finland) |
| Before | 82 | 82 | Sippican MK2 GPS/STAR (United States) with rod thermistor, carbon element and derived pressure |
| Before | 83 | 83 | Sippican MK2 GPS/W9000 (United States) with rod thermistor, carbon element and derived pressure |
| Before | 84 | 84 | Sippican MARK II with chip thermistor, carbon element and derived pressure from GPS height |
| Before | 85 | 85 | Sippican MARK IIA with chip thermistor, carbon element and derived pressure from GPS height |
| Before | 86 | 86 | Sippican MARK II with chip thermistor, pressure and carbon element |
| Before | 87 | 87 | Sippican MARK IIA with chip thermistor, pressure and carbon element |
| Before | 88 | 88 | MARL-A or Vektor-M-MRZ (Russian Federation) |
| Before | 89 | 89 | MARL-A or Vektor-M-BAR (Russian Federation) |
| Not applicable | 90 | 90 | Radiosonde not specified or unknown |
| Not applicable | 91 | 91 | Pressure only radiosonde |
| Not applicable | 92 | 92 | Pressure only radiosonde plus transponder |
| Not applicable | 93 | 93 | Pressure only radiosonde plus radar reflector |
| Not applicable | 94 | 94 | No pressure radiosonde plus transponder |
| Not applicable | 95 | 95 | No pressure radiosonde plus radar reflector |
| Not applicable | 96 | 96 | Descending radiosonde |
| Before | 97 | 97 | iMet-2/iMet-1500 RDF radiosonde with pressure sensor chip (South Africa) |
| Before | 98 | 98 | iMet-2/iMet-1500 GPS radiosonde with derived pressure from GPS height (South Africa) |
| Before | 99 | 99 | iMet-2/iMet-3200 GPS radiosonde with derived pressure from GPS height (South Africa) |
| | Not available | 100 | Reserved for BUFR only |
| | 01 | 101 | Not vacant |
| | Not available | 102–106 | Reserved for BUFR only |
| | 07 | 107 | Not vacant |
| | Not available | 108–109 | Reserved for BUFR only |
| 01/01/2008 | 10 | 110 | Sippican LMS5 w/Chip Thermistor, duct mounted capacitance relative humidity sensor and derived pressure from GPS height |
| 01/01/2008 | 11 | 111 | Sippican LMS6 w/Chip Thermistor, external boom mounted capacitance relative humidity sensor, and derived pressure from GPS height |
| 06/05/2015 | 12 | 112 | Jin Yang RSG-20A with derived pressure from GPS height/GL-5000P (Republic of Korea) |

| Date of assignment of number (necessary after 30/06/2007) | Code figure for $r_ar_a$ (Code table 3685) | Code figure for BUFR (Code table 0 02 011) | |
|---|---|---|---|
| 15/09/2010 | 13 | 113 | Vaisala RS92/MARWIN MW32 (Finland) |
| 03/11/2011 | 14 | 114 | Vaisala RS92/DigiCORA MW41 (Finland) |
| 01/12/2011 | 15 | 115 | PAZA-12M/Radiotheodolite-UL (Ukraine) |
| 01/12/2011 | 16 | 116 | PAZA-22/AVK-1 (Ukraine) |
| 02/05/2012 | 17 | 117 | Graw DFM-09 (Germany) |
| | 18 | 118 | Not vacant |
| Needed | 19 | 119 | Vacant |
| | 20 | 120 | Not vacant |
| 06/05/2015 | 21 | 121 | Jin Yang 1524LA LORAN-C/GL5000 (Republic of Korea) |
| 02/05/2012 | 22 | 122 | Meisei RS-11G GPS radiosonde w/thermistor, capacitance relative humidity sensor, and derived pressure from GPS height (Japan) |
| 03/11/2011 | 23 | 123 | Vaisala RS41/DigiCORA MW41 (Finland) |
| 03/11/2011 | 24 | 124 | Vaisala RS41/AUTOSONDE (Finland) |
| 03/11/2011 | 25 | 125 | Vaisala RS41/MARWIN MW32 (Finland) |
| 07/05/2014 | 26 | 126 | Meteolabor SRS-C34/Argus 37 (Switzerland) |
| | 27 | 127 | Not vacant |
| 15/09/2011 | 28 | 128 | AVK – AK2-02 (Russian Federation) |
| 15/09/2011 | 29 | 129 | MARL-A or Vektor-M – AK2-02 (Russian Federation) |
| 01/01/2010 | 30 | 130 | Meisei RS-06G (Japan) |
| 03/11/2011 | 31 | 131 | Taiyuan GTS1-1/GFE(L) (China ) |
| 03/11/2011 | 32 | 132 | Shanghai GTS1/GFE(L) (China) |
| 03/11/2011 | 33 | 133 | Nanjing GTS1-2/GFE(L) (China) |
| Needed | 34 | 134 | Vacant |
| 07/05/2014 | 35 | 135 | Meisei iMS-100 GPS radiosonde w/thermistor sensor, capacitance relative humidity sensor, and derived pressure form GPS height (Japan) |
| 02/05/2018 | 36 | 136 | Meisei iMDS-17 GPS dropsonde w/thermistor sensor, capacitance relative humidity sensor, and capacitance pressure sensor (Japan) |
| | 37 | 137 | Not vacant |
| Needed | 38–40 | 138–140 | Vacant |
| 03/11/2011 | 41 | 141 | Vaisala RS41 with pressure derived from GPS height/DigiCORA MW41 (Finland) |
| 03/11/2011 | 42 | 142 | Vaisala RS41 with pressure derived from GPS height/ AUTOSONDE (Finland) |
| 07/05/2014 | 43 | 143 | NanJing Daqiao XGP-3G (China)* |
| 07/05/2014 | 44 | 144 | TianJin HuaYunTianYi GTS(U)1 (China)* |
| 07/05/2014 | 45 | 145 | Beijing Changfeng CF-06 (China)* |
| 07/05/2014 | 46 | 146 | Shanghai Changwang GTS3 (China)* |
| | 47 | 147 | Not vacant |
| 02/05/2012 | 48 | 148 | PAZA-22M/MARL-A |
| | 49 | 149 | Not vacant |

* All GPS radiosondes are with thermistor, silicon piezoresistive pressure sensor or pressure derived from GPS height, capacitive relative humidity sensor and wind derived from GPS height.

| Date of assignment of number (necessary after 30/06/2007) | Code figure for $r_ar_a$ (Code table 3685) | Code figure for BUFR (Code table 0 02 011) | |
|---|---|---|---|
| 02/11/2016 | 50 | 150 | Meteolabor SRS-C50/Argus (Switzerland) |
| | 51 | 151 | Not vacant |
| 03/11/2011 | 52 | 152 | Vaisala RS92-NGP/Intermet IMS-2000 (United States) |
| 06/05/2015 | 53 | 153 | AVK – I-2012 (Russian Federation) |
| | 54–59 | 154–159 | Not vacant |
| 06/05/2015 | 60 | 160 | MARL-A or Vektor-M – I-2012 (Russian Federation) |
| | 61 | 161 | Not vacant |
| 06/05/2015 | 62 | 162 | MARL-A or Vektor-M – MRZ-3MK (Russian Federation) |
| 07/11/2018 | 63 | 163 | Modem M20 radiosonde w/thermistor sensor, capacitance relative humidity sensor, and derived pressure from GPS height (France) |
| 07/11/2018 | 64 | 164 | Modem PilotSonde GPS radiosonde (France) |
| | 65–66 | 165–166 | Vacant |
| | 67–72 | 167–172 | Not vacant |
| 02/11/2016 | 73 | 173 | MARL-A (Russian Federation) – ASPAN-15 (Kazakhstan) |
| | 74–76 | 174–176 | Not vacant |
| 15/03/2010 | 77 | 177 | Modem GPSonde M10 (France) |
| | 78–81 | 178–181 | Not vacant |
| 07/11/2012 | 82 | 182 | Lockheed Martin LMS-6 w/chip thermistor; external boom mounted polymer capacitive relative humidity sensor; capacitive pressure sensor and GPS wind |
| 07/11/2012 | 83 | 183 | Vaisala RS92-D/Intermet IMS 1500 w/silicon capacitive pressure sensor, capacitive wire temperature sensor, twin thin-film heated polymer capacitive relative humidity sensor and RDF wind |
| Needed | 84 | 184 | Vacant |
| | 85–89 | 185–189 | Not vacant |
| | Not available | 190 | NCAR research dropsonde NRD94 with GPS and Vaisala RS92-based sensor module (United States) |
| | Not available | 191 | NCAR research dropsonde NRD41 with GPS and Vaisala RS41-based sensor module (United States) |
| | Not available | 192 | Vaisala/NCAR dropsonde RD94 with GPS and Vaisala RS92-based sensor module (Finland/United States) |
| | Not available | 193 | Vaisala/NCAR dropsonde RD41 with GPS and Vaisala RS41-based sensor module (Finland/United States) |
| | Not available | 194–196 | Reserved for BUFR only |
| | 97–99 | 197–199 | Not vacant |
| | Not available | 200–254 | Reserved for BUFR only |
| | | 255 | Missing value |

Notes:

(1) References to countries in brackets indicate the manufacturing location rather than the country using the instrument.

(2) Some of the radiosondes listed are no longer in use but are retained for archiving purposes.

(3) The alphanumeric code format reports only 2 digits, and the first digit for BUFR is identified from the date: the first digit is 0 if the introduction of the radiosonde for observation was before 30 June 2007, or 1 otherwise. Entries in the second part of the table (after 99), which are declared "Vacant" can be used for new radiosondes because the 2-digit number was originally attributed to sondes, which are no longer used. *This system has been adopted to accommodate reporting in TEMP traditional alphanumeric code format up to the time BUFR is fully used for radiosounding reports*.

**COMMON CODE TABLE C–3:** ***Instrument make and type for water temperature profile measurement with fall rate equation coefficients***

Common Code table { Code table 1770 – $I_XI_XI_X$ (Instrument type for XBT, with fall rate equation coefficients) – for alphanumeric codes
Code table 0 22 067 (Instrument type for water temperature/salinity profile measurement) in BUFR

| Code figure for $I_XI_XI_X$ | Code figure for BUFR (Code table 022 067) | Meaning | | |
|---|---|---|---|---|
| | | Instrument make and type | Equation coefficients | |
| | | | *a* | *b* |
| 001 | 1 | Sippican T-4 | 6.472 | –2.16 |
| 002 | 2 | Sippican T-4 | 6.691 | –2.25 |
| 011 | 11 | Sippican T-5 | 6.828 | –1.82 |
| 021 | 21 | Sippican Fast Deep | 6.346 | –1.82 |
| 031 | 31 | Sippican T-6 | 6.472 | –2.16 |
| 032 | 32 | Sippican T-6 | 6.691 | –2.25 |
| 041 | 41 | Sippican T-7 | 6.472 | –2.16 |
| 042 | 42 | Sippican T-7 | 6.691 | –2.25 |
| 051 | 51 | Sippican Deep Blue | 6.472 | –2.16 |
| 052 | 52 | Sippican Deep Blue | 6.691 | –2.25 |
| 061 | 61 | Sippican T-10 | 6.301 | –2.16 |
| 071 | 71 | Sippican T-11 | 1.779 | –0.255 |
| 081 | 81 | Sippican AXBT (300m probes) | 1.52 | 0.0 |
| 201 | 201 | TSK T-4 | 6.472 | –2.16 |
| 202 | 202 | TSK T-4 | 6.691 | –2.25 |
| 211 | 211 | TSK T-6 | 6.472 | –2.16 |
| 212 | 212 | TSK T-6 | 6.691 | –2.25 |
| 221 | 221 | TSK T-7 | 6.472 | –2.16 |
| 222 | 222 | TSK T-7 | 6.691 | –2.25 |
| 231 | 231 | TSK T-5 | 6.828 | –1.82 |
| 241 | 241 | TSK T-10 | 6.301 | –2.16 |
| 251 | 251 | TSK Deep Blue | 6.472 | –2.16 |
| 252 | 252 | TSK Deep Blue | 6.691 | –2.25 |
| 261 | 261 | TSK AXBT | | |
| 401 | 401 | Sparton XBT-1 | 6.301 | –2.16 |
| 411 | 411 | Sparton XBT-3 | 5.861 | –0.0904 |
| 421 | 421 | Sparton XBT-4 | 6.472 | –2.16 |
| 431 | 431 | Sparton XBT-5 | 6.828 | –1.82 |
| 441 | 441 | Sparton XBT-5DB | 6.828 | –1.82 |
| 451 | 451 | Sparton XBT-6 | 6.472 | –2.16 |
| 461 | 461 | Sparton XBT-7 | 6.472 | –2.16 |
| 462 | 462 | Sparton XBT-7 | 6.705 | –2.28 |
| 471 | 471 | Sparton XBT-7DB | 6.472 | –2.16 |
| 481 | 481 | Sparton XBT-10 | 6.301 | –2.16 |
| 491 | 491 | Sparton XBT-20 | 6.472 | –2.16 |
| 501 | 501 | Sparton XBT-20DB | 6.472 | –2.16 |
| 510 | 510 | Sparton 536 AXBT | 1.524 | 0 |
| 700 | 700 | Sippican XCTD Standard | | |
| 710 | 710 | Sippican XCTD Deep | | |
| 720 | 720 | Sippican AXCTD | | |
| 730 | 730 | Sippican SXCTD | | |
| 741 | 741 | TSK XCTD/XCTD-1 | 3.42543 | –0.47 |

| Code figure for $I_XI_XI_X$ | Code figure for BUFR (Code table 022 067) | Meaning | | |
|---|---|---|---|---|
| | | Instrument make and type | Equation coefficients | |
| | | | *a* | *b* |
| 742 | 742 | TSK XCTD-2 | 3.43898 | –0.31 |
| 743 | 743 | TSK XCTD-2F | 3.43898 | –0.31 |
| 744 | 744 | TSK XCTD-3 | 5.07598 | –0.72 |
| 745 | 745 | TSK XCTD-4 | 3.68081 | –0.47 |
| 751 | 751 | TSK AXCTD | | |
| 780 | 780 | Sea-Bird SBE21 SEACAT Thermosalinograph | Not applicable | |
| 781 | 781 | Sea-Bird SBE45 MicroTSG Thermosalinograph | Not applicable | |
| 800 | 800 | Mechanical BT | Not applicable | |
| 810 | 810 | Hydrocast | Not applicable | |
| 820 | 820 | Thermistor chain | Not applicable | |
| 825 | 825 | Temperature (sonic) and pressure probes | Not applicable | |
| 830 | 830 | CTD | Not applicable | |
| 831 | 831 | CTD-P-ALACE float | Not applicable | |
| 835 | 835 | PROVOR-IV | Not applicable | |
| 836 | 836 | PROVOR-III | Not applicable | |
| 837 | 837 | ARVOR_C, SBE conductivity sensor | | |
| 838 | 838 | ARVOR_D, SBE conductivity sensor | | |
| 839 | 839 | PROVOR-II, SBE conductivity sensor | | |
| 840 | 840 | PROVOR, no conductivity sensor | Not applicable | |
| 841 | 841 | PROVOR, Sea-Bird conductivity sensor | Not applicable | |
| 842 | 842 | PROVOR, FSI conductivity sensor | Not applicable | |
| 843 | 843 | Polar Ocean Profiling System (POPS), PROVOR, SBE CTD | | |
| 844 | 844 | Profiling float, ARVOR, Sea-Bird conductivity sensor | | |
| 845 | 845 | Webb Research, no conductivity sensor | Not applicable | |
| 846 | 846 | Webb Research, Sea-Bird conductivity sensor | Not applicable | |
| 847 | 847 | Webb Research, FSI conductivity sensor | Not applicable | |
| 848 | 848 | APEX-EM, SBE conductivity sensor | | |
| 849 | 849 | APEX_D, SBE conductivity sensor | | |
| 850 | 850 | SOLO, no conductivity sensor | Not applicable | |
| 851 | 851 | SOLO, Sea-Bird conductivity sensor | Not applicable | |
| 852 | 852 | SOLO, FSI conductivity sensor | Not applicable | |
| 853 | 853 | Profiling float, SOLO2 (SCRIPPS), Sea-Bird conductivity sensor | | |
| 854 | 854 | S2A, SBE conductivity sensor | Not applicable | |
| 855 | 855 | Profiling float, NINJA, no conductivity sensor | Not applicable | |
| 856 | 856 | Profiling float, NINJA, SBE conductivity sensor | Not applicable | |
| 857 | 857 | Profiling float, NINJA, FSI conductivity sensor | Not applicable | |

| Code figure for $I_XI_XI_X$ | Code figure for BUFR (Code table 022 067) | Meaning | | |
|---|---|---|---|---|
| | | Instrument make and type | Equation coefficients | |
| | | | *a* | *b* |
| 858 | 858 | Profiling float, NINJA, TSK conductivity sensor | Not applicable | |
| 859 | 859 | Profiling float, NEMO, no conductivity sensor | Not applicable | |
| 860 | 860 | Profiling float, NEMO, SBE conductivity sensor | Not applicable | |
| 861 | 861 | Profiling float, NEMO, FSI conductivity sensor | Not applicable | |
| 862 | 862 | SOLO_D, SBE conductivity sensor | | |
| 863 | 863 | NAVIS-A, SBE conductivity sensor | | |
| 864 | 864 | NINJA_D, SBE conductivity sensor | | |
| 865 | 865 | NOVA, SBE conductivity sensor | | |
| 866 | 866 | ALAMO, no conductivity sensor | | |
| 867 | 867 | ALAMO, RBR conductivity sensor | | |
| 868 | 868 | ALAMO, SBE conductivity sensor | | |
| 869 | 869 | Reserved | | |
| 870 | 870 | HM2000 | Not applicable | |
| 871 | 871 | COPEX | Not applicable | |
| 872 | 872 | S2X | Not applicable | |
| 873 | 873 | ALTO | Not applicable | |
| 874 | 874 | SOLO D MRV | Not applicable | |
| 875–899 | 875–899 | Reserved | | |
| 900 | 900 | Sippican LMP-5 XBT | 9.727 | –0.0000473 |
| 901 | 901 | Ice-tethered Profiler (ITP), SBE CTD | | |
| 902 | 902 | Brooke Ocean Moving Vessel Profiler (MVP) | | |
| 903 | 903 | Sea-Bird CTD | | |
| 904 | 904 | AML Oceanographic CTD | | |
| 905 | 905 | Falmouth Scientific CTD | | |
| 906 | 906 | Ocean Sensors CTD | | |
| 907 | 907 | Valeport CTD | | |
| 908 | 908 | Oceanscience MVP | | |
| 909 | 909 | IDRONAUT CTD | | |
| 910 | 910 | Sea-Bird SBE 38 | | |
| 911–994 | 911–994 | Reserved | | |
| 995 | 995 | Instrument attached to marine mammals | Not applicable | |
| 996 | 996 | Instrument attached to animals other than marine mammals | Not applicable | |
| 997–999 | 997–999 | Reserved | | |
| | 1000–1022 | Reserved | | |
| | 1023 | Missing value | | |

Notes:

(1) The depth is calculated from coefficients *a* and *b* and the time *t* as follows: $z = at + 10^{-3}bt^2$.

(2) All unassigned numbers are reserved for future use.

(3) The values of *a* and *b* are supplied for information only.

## COMMON CODE TABLE C–4: *Water temperature profile recorder types*

Common Code table { Code table 4770 – $X_RX_R$ (Recorder type) – for alphanumeric codes
Code table 0 22 068 (Water temperature profile recorder types) in BUFR

| Code figure for $X_RX_R$ | Code figure for BUFR (Code table 0 22 068) | Meaning |
|---|---|---|
| 01 | 1 | Sippican Strip Chart Recorder |
| 02 | 2 | Sippican MK2A/SSQ-61 |
| 03 | 3 | Sippican MK-9 |
| 04 | 4 | Sippican AN/BHQ-7/MK8 |
| 05 | 5 | Sippican MK-12 |
| 06 | 6 | Sippican MK-21 |
| 07 | 7 | Sippican MK-8 Linear Recorder |
| 08 | 8 | Sippican MK-10 |
| 10 | 10 | Sparton SOC BT/SV Processor Model 100 |
| 11 | 11 | Lockheed-Sanders Model OL5005 |
| 20 | 20 | ARGOS XBT-ST |
| 21 | 21 | CLS-ARGOS/Protecno XBT-ST Model-1 |
| 22 | 22 | CLS-ARGOS/Protecno XBT-ST Model-2 |
| 30 | 30 | BATHY Systems SA-810 |
| 31 | 31 | Scripps Metrobyte Controller |
| 32 | 32 | Murayama Denki Z-60-16 III |
| 33 | 33 | Murayama Denki Z-60-16 II |
| 34 | 34 | Protecno ETSM2 |
| 35 | 35 | Nautilus Marine Service NMS-XBT |
| 40 | 40 | TSK MK-2A |
| 41 | 41 | TSK MK-2S |
| 42 | 42 | TSK MK-30 |
| 43 | 43 | TSK MK-30N |
| 45 | 45 | TSK MK-100 |
| 46 | 46 | TSK MK-130 Compatible recorder for both XBT and XCTD |
| 47 | 47 | TSK MK-130A XCTD recorder |
| 48 | 48 | TSK AXBT RECEIVER MK-300 |
| 49 | 49 | TSK MK-150/MK-150N Compatible recorder for both XBT and XCTD |
| 50 | 50 | JMA ASTOS |
| 60 | 60 | ARGOS communications, sampling on up transit |
| 61 | 61 | ARGOS communications, sampling on down transit |
| 62 | 62 | Orbcomm communications, sampling on up transit |
| 63 | 63 | Orbcomm communications, sampling on down transit |
| 64 | 64 | Iridium communications, sampling on up transit |
| 65 | 65 | Iridium communications, sampling on down transit |
| 70 | 70 | CSIRO Devil-1 XBT acquisition system |
| 71 | 71 | CSIRO Devil-2 XBT acquisition system |
| 72 | 72 | TURO/CSIRO Quoll XBT Acquisition System |
| 80 | 80 | Applied Microsystems Ltd, MICRO-SVT&P |
| 81 | 81 | Sea Mammal Research Unit, Univ. St Andrews, UK, uncorrected salinity from a sea mammal mounted instrument |
| 82 | 82 | Sea Mammal Research Unit, Univ. St Andrews, UK, corrected salinity from a sea mammal mounted instrument |
| 99 | 99 | Unknown |
| | 127 | Missing value |

Note: All unassigned numbers are reserved for future use.

## COMMON CODE TABLE C–5: *Satellite identifier*

Common Code table { $I_6I_6I_6$ for alphanumeric codes; Code table 0 01 007 in BUFR; Code used in GRIB Edition 2 }

| Code figure for $I_6I_6I_6$ | Code figure for BUFR (Code table 0 01 007) | Code figure for GRIB Edition 2 | |
|---|---|---|---|
| 000 | 0 | 0 | Reserved |
| | 001–099: Numbers allocated to Europe | | |
| 001 | 1 | 1 | ERS 1 |
| 002 | 2 | 2 | ERS 2 |
| 003 | 3 | 3 | METOP-1 (Metop-B) |
| 004 | 4 | 4 | METOP-2 (Metop-A) |
| 005 | 5 | 5 | METOP-3 (Metop-C) |
| 020 | 20 | 20 | SPOT 1 |
| 021 | 21 | 21 | SPOT 2 |
| 022 | 22 | 22 | SPOT 3 |
| 023 | 23 | 23 | SPOT 4 |
| 040 | 40 | 40 | OERSTED |
| 041 | 41 | 41 | CHAMP |
| 042 | 42 | 42 | TerraSAR-X |
| 043 | 43 | 43 | TanDEM-X |
| 044 | 44 | 44 | PAZ |
| 046 | 46 | 46 | SMOS |
| 047 | 47 | 47 | CryoSat-2 |
| 048 | 48 | 48 | AEOLUS |
| 050 | 50 | 50 | METEOSAT 3 |
| 051 | 51 | 51 | METEOSAT 4 |
| 052 | 52 | 52 | METEOSAT 5 |
| 053 | 53 | 53 | METEOSAT 6 |
| 054 | 54 | 54 | METEOSAT 7 |
| 055 | 55 | 55 | METEOSAT 8 |
| 056 | 56 | 56 | METEOSAT 9 |
| 057 | 57 | 57 | METEOSAT 10 |
| 058 | 58 | 58 | METEOSAT 1 |
| 059 | 59 | 59 | METEOSAT 2 |
| 060 | 60 | 60 | ENVISAT |
| 061 | 61 | 61 | Sentinal 3A |
| 062 | 62 | 62 | Sentinal 1A |
| 063 | 63 | 63 | Sentinal 1B |
| 064 | 64 | 64 | Sentinal 5P |
| 065 | 65 | 65 | Sentinal 3B |
| 070 | 70 | 70 | METEOSAT 11 |
| | 100–199: Numbers allocated to Japan | | |
| 120 | 120 | 120 | ADEOS |
| 121 | 121 | 121 | ADEOS II |
| 122 | 122 | 122 | GCOM-W1 |
| 140 | 140 | 140 | GOSAT |

| Code figure for $I_6I_6I_6$ | Code figure for BUFR (Code table 0 01 007) | Code figure for GRIB Edition 2 | |
|---|---|---|---|
| 150 | 150 | 150 | GMS 3 |
| 151 | 151 | 151 | GMS 4 |
| 152 | 152 | 152 | GMS 5 |
| 153 | 153 | 153 | GMS |
| 154 | 154 | 154 | GMS 2 |
| 171 | 171 | 171 | MTSAT-1R |
| 172 | 172 | 172 | MTSAT-2 |
| 173 | 173 | 173 | Himawari-8 |
| 174 | 174 | 174 | Himawari-9 |
| | 200–299: Numbers allocated to the United States | | |
| 200 | 200 | 200 | NOAA 8 |
| 201 | 201 | 201 | NOAA 9 |
| 202 | 202 | 202 | NOAA 10 |
| 203 | 203 | 203 | NOAA 11 |
| 204 | 204 | 204 | NOAA 12 |
| 205 | 205 | 205 | NOAA 14 |
| 206 | 206 | 206 | NOAA 15 |
| 207 | 207 | 207 | NOAA 16 |
| 208 | 208 | 208 | NOAA 17 |
| 209 | 209 | 209 | NOAA 18 |
| 220 | 220 | 220 | LANDSAT 5 |
| 221 | 221 | 221 | LANDSAT 4 |
| 222 | 222 | 222 | LANDSAT 7 |
| 223 | 223 | 223 | NOAA 19 |
| 224 | 224 | 224 | NPP |
| 225 | 225 | 225 | NOAA 20 |
| 226 | 226 | 226 | NOAA 21 |
| 240 | 240 | 240 | DMSP 7 |
| 241 | 241 | 241 | DMSP 8 |
| 242 | 242 | 242 | DMSP 9 |
| 243 | 243 | 243 | DMSP 10 |
| 244 | 244 | 244 | DMSP 11 |
| 245 | 245 | 245 | DMSP 12 |
| 246 | 246 | 246 | DMSP 13 |
| 247 | 247 | 247 | DMSP 14 |
| 248 | 248 | 248 | DMSP 15 |
| 249 | 249 | 249 | DMSP 16 |
| 250 | 250 | 250 | GOES 6 |
| 251 | 251 | 251 | GOES 7 |
| 252 | 252 | 252 | GOES 8 |
| 253 | 253 | 253 | GOES 9 |
| 254 | 254 | 254 | GOES 10 |
| 255 | 255 | 255 | GOES 11 |
| 256 | 256 | 256 | GOES 12 |
| 257 | 257 | 257 | GOES 13 |
| 258 | 258 | 258 | GOES 14 |

| Code figure for $I_6I_6I_6$ | Code figure for BUFR (Code table 0 01 007) | Code figure for GRIB Edition 2 | |
|---|---|---|---|
| 259 | 259 | 259 | GOES 15 |
| 260 | 260 | 260 | JASON 1 |
| 261 | 261 | 261 | JASON 2 |
| 262 | 262 | 262 | JASON 3 |
| 269 | 269 | 269 | Spire Lemur 3U CubeSat |
| 270 | 270 | 270 | GOES 16 |
| 271 | 271 | 271 | GOES 17 |
| 272 | 272 | 272 | GOES 18 |
| 273 | 273 | 273 | GOES 19 |
| 281 | 281 | 281 | QUIKSCAT |
| 282 | 282 | 282 | TRMM |
| 283 | 283 | 283 | CORIOLIS |
| 285 | 285 | 285 | DMSP 17 |
| 286 | 286 | 286 | DMSP 18 |
| 287 | 287 | 287 | DMSP 19 |
| 288 | 288 | 288 | GPM-core |
| 289 | 289 | 289 | Orbiting Carbon Observatory – 2 (OCO-2, NASA) |
| | 300–399: Numbers allocated to the Russian Federation | | |
| 310 | 310 | 310 | GOMS 1 |
| 311 | 311 | 311 | GOMS 2 |
| 320 | 320 | 320 | METEOR 2-21 |
| 321 | 321 | 321 | METEOR 3-5 |
| 322 | 322 | 322 | METEOR 3M-1 |
| 323 | 323 | 323 | METEOR 3M-2 |
| 341 | 341 | 341 | RESURS 01-4 |
| | 400–499: Numbers allocated to India | | |
| 410 | 410 | 410 | KALPANA-1 |
| 421 | 421 | 421 | Oceansat-2 |
| 422 | 422 | 422 | ScatSat-1 |
| 423 | 423 | 423 | Oceansat-3 |
| 430 | 430 | 430 | INSAT 1B |
| 431 | 431 | 431 | INSAT 1C |
| 432 | 432 | 432 | INSAT 1D |
| 440 | 440 | 440 | Megha-Tropiques |
| 441 | 441 | 441 | SARAL |
| 450 | 450 | 450 | INSAT 2A |
| 451 | 451 | 451 | INSAT 2B |
| 452 | 452 | 452 | INSAT 2E |
| 470 | 470 | 470 | INSAT 3A |
| 471 | 471 | 471 | INSAT 3D |
| 472 | 472 | 472 | INSAT 3E |
| 473 | 473 | 473 | INSAT 3DR |
| 474 | 474 | 474 | INSAT 3DS |
| | 500–599: Numbers allocated to China | | |
| 500 | 500 | 500 | FY–1C |
| 501 | 501 | 501 | FY–1D |

| Code figure for $I_6I_6I_6$ | Code figure for BUFR (Code table 0 01 007) | Code figure for GRIB Edition 2 | |
|---|---|---|---|
| 502 | 502 | 502 | Hai Yang 2A (HY-2A, SOA/NSOAS China) |
| 503 | 503 | 503 | Hai Yang 2B (HY-2B, SOA/NSOAS China) |
| 510 | 510 | 510 | FY–2 |
| 512 | 512 | 512 | FY-2B |
| 513 | 513 | 513 | FY-2C |
| 514 | 514 | 514 | FY-2D |
| 515 | 515 | 515 | FY-2E |
| 516 | 516 | 516 | FY-2F |
| 517 | 517 | 517 | FY-2G |
| 520 | 520 | 520 | FY-3A |
| 521 | 521 | 521 | FY-3B |
| 522 | 522 | 522 | FY-3C |
| 523 | 523 | 523 | FY-3D |
| 530 | 530 | 530 | FY-4A |

600–699: Numbers allocated to Europe

700–799: Numbers allocated to the United States

| | | | |
|---|---|---|---|
| 700 | 700 | 700 | TIROS M (ITOS 1) |
| 701 | 701 | 701 | NOAA 1 |
| 702 | 702 | 702 | NOAA 2 |
| 703 | 703 | 703 | NOAA 3 |
| 704 | 704 | 704 | NOAA 4 |
| 705 | 705 | 705 | NOAA 5 |
| 706 | 706 | 706 | NOAA 6 |
| 707 | 707 | 707 | NOAA 7 |
| 708 | 708 | 708 | TIROS-N |
| 710 | 710 | 710 | GOES (SMS 1) |
| 711 | 711 | 711 | GOES (SMS 2) |
| 720 | 720 | 720 | TOPEX |
| 721 | 721 | 721 | GFO (GEOSAT follow on) |
| 722 | 722 | 722 | GRACE A |
| 723 | 723 | 723 | GRACE B |
| 724 | 724 | 724 | COSMIC-2 P1 |
| 725 | 725 | 725 | COSMIC-2 P2 |
| 726 | 726 | 726 | COSMIC-2 P3 |
| 727 | 727 | 727 | COSMIC-2 P4 |
| 728 | 728 | 728 | COSMIC-2 P5 |
| 729 | 729 | 729 | COSMIC-2 P6 |
| 731 | 731 | 731 | GOES 1 |
| 732 | 732 | 732 | GOES 2 |
| 733 | 733 | 733 | GOES 3 |
| 734 | 734 | 734 | GOES 4 |
| 735 | 735 | 735 | GOES 5 |
| 740 | 740 | 740 | COSMIC-1 |
| 741 | 741 | 741 | COSMIC-2 |
| 742 | 742 | 742 | COSMIC-3 |
| 743 | 743 | 743 | COSMIC-4 |
| 744 | 744 | 744 | COSMIC-5 |
| 745 | 745 | 745 | COSMIC-6 |

| Code figure for $I_6I_6I_6$ | Code figure for BUFR (Code table 0 01 007) | Code figure for GRIB Edition 2 | |
|---|---|---|---|
| 750 | 750 | 750 | COSMIC-2 E1 |
| 751 | 751 | 751 | COSMIC-2 E2 |
| 752 | 752 | 752 | COSMIC-2 E3 |
| 753 | 753 | 753 | COSMIC-2 E4 |
| 754 | 754 | 754 | COSMIC-2 E5 |
| 755 | 755 | 755 | COSMIC-2 E6 |
| 763 | 763 | 763 | NIMBUS 3 |
| 764 | 764 | 764 | NIMBUS 4 |
| 765 | 765 | 765 | NIMBUS 5 |
| 766 | 766 | 766 | NIMBUS 6 |
| 767 | 767 | 767 | NIMBUS 7 |
| 780 | 780 | 780 | ERBS |
| 781 | 781 | 781 | UARS |
| 782 | 782 | 782 | EARTH PROBE |
| 783 | 783 | 783 | TERRA |
| 784 | 784 | 784 | AQUA |
| 785 | 785 | 785 | AURA |
| 786 | 786 | 786 | C/NOFS |
| 787 | 787 | 787 | CALIPSO |
| 788 | 788 | 788 | CloudSat |
| 800–849: Numbers allocated to other satellite operators | | | |
| 800 | 800 | 800 | SUNSAT |
| 801 | 801 | 801 | International Space Station (ISS) |
| 802 | 802 | 802 | CFOSAT |
| 803 | 803 | 803 | GRACE C (GRACE FO) |
| 804 | 804 | 804 | GRACE D (GRACE FO) |
| 810 | 810 | 810 | COMS-1 |
| 811 | 811 | 811 | COMS-2 |
| 812 | 812 | 812 | SCISAT-1 |
| 813 | 813 | 813 | ODIN |
| 820 | 820 | 820 | SAC-C |
| 821 | 821 | 821 | SAC-D |
| 825 | 825 | 825 | KOMPSAT-5 |
| 850 | 850 | 850 | Combination of TERRA and AQUA |
| 851 | 851 | 851 | Combination of NOAA 16 to NOAA 19 |
| 852 | 852 | 852 | Combination of Metop-1 to Metop-3 |
| 853 | 853 | 853 | Combination of METEOSAT and DMSP |
| 854 | 854 | 854 | Non-specific mixture of geostationary and low Earth-orbiting satellites |
| 855 | 855 | 855 | Combination of INSAT 3D and INSAT 3DR |
| 870–998 | 870–998 | 870–998 | Reserved |
| 999 Missing value | 999–1022 | 999–65534 | Reserved |
| | 1023 | 65535 | Missing value |

Note: Within the ranges 000 to 849 and 870 to 998, even deciles indicate polar-orbiting satellites and odd deciles indicate geostationary satellites. The range from 850 to 869 shall be used to indicate combinations of satellites, so the aforementioned decile rule does not apply to values in this range.

**COMMON CODE TABLE C–6:** ***List of international units***

(Used only in Volume I.2, Parts B and C)

**COMMON CODE TABLE C–7:** ***Tracking technique/status of system used***

Common Code table { Code table 3872 – $s_a s_a$ for alphanumeric codes
Code table 0 02 014 in BUFR

| Code figure for $s_a s_a$ | Code figure for BUFR (Code table 0 02 014) | |
|---|---|---|
| 00 | 0 | No windfinding |
| 01 | 1 | Automatic with auxiliary optical direction finding |
| 02 | 2 | Automatic with auxiliary radio direction finding |
| 03 | 3 | Automatic with auxiliary ranging |
| 04 | 4 | Not used |
| 05 | 5 | Automatic with multiple VLF-Omega signals |
| 06 | 6 | Automatic cross chain Loran-C |
| 07 | 7 | Automatic with auxiliary wind profiler |
| 08 | 8 | Automatic satellite navigation |
| 09–18 | 9–18 | Reserved |
| 19 | 19 | Tracking technique not specified |
| | | TRACKING TECHNIQUES/STATUS OF ASAP SYSTEM |
| | | STATUS OF SHIP SYSTEM |
| 20 | 20 | Vessel stopped |
| 21 | 21 | Vessel diverted from original destination |
| 22 | 22 | Vessel’s arrival delayed |
| 23 | 23 | Container damaged |
| 24 | 24 | Power failure to container |
| 24–28 | 25–28 | Reserved for future use |
| 29 | 29 | Other problems |
| | | SOUNDING SYSTEM |
| 30 | 30 | Major power problems |
| 31 | 31 | UPS inoperative |
| 32 | 32 | Receiver hardware problems |
| 33 | 33 | Receiver software problems |
| 34 | 34 | Processor hardware problems |
| 35 | 35 | Processor software problems |
| 36 | 36 | NAVAID system damaged |
| 37 | 37 | Shortage of lifting gas |
| 38 | 38 | Reserved |
| 39 | 39 | Other problems |
| | | LAUNCH FACILITIES |
| 40 | 40 | Mechanical defect |
| 41 | 41 | Material defect (hand launcher) |
| 42 | 42 | Power failure |
| 43 | 43 | Control failure |

| Code figure for $s_a s_a$ | Code figure for BUFR (Code table 0 02 014) | |
|---|---|---|
| 44 | 44 | Pneumatic/hydraulic failure |
| 45 | 45 | Other problems |
| 46 | 46 | Compressor problems |
| 47 | 47 | Balloon problems |
| 48 | 48 | Balloon release problems |
| 49 | 49 | Launcher damaged |
| | | DATA ACQUISITION SYSTEM |
| 50 | 50 | R/S receiver antenna defect |
| 51 | 51 | NAVAID antenna defect |
| 52 | 52 | R/S receiver cabling (antenna) defect |
| 53 | 53 | NAVAID antenna cabling defect |
| 54–58 | 54–58 | Reserved |
| 59 | 59 | Other problems |
| | | COMMUNICATIONS |
| 60 | 60 | ASAP communications defect |
| 61 | 61 | Communications facility rejected data |
| 62 | 62 | No power at transmitting antenna |
| 63 | 63 | Antenna cable broken |
| 64 | 64 | Antenna cable defect |
| 65 | 65 | Message transmitted power below normal |
| 66–68 | 66–68 | Reserved |
| 69 | 69 | Other problems |
| 70 | 70 | All systems in normal operation |
| 71–98 | 71–98 | Reserved |
| 99 | 99 | Status of system and its components not specified |
| Not available | 100–126 | Reserved |
| Not available | 127 | Missing value |

## ATTACHMENT II

# LIST OF ALPHANUMERIC CODE TABLES RELATED TO BUFR TABLE B

| Related specification/code table/ regulation/code form in alphanumeric codes | BUFR code/flag table | Remarks |
|---|---|---|
| A — Code table 0101 | 0 20 063 | — |
| $A_N$ — Code table 0114 | 0 02 169 | — |
| $A_a$ — Code table 0131 | 0 23 001 | — |
| $A_c$ — Code table 0133 | 0 23 005 | — |
| $A_e$ — Code table 0135 | 0 23 006 | — |
| $A_1$ — Code table 0161 | 0 01 003 | — |
| $A_3$ — Code table 0163 | 0 20 063 | — |
| AA — Code table 0177 | 0 23 002 | — |
| a — Code table 0200 | 0 10 063 | — |
| $a_4$ — Code table 0265 | 0 02 003 | — |
| $B_A$ — Code table 0302 | 0 11 031 | — |
| $B_T$ — Code table 0324 | 0 23 003 | — |
| $B_tB_t$ — Code table 0370 | 0 02 149 | — |
| $b_i$ — Code table 0439 | 0 20 035 | — |
| C — Code table 0500 | 0 20 012 | — |
| $C_H$ — Code table 0509 | 0 20 012 | — |
| $C_L$ — Code table 0513 | 0 20 012 | — |
| $C_M$ — Code table 0515 | 0 20 012 | — |
| $C_a$ — Code table 0531 | 0 20 136 | — |
| $C_c$ — Code table 0533 | 0 20 063 | — |
| $C_t$ — Code table 0552 | 0 20 017 | — |
| $C_0$ — Code table 0561 | 0 20 136 | — |
| $c_i$ — Code table 0639 | 0 20 034 | — |
| $D_s$ — Code table 0700 | 0 25 041 | — |
| E — Code table 0901 | 0 20 062 | — |
| $E_c$ — Code table 0933 | 0 23 007 | — |
| $E_e$ — Code table 0935 | 0 23 018 | — |
| $E_s$ — Code table 0943 | 0 23 008<br>0 23 009 | — |
| E´ — Code table 0975 | 0 20 062 | — |
| $F_t$ — Code table 1152 | 0 08 011 | — |
| $F_1F_2$ — Common Code table C–1 | 0 01 033 | — |
| $F_3F_3F_3$ — Common Code table C–1 | 0 01 033 | — |
| $F_4F_4F_4$ | 0 01 034 | To be specified |
| $g_rg_r$ — Code table 1487 | 0 29 001 | — |
| $I_n$ — Code table 1743 | 0 23 032 | — |
| $I_s$ — Code table 1751 | 0 20 033 | — |
| $I_3$ | 0 02 021 | — |
| $I_4$ — Code table 1765 | 0 02 022 | — |
| $I_6I_6I_6$ — Common Code table C-5 | 0 01 007 | — |
| $I_XI_XI_X$ — Code table 1770 | 0 22 067 | Defined in Common Code table C–3 |
| i — Code table 1800 | 0 11 031 | — |
| $i_E$ — Code table 1806 | 0 02 004 | — |

| Related specification/code table/ regulation/code form in alphanumeric codes | BUFR code/flag table | Remarks |
|---|---|---|
| $i_u$ — Code table 1853 | 0 02 001 | — |
| $i_y$ — Code table 1857 | 0 02 051 | — |
| $I_X$ — Code table 1860 | 0 02 001* | — |
| $k_1$ — Code table 2262 | 0 02 032 | Numerical variation in each table |
| $k_2$ — Code table 2263 | 0 02 033 | — |
| $k_3$ — Code table 2264 | 0 02 031 | — |
| $k_4$ — Code table 2265 | 0 02 031 | — |
| $k_5$ — Code table 2266 | 0 02 030 | — |
| $k_6$ — Code table 2267 | 0 02 040 | — |
| N — Code table 2700 | 0 20 011 | — |
| $N_m$ — Code table 2745 | 0 20 136 | — |
| $N_t$ — Code table 2752 | 0 20 136 | — |
| $N_v$ — Code table 2754 | 0 20 136 | — |
| $n_3$ — Code table 2863 | 0 20 137 | — |
| $P_a$ — Code table 3131 | 0 23 004 | — |
| $Q_A$ — Code table 3302 | 0 33 027 | — |
| $Q_z$ — Code table 3318 | 0 25 086 | — |
| $R_c$ — Code table 3533 | 0 24 003 | — |
| $R_d$ — Code table 3534 | 0 13 051 | — |
| $R_e$ — Code table 3535 | 0 23 016 | — |
| $R_p$ — Code table 3548 | 0 23 031 | — |
| $R_s$ — Code table 3551 | 0 20 032 | — |
| $r_ar_a$ — Code table 3685 (0–89) | 0 02 011 | Defined in Common Code table C–2 |
| $r_ar_a$ — Code table 3685 (91–95) | 0 02 015 | Defined in Common Code table C–2 |
| S — Code table 3700 | 0 22 061 | — |
| $S_i$ — Code table 3739 | 0 20 037 | — |
| $S_0$ — Code table 3761 | 0 20 063 | — |
| $S_PS_Ps_ps_p$ — Code table 3778 | 0 20 063 | To be developed |
| $s_p$ — Code table 3847 | 0 13 041 | — |
| $s_q$ — Code table 3848 | 0 20 063 | — |
| $s_r$ — Code table 3849 | 0 02 013 | — |
| $s_s$ — Code table 3850 | 0 02 038 | — |
| $s_w$ — Code table 3855 | 0 02 039 | — |
| $s_1$ — Code table 3866 | 0 02 061 | — |
| $s_2$ — Code table 3867 | 0 02 062 | — |
| $s_as_a$ — Code table 3872 | 0 02 014 | Defined in Common Code table C–7 |
| $T_w$ — Code table 3955 | 0 20 063 | — |
| $v_s$ — Code table 4451 | 0 25 042 | — |
| $W_{a1}$ — Code table 4531 | 0 20 004 | — |
| $W_{a2}$ — Code table 4531 | 0 20 005 | — |
| $W_1$ — Code table 4561 | 0 20 004 | — |
| $W_2$ — Code table 4561 | 0 20 005 | — |
| $w_i$ — Code table 4639 | 0 02 023 | — |
| ww — Code table 4677 | 0 20 003* | — |
| $w_aw_a$ — Code table 4680 | 0 20 003* | — |
| $w_1w_1$ — Code table 4687 | 0 20 003* | — |

* See note at end of Attachment II.

| Related specification/code table/ regulation/code form in alphanumeric codes | BUFR code/flag table | Remarks |
|---|---|---|
| $X_RX_R$ — Code table 4770 | 0 22 068 | Defined in Common Code table C–4 |
| $X_tX_t$ — Code table 4780 | 0 02 034 | — |
| $Z_0$ — Code table 5161 | 0 20 063 | — |
| $z_i$ — Code table 5239 | 0 20 036 | — |
| AMDAR — Regulation 42.2 | 0 08 004 | — |
| SYNOP/SHIP — Regulation 12.4.10.1 | 0 08 002 | — |
| TEMP/TEMP SHIP — Sections 2 to 6 | 0 08 001 | — |

**Note: Encoding/decoding of SYNOP/SHIP $i_x$ — Code table 1860** **to/from BUFR code tables**

| Code figure | Type of station operation | 0 02 001 Type of station | 0 20 003 Present weather |
|---|---|---|---|
| 1 | Manned station (group $7wwW_1W_2$ included)<br>(but actually missing) | 1<br>(1) | 00–99 (200–299)<br>(510) |
| 2 | Manned station (group 7ww $W_1W_2$ omitted, no significant phenomenon to report) | 1 | 508 |
| 3 | Manned station (group 7ww $W_1W_2$ omitted, no observation, data not available) | 1 | 509 |
| 4 | Automatic station (group 7ww $W_1W_2$ included, using Code tables 4677 and 4561)<br>(but actually missing) | 0<br>(0) | 00–99 (200–299)<br>(510) |
| 5 | Automatic station (group $7w_aw_aW_{a1}W_{a2}$ omitted, no significant phenomenon to report) | 0 | 508 |
| 6 | Automatic station (group $7w_aw_aW_{a1}W_{a2}$ omitted, no observation, data not available) | 0 | 509 |
| 7 | Automatic station (group $7w_aw_aW_{a1}W_{a2}$ included, using Code tables 4680 and 4531)<br>(but actually missing) | 0<br>(0) | 100–199 (200–299)<br>(510) |

# ATTACHMENT III

# INTERNATIONAL SEISMIC CODE

## INTRODUCTION

The 1985 version of the *International Seismic Code* has been developed by an international working group. Although quite a few new features have been added, *upward compatibility* with the previous code has been maintained – the previous code is a subset of this 1985 version. That is to say, the new version does not make any of the features of the old version obsolete but simply increases the scope of data types that can be transmitted. If a data contributor does not wish to include any of the newly reportable items, the old version may be used without having to violate the format of this new version.

This version of the seismic code consists of three parts:

1. **Code form**. A precise description of the syntax using a modification of a widely used *metalanguage* – a set of symbols and words used to describe another language (in which these symbols do not appear). This metalanguage is fully defined and illustrated in the last section of this introduction.
2. **Definitions and usage** . A supplement to the code form in which various codes are defined, expanded explanations are given, and usage and scaling criteria are discussed.
3. **Examples**. Sample messages, exercising nearly the full range of parameters defined by the code, are given.

Among the various agencies receiving seismic data in the telegraphic format, few may wish to receive, or be prepared to process, all of the types of data and messages that can be sent with the new seismic code. These agencies should communicate their precise needs to their traditional contributors in order to avoid confusion and processing problems.

*Stations contributing data to agencies such as the ISC, the United States Geological Survey's NEIC or other international data centres are advised NOT to send ANY of the types of data newly permitted by the 1985 version NOR to implement ANY of the new formats until they have been notified by the recipient to do so.*

The seismic code is intended for transmittal via any telegraphic circuit employing CCITT *International Alphabets Nos. 2 and 5* and it is also the format in which computer-to-computer transfers of such seismic data take place. However, there is one internal heading field that should be used only by those sending via the WMO/GTS circuits. Also, WMO advises that the maximum length of the text of a seismic message is about 2100 characters for transmission on the GTS.

### BACKUS-NAUR FORM

In order to precisely describe the syntax of the International Seismic Code a widely used *metalanguage*, known as *Backus-Naur Form* (*Backus Normal Form* or *BNF*), has been employed in a modified form – using BNF, syntactically valid sequences of symbols have been specified.

BNF consists of the four symbols (*metacharacters*) "⟨", "⟩", "|" and "::=" together with *terminal* and *non-terminal* symbols. Non-terminal symbols, *metalinguistic variables* (or *metanames*) are enclosed in *angle-brackets* "⟨⟩" and are used to define the components of the seismic code. The values of these metanames are chosen so as to suggest their semantics. Terminal symbols appear outside the angle-brackets and denote themselves – thus they are characters that actually appear in the seismic code. The vertical stroke "|" has the meaning "or" and the metacharacter "::=" means "is defined as". Juxtaposition of terms implies concatenation – any sequence of terminal symbols and metanames implies linking together in a series.

The seismic code is herein initially defined in terms of four components, two terminal symbols (SEISMO and STOP) and the metanames ⟨standard delimiter⟩ and ⟨text⟩. These metanames and each metaname introduced thereafter are then defined by their components until each is reduced to the terminal symbols found in the seismic code. The components designating the seismic code have been chosen and expanded so as to make the BNF definition *context-free.* In a context-free grammar, any occurrence of a particular metavariable may be replaced by one of its alternative values, irrespective of the other elements in the language.

For an example, here is how the original BNF definition of an integer was developed:

⟨integer⟩::=⟨unsigned integer⟩ | +⟨unsigned integer⟩ | –⟨unsigned integer⟩ (1)

⟨unsigned integer⟩::=⟨digit⟩ | ⟨unsigned integer⟩⟨digit⟩ (2)

⟨digit⟩::=0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | (3)

By introducing braces "{}" with indices into the notation, (1) can be written as:

⟨integer⟩::={+ | –}$_0^1$ ⟨unsigned integer⟩ (4)

and the recursive definition (2) can be written as:

⟨unsigned integer⟩::={⟨digit⟩}$_1^n$ (5)

where $n$ = number of digits in the integer.

By combining (4) and (5) we can replace (1) and (2) with (6):

⟨integer⟩::={+ | –}$_0^1${⟨digit⟩}$_1^n$ or ⟨integer⟩::=[+ | –]{⟨digit⟩}$_1^n$ (6)

Here, the braces represent repeated concatenation of the object within the braces with itself and the indices specify the upper and lower bounds of the number of repetitions.

A subscript of zero indicates that the enclosed item is not required (*optional*). The frequently encountered optional case with a superscript of 1 will be written as [...] rather than {...}$_0^1$ as shown in (6) above. A superscript without a subscript is used to indicate a *required* number of repetitions.

Terminal and non-terminal symbols are considered *optional*, either if their inclusion is entirely a matter of choice or preference or else if their use is *required* because of circumstances or the inclusion of related optional data. For example, ⟨date⟩ is frequently shown as optional [⟨date⟩] simply because it is *required* with the initial occurrence of the group in which it is included and is only *required* thereafter when its value changes. If a required non-terminal group consists only of optional components, then at least one such component must be chosen.

Braces without indices will be used to group terms in a sequence. Parentheses inside angle-brackets "⟨(...)⟩" will occasionally be used to define a non-terminal symbol in plain language, where continued decomposition will not lead to greater clarity.

## CODE FORM

⟨code form⟩::=SEISMO⟨standard delimiter⟩⟨text⟩STOP

⟨standard delimiter⟩::=⟨b⟩::={(space) | (return) | (line feed)}$_1^n$

The ⟨standard delimiter⟩ is used to separate groups and subgroups. As it consists of any number or combinations of spaces, carriage-returns and line-feeds, it also serves to indicate where lines of code may be broken. Henceforth this delimiter is indicated by ⟨b⟩ and is shown only where required. Only single spaces are permitted in certain other positions which will be illustrated in the examples.

⟨text⟩::=[⟨message heading⟩]{⟨administrative messages⟩ | ⟨seismic data⟩}$_1^2$

### MESSAGE HEADING

⟨message heading⟩::=[⟨content designator⟩]⟨message number⟩[⟨originator⟩]

⟨content designator⟩::=GSE⟨gse code⟩⟨b⟩

⟨gse code⟩::=CR | DC | FB | NC | PA | PL | RP | RR | ST | XY (Refer to Definitions and usage)

⟨message number⟩::=N⟨last digit of year⟩⟨nnn⟩⟨b⟩

⟨last digit of year⟩::=0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

⟨nnn⟩::=001 | 002 | 003...999

⟨nnn⟩ is the ordinal number from the first seismic message of the calendar year.

⟨originator⟩::=⟨([⟨gse test⟩]⟨message centre⟩[⟨transmission time⟩])⟩

⟨originator⟩ ought to be included only in those messages sent via the Global Telecommunication System (GTS) of the World Meteorological Organization (WMO).

⟨gse test⟩::=GSE⟨(value to be specified by GSE for each *ad hoc* test)⟩

⟨message centre⟩::=⟨(WMO GTS group TTAAii)⟩⟨b⟩

⟨transmission time⟩::=[19]⟨yymmdd⟩⟨b⟩⟨hhmm⟩⟨b⟩ (See Definitions and usage)

⟨yymmdd⟩::=⟨(6-digit year-month-day)⟩

⟨hhmm⟩::=⟨(4-digit hour-minute)⟩

## ADMINISTRATIVE MESSAGES

⟨administrative messages⟩::={(((free form and contents)))⟨b⟩$\}_0^n$

*n* = number of separate messages

## SEISMIC DATA FORMAT OPTIONS

⟨seismic data⟩::={⟨single-station group form⟩$\}_1^s$ | ⟨net-event group form⟩

*s* = number of stations reported

### DATA ARRANGED BY STATION

⟨single-station group form⟩::=⟨station⟩[⟨report times⟩][⟨status code⟩][⟨process code⟩][⟨magnification⟩]
{[⟨date⟩]{⟨station-event⟩ | ⟨delimited station-event⟩}$\}_1^e$

*e* = number of events reported

### DATA ARRANGED BY SEISMIC EVENT

⟨net-event group form⟩::={⟨station⟩⟨report times⟩$\}_0^s$[⟨status code⟩][⟨process code⟩][channel]{⟨net-event⟩ |
⟨delimited net-event⟩$\}_1^e$

*e* = number of net-events reported

⟨net-event⟩::={[⟨date⟩]{⟨station⟩[⟨process code⟩][⟨magnification⟩]{⟨station-event⟩ | ⟨delimited station-event⟩} |
[⟨net⟩]⟨computations⟩}$\}_1^n$

*n* = number of stations reported
(add 1 to *n* if a ⟨computations⟩ group is included)

⟨delimited net-event⟩::=BEGEV⟨b⟩⟨net-event⟩ENDEV

The content of a ⟨net-event⟩ never requires that the event be delimited. Whether or not an event is given as a ⟨delimited net-event⟩ may depend strictly on the preference of the sender or receiver.

⟨station-event⟩::=[⟨first-arrival phase group⟩]{⟨secondary phase group⟩$\}_0^n$ [⟨LP surface-wave group⟩]
[⟨old surface-wave group⟩][⟨event class⟩][⟨local magnitude data⟩][⟨comments⟩]

*n* = number of secondary phases reported

⟨delimited station-event⟩::=/⟨b⟩⟨station event⟩⟨b⟩/[⟨b⟩]

A ⟨station-event⟩ must be enclosed in *solidi* whenever its ⟨first-arrival phase group⟩ is either absent or contains more than one ⟨1st phase code⟩. A single *solidus* (/) cannot serve as both an ending and beginning delimiter when two delimited station-events are adjacent. Two must separate the two station-events.

⟨computations⟩::={⟨hypocentre⟩ | ⟨magnitude⟩ | ⟨moment⟩$\}_1^n$

## PARAMETERS

The following parameters, once established, remain in effect until changed. All dates and times are UTC.

⟨station⟩::=[:]⟨(3–5 character station abbreviation)⟩⟨b⟩

⟨net⟩::=[:]⟨(3–5 character network abbreviation)⟩⟨b⟩

A colon (:) must be prefixed to a station or net abbreviation whenever the abbreviation is identical to a phase code or symbolic identifier used in the *International Seismic Code.*

⟨report times⟩::={⟨begin⟩⟨end⟩}{⟨out⟩⟨to⟩$\}_0^n$

⟨report times⟩ may not be set within a ⟨net-event⟩.

⟨beg⟩: :=BEG⟨b⟩⟨month⟩⟨day⟩⟨b⟩⟨hhmmss⟩⟨b⟩

⟨end⟩: :=END⟨b⟩⟨month⟩⟨day⟩⟨b⟩⟨hhmmss⟩⟨b⟩

⟨out⟩: :=OUT⟨b⟩⟨channels⟩⟨b⟩⟨month⟩⟨day⟩⟨b⟩⟨hhmmss⟩⟨b⟩

⟨channels⟩: :={⟨instrument class⟩⟨components⟩ | ALL}⟨b⟩

⟨instrument class⟩: :=SP | LP | MP | BP | UP

⟨components⟩: :=Z | ZN | ZNE | ZE | N | NE | E

⟨to⟩: :=TO⟨b⟩⟨month⟩⟨day⟩⟨b⟩⟨hhmmss⟩⟨b⟩

⟨hhmmss⟩: :=⟨(6-digit hour-minute-second)⟩

⟨date⟩: :=[⟨year⟩]⟨month⟩⟨day⟩⟨b⟩

⟨year⟩: :=YR19⟨(2-digit year)⟩⟨b⟩

⟨month⟩: :=JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC

⟨day⟩: :=01 | 02 | 03...31

⟨status code⟩: :=STAT{P | F}⟨b⟩

P = message contains preliminary interpretations and/or computations

F = message contains final interpretations and/or computations

The ⟨status code⟩ cannot be changed within a ⟨net-event⟩. It should be used especially by those contributors sending preliminary interpretations and then sending revisions and more complete interpretations later. Any data which are not the first set of interpretations for a reporting period for a given station are considered final.

⟨process code⟩: :=PROC{A | D | G}⟨b⟩ (Refer to Definitions and usage)

The following parameter, once established, remains in effect only until a station abbreviation is encountered.

⟨magnification⟩: :=[TRACE | GRND]{⟨SPZ magnification⟩ | ⟨SPH magnification⟩ |
⟨LPZ magnification⟩ | ⟨LPH magnification⟩}$_0^4$

If *double* trace amplitudes are included in the current station's data, inclusion of TRACE is *strongly recommended,* prefixing the *required* relevant channel magnification(s).

If all of the amplitudes reported for the current station are *ground* amplitudes, the sender *may choose* to include the channel magnification(s) *for informational purposes only.* If so, GRND is *required.*

See also under Definitions and usage for detailed discussion.

⟨SPZ magnification⟩: :=⟨mk⟩K[C]

⟨SPH magnification⟩: :=⟨mk⟩H[C]

⟨mk⟩: :=⟨(magnification of SPZ or SPH instruments in thousands)⟩

⟨LPZ magnification⟩: :=⟨m⟩M[C]

⟨LPH magnification⟩: :=⟨m⟩J[C]

⟨m⟩: :=⟨(magnification of LPZ or LPH instruments)⟩

The horizontal magnifications are required only if they differ from their respective vertical magnifications. The optional C is used to confirm that the indicated magnification represents a change from that previously reported by this station, for this component.

The following parameter (⟨channel⟩) is used to indicate the instrument type (*class*) and component from which a phase and its associated measurements were obtained. ⟨channel⟩ may be changed within a ⟨station-event⟩ as often as necessary. However, once established (either explicitly or by default) within a ⟨station-event⟩, it remains in effect until changed or until the next ⟨station-event⟩ is encountered.

Since, within a given message, the overwhelming majority of the first phases reported within a ⟨station-event⟩ will begin with data from the same ⟨channel⟩, a method of indicating this ⟨channel⟩ without repeating the value of ⟨channel⟩ with each ⟨station-event⟩ is available. This *default* value is established using the optional symbol "DEFAULT" as indicated below, with the first ⟨channel⟩ appearing in the message. This *default* may be reset to a new value if necessary. This default value may be overridden for a given first phase reported within a ⟨station-event⟩ by simply including the correct ⟨channel⟩ value; the default value will be resumed with the next ⟨station-event⟩ not beginning with ⟨channel⟩.

If no ⟨channel⟩ is given within the message, its value will be considered “unknown” unless implied by amplitudes available with the previous version of the seismic code.

⟨channel⟩::=⟨instrument class⟩⟨component⟩⟨b⟩[DEFAULT⟨b⟩]

⟨instrument class⟩::=⟨(*See above under* ⟨report times⟩)⟩

⟨component⟩::=Z | N | E

Z = vertical, N = north-south, E = east-west

## BASIC SEISMIC DATA

The data covered in this section are obtained from both body and surface-wave recordings. In general, only their syntax is given here. For a complete discussion of all the groups relating to periods and amplitudes, refer also to the Definitions and usage section.

As used in this specification of the seismic code, the term long-period (LP) is a generic term applied to data from intermediate-period (MP), broad-band (BP) and ultra long-period (UP) recordings as well as data from long-period recordings *per se.* This terminology is used herein simply to indicate that the forms and groups that accommodate long-period data *per se* are used for MP, BP and UP data as well. However, the appropriate specific ⟨channel⟩ designators must be used in these various LP groups.

### SCALING TIMES

⟨arrival time⟩::=[⟨2-digit hour⟩]⟨2-digit minute⟩⟨seconds⟩

⟨2-digit hour⟩::=00 | 01 | 02...23

The hour is required for the first ⟨arrival time⟩ reported within any ⟨station-event⟩ and whenever the hour changes within a ⟨station-event⟩.

⟨2-digit minute⟩::=00 | 01 | 02...59

⟨seconds⟩::={⟨digit⟩}$^{2}$[.][⟨digit⟩] | {⟨digit⟩}$^{2}$.{⟨digit⟩}$^{2}$

⟨arrival time⟩ must be given to at least the nearest whole second. Usually it is given to the nearest tenth of a second when taken from SPZ. In either case the decimal point “.” is optional, but *recommended.* However, if given to hundredths of a second, the decimal point *must* be included.

⟨seconds⟩ should be quoted only to the precision actually obtained in scaling. However, in dealing with surface waves, the seconds may be filled with one or two zeros, if reasonable. Arrival times scaled from most long-period seismograms will generally not be legible to a precision closer than one second. However, they may be given to a closer precision whenever it is obtainable.

A sixty-first second may be included when the scaling falls within a leap second.

⟨zero-crossing amplitude scaling time⟩::=⟨(Use the same rules that apply to ⟨arrival time⟩)⟩

This time is measured where the trace crosses the equilibrium point between the peak and trough that comprise the cycle whose amplitude was obtained.

### PHASE CODES

The ⟨2nd phase code⟩ has been expanded to six characters. The clarity is *not* included in this limit.

Phases pP, pwP, pPcP, pPP, pS, etc. are encoded as AP, AWP, APCP, APP, AS, etc.; and sP, sPcP, sS, sSKS, etc. are encoded as XP, XPCP, XS, XSKS, etc.

The T-phase is encoded as TT to avoid confusion with T used as a symbolic prefix for periods.

Phase PKPPKPPKP (P´P´P´) is encoded as RRPKP, likewise PKPPKP (P´P´) is encoded as either PKPPKP or RPKP.

P´ and P* are alternative phase code designators for PKP and PB respectively. They are acceptable to computers processing seismic data, and may thus be exchanged by computer links or by air mail. However, “´” and “*” are generally not available to teletype circuits, so PKP and PB are the codes for teletype transmission even if the originator’s circuit is capable of sending either “´” or “*”.

### CLARITY OR ONSET QUALITY

⟨clarity⟩::=I | E | Q   (See Definitions and usage)

⟨clarity⟩ is required if phase code is absent from a secondary phase.

### PERIODS AND AMPLITUDES

⟨amplitude⟩

The amplitude units are not expressly given in a telegraphic message, but are implied by the channel from which they were scaled and the presence or absence of a corresponding magnification field. A decimal point must be included in every amplitude value.

⟨period⟩

A decimal point must be included in every period value except in the long-period surface-wave groups and the ⟨10–30 second noise⟩ group.

⟨LP maximum amplitude⟩::=XM[⟨(zero-crossing amplitude scaling time)⟩]⟨b⟩
T⟨period⟩[G]A⟨amplitude⟩⟨b⟩

An LP maximum amplitude can be scaled for any phase. Occasionally, this amplitude may also meet the criteria for the reporting of one of the several GSE amplitude groups. If a contributor is committed to supplying both groups but wishes to avoid duplication in this case, he may do so by using the optional "M" provided in the Rayleigh wave period-range designator of the ⟨gse Rayleigh amplitudes⟩ group and omitting the ⟨LP maximum amplitude⟩ group.

⟨SP maximum amplitude⟩::=XM[⟨(zero-crossing amplitude scaling time)⟩]⟨b⟩
T⟨period⟩[G]A⟨amplitude⟩⟨b⟩

An SP maximum amplitude can be scaled for any body wave and the Lg phase. Occasionally, this amplitude may also meet the criteria for the reporting of one of the several GSE amplitude groups. If a contributor is committed to supplying both groups but wishes to avoid duplication in this case, he may do so by using the optional "M" provided in the P-coda interval-time designator of the gse SPZ first-arrival amplitudes group. Frequently, the SP maximum amplitude, scaled from recordings of intermediate or deep focus events, will be found in the first few cycles. When this situation occurs, report the amplitude in the SP maximum amplitude group, or, if reporting ⟨gse SPZ first-arrival amplitudes⟩, report it as an XAM prefixed group.

### FIRST MOTIONS

⟨first motion⟩::=FM[⟨SP 1st-motion(s)⟩][,⟨LP 1st-motion(s)⟩]

⟨SP 1st-motion(s)⟩::=[C | D][N | S][E | W]

⟨LP 1st-motion(s)⟩::=[C | D][N | S][E | W]

The short-period first-motion code(s), if any, are appended to the symbolic prefix FM. The long-period first-motion code(s), if any, together with their prefixed comma are appended to the ⟨SP 1st-motion(s)⟩ if it exists, or else directly to the FM. The comma (,) is *required* whenever LP first-motion codes are given.

Long-period, intermediate-period, broad-band or ultra long-period are indicated by the ⟨channel⟩ value. If a first-motion group included in any SP channel contains first-motion codes to the right of the comma, they are simply considered generic LP first motions. Whenever LP, MP, BB or UP first motions are included in a first-motion group, a preceding comma is required.

## FIRST-ARRIVAL PHASE GROUP

⟨first-arrival phase group⟩::=[⟨SP first-arrival phase group⟩]
[⟨LP first-arrival phase group⟩]

### SHORT-PERIOD DATA

⟨SP first-arrival phase group⟩:: =[⟨SPZ 1st phase group⟩]{⟨SPH 1st phase group⟩}$_0^2$

⟨SPZ 1st phase group⟩::=[⟨channel⟩]⟨1st phase group⟩⟨arrival-time⟩[⟨first motion⟩]
[⟨SPZ amplitudes⟩][⟨gse SPZ first-arrival amplitudes⟩]
[⟨SPZ noise⟩][⟨slowness⟩][⟨complexity⟩]
[⟨station scalar moment⟩]

⟨SPZ amplitudes⟩::=[⟨1st few cycles amplitude⟩][⟨SP maximum amplitude⟩]

⟨1st few cycles amplitude⟩::=T⟨period⟩[G]A⟨amplitude⟩⟨b⟩

⟨gse SPZ first-arrival amplitudes⟩::={X⟨t⟩⟨zero-crossing amplitude scaling time⟩
T⟨period⟩A⟨amplitude⟩}$_{1}^{4}$

⟨t⟩::={A | B | C | D}[M] These are the P-coda interval-time designators.

The optional “M” may be used when the associated amplitude also meets the criteria of the ⟨SP maximum amplitude⟩ to avoid reporting under both categories.

⟨SPZ noise⟩::=NT⟨period⟩A⟨amplitude⟩⟨b⟩

⟨complexity⟩::=CPX⟨(complexity value)⟩⟨b⟩

⟨station scalar-moment⟩::=SM⟨mantissa⟩⟨exponent⟩ (newton-m.)

⟨mantissa⟩::=.{⟨digit⟩}$_{2}^{3}$⟨b⟩

⟨exponent⟩::=E{⟨digit⟩}$^{2}$⟨b⟩

⟨SPH 1st phase group⟩::=[⟨channel⟩][⟨1st phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨SP maximum amplitude⟩]

where ⟨channel⟩ value is SPN or SPE and will usually be required.

## LONG-PERIOD DATA

⟨LP first-arrival phase group⟩::=[⟨LPZ 1st phase group⟩]{⟨LPH 1st phase group⟩}$_{0}^{2}$

⟨LPZ 1st phase group⟩::=[⟨channel⟩][⟨1st phase group⟩][⟨arrival time⟩][⟨first motion⟩]
[⟨LP maximum amplitude⟩][⟨LPZ noise⟩][⟨slowness⟩]

where ⟨channel⟩ value is LPZ, MPZ, BPZ or UPZ.

⟨LPZ noise⟩::=⟨1 minute before P noise⟩⟨10-30 second noise⟩

⟨1 minute before P noise⟩::=NAT⟨period⟩A⟨amplitude⟩⟨b⟩

⟨10–30 second noise⟩::=NBT⟨period⟩A⟨amplitude⟩⟨b⟩

⟨LPH 1st phase group⟩::=[⟨channel⟩][⟨1st phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨LP maximum amplitude⟩]

where ⟨channel⟩ value is LPN, MPN, BPN, UPN, LPE, MPE, BPE or UPE.

## ELEMENTS COMMON TO SHORT-PERIOD AND LONG-PERIOD GROUPS

⟨1st phase group⟩::=[⟨clarity⟩]⟨1st phase code⟩[⟨appended first-motion⟩]

⟨1st phase code⟩::=P | PN | PB | PG | PLOC | UNK | PKP | PDIF

⟨appended first-motion⟩::=C | D | U | R | CU | CR | DU | DR

Available only with vertical channels when ⟨first motion⟩ is not used anywhere in ⟨first-arrival phase group⟩.

⟨slowness⟩::=SLO⟨(slowness value)⟩⟨b⟩AZ⟨(azimuth)⟩⟨b⟩

Slowness is given to a precision of 0.1 s deg.$^{-1}$; decimal point required when given to such precision. Azimuth may be given to a precision of up to 0.1 deg.; decimal point required.

*The* N *and* E *channel data may appear in either order. The first channel reported for any phase must include the phase code (and/or clarity) and, except for long-period surface-wave groups, the arrival time. Arrival times may be given for each channel reported for a phase and need not be identical, but must be preceded by the phase code. More than one channel cannot be given for a secondary phase identified only by its clarity, otherwise it would be indistinguishable from a succeeding phase so identified.*

## SECONDARY PHASE GROUP

⟨secondary phase group⟩::=[⟨SP secondary phase group⟩]
[⟨LP secondary phase group⟩]

### SHORT-PERIOD DATA

⟨SP secondary phase group⟩::=[⟨SPZ 2nd phase group⟩]{⟨SPH 2nd phase group⟩}$_{0}^{2}$

⟨SPZ 2nd phase group⟩::=[⟨channel⟩][⟨2nd phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨SP maximum amplitude⟩]

⟨SPH 2nd phase group⟩::=[⟨channel⟩][⟨2nd phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨SP maximum amplitude⟩]
[⟨gse SPH S-wave amplitude⟩]

⟨gse SPH S-wave amplitude⟩::=XA[M]⟨zero-crossing amplitude scaling time⟩⟨b⟩
T⟨period⟩A⟨amplitude⟩⟨b⟩

available only if phase code is “S”. The optional “M” is used to indicate that the amplitude also meets the criteria of the ⟨SP maximum amplitude⟩.

### LONG-PERIOD DATA

⟨LP secondary phase group⟩::=[⟨LPZ 2nd phase group⟩]{⟨LPH 2nd phase group⟩}$_{0}^{2}$

⟨LPZ 2nd phase group⟩::=[⟨channel⟩][⟨2nd phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨LP maximum amplitude⟩]

⟨LPH 2nd phase group⟩::=[⟨channel⟩][⟨2nd phase group⟩][⟨arrival time⟩]
[⟨first motion⟩][⟨LP maximum amplitude⟩]
[⟨gse LPH S-wave amplitude⟩]

⟨gse LPH S-wave amplitude⟩:: =XA[M]⟨zero-crossing amplitude scaling time⟩⟨b⟩
T⟨period ⟩A⟨amplitude⟩⟨b⟩

available only if phase code is “S”. The optional “M” is used to indicate that the amplitude also meets the criteria of the ⟨LP maximum amplitude⟩.

⟨2nd phase group⟩::={⟨clarity⟩ | ⟨2nd phase code⟩}$_{1}^{2}$

## LONG-PERIOD SURFACE-WAVE GROUPS

⟨surface-wave groups⟩::={⟨Love waves⟩}$_{0}^{2}${⟨Rayleigh waves⟩}$_{0}^{3}$

### LOVE WAVES

⟨Love waves⟩::=⟨channel⟩[⟨clarity⟩]⟨Love phase code⟩[⟨arrival time⟩]
[⟨Love mantle-wave amplitude⟩][⟨Love-wave maximum amplitude⟩]

where: ⟨channel⟩ is LPN, LPE, MPN, MPE, BPN, BPE, UPN or UPE.

⟨Love phase code⟩::={G | G1 | LQ} | G2

⟨Love mantle-wave amplitude⟩::=T⟨period⟩A⟨amplitude⟩⟨b⟩

⟨Love-wave maximum amplitude⟩::=⟨LP maximum amplitude⟩

### RAYLEIGH WAVES

⟨Rayleigh waves⟩::=⟨channel⟩[⟨clarity⟩]⟨Rayleigh phase code⟩[⟨arrival time⟩]
[⟨Rayleigh mantle-wave amplitude⟩][⟨Rayleigh max amplitude⟩]
[⟨gse Rayleigh amplitudes⟩]

⟨Rayleigh phase code⟩::={R | R1 | LR} | R2

⟨Rayleigh mantle-wave amplitude⟩::=T⟨period⟩A⟨amplitude⟩⟨b⟩

⟨Rayleigh max amplitude⟩::=⟨LP maximum amplitude⟩

⟨gse Rayleigh amplitudes⟩::={X⟨p⟩⟨zero-crossing amplitude scaling time⟩⟨b⟩

T⟨period⟩A⟨amplitude⟩$\}_1^4$

⟨p⟩: : ={A | B | C | D}[M]    This is the Rayleigh wave period-range designator.

The optional “M” may be used when the associated amplitude also meets the criteria of the ⟨Rayleigh max amplitude⟩ to avoid reporting under both categories. These designators are for data from vertical channels only, with the exception of B, which may also be used with horizontal components to report “20-second” wave data.

## OLD SURFACE-WAVE GROUP

⟨old surface-wave group⟩: : ={{LZT | LNT | LET}⟨period⟩A⟨amplitude⟩⟨b⟩$\}_0^3$

where ⟨amplitude⟩ is applied to the “20-second” Rayleigh-waves from the Z, N or E components. Note that this group has been retained for upward compatibility only and one may continue to send data using this group. For a discussion of how data in this group can be included in the groups new to this code, see this heading under Definitions and usage.

## LOCAL MAGNITUDE DATA

⟨local magnitude data⟩: : ={[⟨SP duration time⟩][⟨maximum local amplitude⟩]$\}_1^n$

⟨SP duration time⟩: : =[⟨channel⟩]⟨b⟩DUR⟨(total seconds)⟩⟨b⟩

where total seconds is measured between the first-arrival onset and the time the trace never again exceeds twice the noise level encountered immediately prior to the first arrival. Data are taken from an SP channel. Total seconds is used to compute duration magnitude.

⟨maximum local amplitude⟩: : =[⟨channel⟩]{T | G}AMAX⟨(maximum amplitude)⟩

Scaled from a local event, when either the period cannot be measured or the amplitude assigned to a particular phase. This amplitude must have been recorded by an SP instrument whose response is nearly constant over the period range within which the signal can be presumed to lie. If preceded by TAMAX the amplitude is a *trace* (*not double-trace*) amplitude in millimetres (mm). If preceded by GAMAX the amplitude is a *ground* amplitude in millimicrons (m$\mu$).

## COMMENTS

⟨comments⟩: : =(⟨(unformatted plain-language text)⟩)⟨b⟩

These comments contain information concerning the effects of the seismic occurrence to which the preceding station event data pertain. When a hypocentre is included for the event, it is preferable that the comments be given in the hypocentre comments, as a specific time can then be attached when processed. These comments may include:

1. Macroseismic information such as: casualty, damage, intensity and other cultural effects and unusual animal behaviour;
2. Tsunami wave heights, damage, casualties and run-up data;
3. information on artificial or induced events such as explosions, collapses, rockbursts, coal-bumps and meteoritic impacts;
4. Geological observations of associated faulting, uplift, eruptions, landslides, liquefaction, sand-boils, earthquake lights, etc.

## NETWORK COMPUTATIONS

⟨computations⟩: : =[⟨hypocentre⟩][⟨magnitude⟩][⟨moment⟩]

⟨hypocentre⟩: : =FOCUS⟨b⟩⟨origin-time⟩LAT⟨b⟩⟨latitude⟩LON⟨b⟩⟨longitude⟩
[DEP⟨b⟩⟨depth⟩][NS⟨number of stations⟩]
[(⟨hypocentre comments⟩)⟨b⟩]

⟨hypocentre⟩ may be used to transmit rough hypocentres obtained from slowness and azimuth as well as computations using arrival-times from a net. If a slowness-derived hypocentre has been given, “SLO” should appear in the hypocentre comments. It may also be used to transmit rockburst and explosion coordinates, with appropriate hypocentre comments.

⟨origin time⟩::=⟨hour⟩⟨minutes⟩⟨seconds⟩.[⟨tenths⟩][⟨hundredths⟩]⟨b⟩

⟨latitude⟩::={⟨digit⟩}$_1^2$.{⟨digit⟩}$_0^3${N | S}⟨b⟩

⟨longitude⟩::={⟨digit⟩}$_1^3$.{⟨digit⟩}$_0^3${E | W}⟨b⟩

⟨depth⟩::={⟨digit⟩}$_1^3$.{⟨digit⟩}$_0^1$[FIX]⟨b⟩

where FIX indicates a fixed-depth solution.

⟨number of stations⟩::={⟨digit⟩}$_1^4$⟨b⟩

⟨magnitude⟩::=MAG⟨b⟩{[⟨magnitude type⟩]}⟨magnitude value⟩[⟨distance estimate⟩]
[T⟨(average period of waves used)⟩][NS⟨number of stations⟩]

⟨magnitude type⟩::=ML | MS | MSZ | MSH | MB | MBSH | MW | MBW | MBLG | MSRG | MD | ...

where:

| | |
|---|---|
| ML | Richter (local) magnitude ($M_L$) |
| MS | IASPEI formula Rayleigh wave ($M_s$) |
| MSZ | IASPEI formula Z-component Rayleigh wave |
| MSH | IASPEI formula H-component Rayleigh wave |
| MB | Gutenburg-Richter body-wave magnitude ($m_b$) |
| MBSH | G-R body wave from horizontal S |
| MW | Moment magnitude ($M_w$) |
| MBW | Moment magnitude ($m_w$) |
| MBLG | Nuttli's $m_b$ from Lg |
| MSRG | Nuttli's $M_s$ from Rg |
| MD | Duration magnitude |

This magnitude list is not comprehensive. Additional magnitude types and their appropriate symbols may be included.

⟨magnitude value⟩::=⟨digit⟩.{⟨digit⟩}$_1^2$⟨b⟩

⟨distance estimate⟩::=D⟨(distance estimate in degrees)⟩

⟨moment⟩::=MOM⟨mantissa⟩⟨exponent⟩[NS⟨number of stations⟩]

⟨mantissa⟩::=.{⟨digit⟩}$_2^3$⟨b⟩

⟨exponent⟩::=E{⟨digit⟩}$^2$⟨b⟩ (newton-m.)

## DEFINITIONS AND USAGE

The sequence in which subjects are introduced in this section corresponds to the order in which they are found in the code form. Those subjects treated adequately in the code form will not be dealt with further in this section.

### MESSAGE HEADING

⟨gse code⟩

The gse code used in the message heading is primarily intended for transmissions to and from data centres via the Global Telecommunication System of the World Meteorological Organization. Use of this code early in the message permits the receiving computer to determine the contents of the message without decoding past the heading.

The gse codes and their definitions follow:

| | |
|---|---|
| CR | Coordinator message |
| DC | Data centre message |
| FB | Final event bulletin from IDC |
| NC | Request by a national centre (or station) |

| | |
|---|---|
| PA | Parameter message to IDC (includes measurements of seismic signals) |
| PL | Preliminary event list from IDC |
| RP | Retransmission of PA message |
| RR | Request retransmission of PA message |
| ST | Status or other administrative message |
| XY | Reserved for other messages to be defined by GSE as needed |

⟨originator⟩

This group ought to be included only in messages sent via WMO/GTS circuits. The ⟨message centre⟩ code is the GTS data/geographical designator. The ⟨transmission time⟩ should indicate the time the message was originally transmitted. This field could be completed by the teletypist. If this is a problem, the time that the message is to be given to the sender's message centre could be used.

## SEISMIC DATA FORMAT OPTIONS

⟨single-station group form⟩

With data arranged by station, all of the data for one station for its reporting period are given and they are then followed by data from the next station, etc.

Data arranged by station are further ordered by increasing first *reported* arrival time (which is usually the first-arrival time) for each seismic event reported.

⟨net-event group form⟩

When data are arranged by event, all of the data from several stations pertaining to one seismic event are given, followed by such data from the next event, etc. A net event may include net computations such as hypocentres and magnitudes. On the other hand each event may consist of only hypocentre computations, in which case the report is reduced to an event list.

Data arranged by event is the usual method of sending data from local networks reporting mostly data pertaining to local events and their computational results. Reporting trace amplitudes with data arranged by event is awkward, as the station's magnification must be given each time the station appears with an amplitude. The net computations may appear anywhere within an event.

A contributor sending data arranged by event may wish, occasionally, within a message, to include data arranged by station. It may be that these data belong to two or more teleseisms mixed together on the records, or he may wish to treat local and teleseismic data differently.

⟨delimited net-event⟩ is strictly optional.

⟨delimited station-event⟩

A ⟨station-event⟩ *must* be enclosed with *solidi* when the following conditions are met:

1. A legitimate first-arrival is not available for the ⟨station-event⟩. It could be missing because of a recording interruption or it may happen when a weak local event yields only a legible Sg or Lg. Also a high-gain long-period station may be able to send only surface-wave data for smaller events.
2. A first-arrival time from more than one channel has been included.
3. Whenever there is likely to be some question as to whether two sequentially reported phases belong to the same seismic event.

   This ambiguity is seen when two different phase codes, both of which may be reported as first-arrivals, follow each other closely enough in time. For example, a station could record a Pn from a distant regional event, and then, before recording its associated secondary phases, a Pg and Sg from a nearby local could be recorded. Currently, computer programs decoding the resultant seismic message must resort to assumptions based on generalized travel-time tables to attempt to discern the proper relation. Note also that a P preceding a Pn by a few seconds could belong either to the same event as the Pn or to a teleseism. Therefore, as a general rule,

   *station-events which include P-type crustal phases should be delimited.*
4. Whenever a secondary arrival-time or amplitude scaling time follow the first-arrival time by more than 66 minutes.

   This precautionary requirement is necessary for the receiver to distinguish such data from cases where data have been lost or delimiters forgotten.

## PARAMETERS

⟨report times⟩

⟨beg⟩ and ⟨end⟩ are used to indicate the beginning and ending times of the recording period covered by the message for each station. If the data comprise strictly an event list, these times will indicate the range in time represented by the event list.

⟨out⟩ and ⟨to⟩ are used to delimit periods of interruption in the recording period covered by ⟨beg⟩ and ⟨end⟩. ⟨out⟩ and ⟨to⟩ groups may be repeated as often as needed. The ⟨instrument class⟩ and ⟨components⟩ groups indicate which instruments were not recording. If all instruments were out, "ALL" is used.

⟨process code⟩

The process code indicates the combination of recording and scaling techniques employed to obtain the arrival times (and perhaps amplitudes) reported for the associated station.

The three process codes are:

A The measurements were primarily obtained from *analog* recordings on *paper* or *film*, by an interpreter using *visual* and perhaps mechanical techniques. This is the default case – if no process code is given, "A" will be assumed.

D The data were recorded *digitally* or were originally analog recordings that have been digitized by computer. In addition, the arrival times (and perhaps amplitudes) were obtained solely by *automatic parameter extraction.*

G The data were recorded *digitally* or were originally analog recordings that have been digitized by computer. In addition, *man-machine interactive* methods utilizing a *graphics screen* showing wave-forms were used. The techniques used for process code D could have been employed in an early phase of this procedure.

⟨magnification⟩

See below under Periods, amplitudes and magnifications.

## BASIC SEISMIC DATA

### PHASE CODES

A phase code and/or a clarity code must accompany each arrival time reported. The first reported arrival time within each station event must be identified by a phase code.

### RELATIVE IMPORTANCE OF SECONDARY PHASES

The most important secondary phases for hypocentre estimation are those which give an indication of the depth of focus. These include pP encoded as AP, pwP encoded as AWP, sP encoded as XP, pPKP encoded as APKP, Pg encoded as PG and Lg encoded as LG. Also of great value are S phases for local and regional shocks when their onset can be read accurately enough to yield a check on the computed origin time. They are especially valuable for analysing local and regional shocks with deeper than normal foci. When a large-magnitude shock is too deep to propagate significant surface waves, the amplitude of long-period S assumes greater importance.

Any strong phase following teleseismic P by less than 2 min 30 s, which might be a pP but which the interpreter does not wish to identify definitely as pP, should be encoded with a clarity of "e" or "i" (followed by the arrival time). A pPcP and/or sPcP together with PcP will yield depth information at epicentral distances too small to record pP or sP. The same considerations apply to ScP, PcS and ScS.

Phases which are generally prominent on short-period vertical instruments which are of some value in hypocentre estimation include PcP, ScP, PKKP and SKP. Identification of these phases by some stations may aid in the identification of these same phases from other stations which have reported them as P. Such phases as PP, PPP, SS, SSS, SP, PgPg, etc. are generally of lesser value in routine hypocentre work.

Phases closely following P, which have much larger amplitudes than P, may indicate a multiple or complex event. If their arrival times can be scaled accurately, they should be reported preceded by a clarity code (these may also include breakout or stopping phases), or they may be encoded as separate shocks if the interpreter suspects this is the case. In any case all significant increases in the SPZ amplitudes of complex-multiple events should be reported either as individual SP maximum amplitudes or as one or more of the gse SPZ first-arrival amplitudes.

## CLARITY OR ONSET QUALITY

Clarity is the observer’s estimation of the accuracy to which the associated arrival time has been measured.

The clarity codes are:

I  indicates an accuracy to within ± 0.2 second.

E  indicates an accuracy to within ± 1.0 second.

Q  indicates a less accurate measurement.

These limits are, in general, most appropriately applied to the first-arrival, and must be relaxed somewhat for many secondary phases.

As the “shape” of the wave at the onset is a function of the transport speed of the drum or film and trace widths, the “character” of the onset is not as useful as the observer’s indication of the timing accuracy, which also may reflect the accuracy of the chronometer.

it is difficult to establish firm clarity limits for secondary phases. For example, an accuracy of 1.0 second may rate an I for a teleseismic S, but only an E or a Q for an S recorded locally by a modern network.

## PERIODS, AMPLITUDES AND MAGNIFICATIONS

A number of additional amplitude measurements may now be reported. Before discussing each individually, the general rules for reporting amplitudes, especially their units, will follow. In the past, reporting of amplitude measurements has caused considerable confusion and undoubtedly resulted in the entry of erroneous data into the databases of several seismic centres.

The period is the *apparent* or *dominant* period of the wave whose amplitude is given.

Amplitude measurements are given either in *double* trace amplitudes in *millimetres* (*mm*) or as *ground* amplitudes whose units depend on the channel from which they were scaled (see definition of ⟨channel⟩ under Parameters, in the Code form).

Amplitude data from a given station must be either double trace (with rare exceptions because of recording off-scale) or all ground amplitudes.

*Double* trace-amplitude measurements can be defined as either:

peak-to-trough deflection for symmetrical waves, or,

*twice* centre-to-peak for symmetrical or asymmetrical waves, where centre means base-line, zero-line or equilibrium.

Double trace amplitudes in millimetres (mm) may be given for any reportable amplitude group. When double trace amplitudes are given, the channel magnification *should* be given and it is *strongly re commended* that the magnification include the TRACE symbol.

*Ground* amplitudes scaled from an SP channel must be given in nanometres (nm).

*Ground* amplitudes scaled from an LP channel must be given in micrometres ($\mu$m).

Thus effectively, all reportable *surface-wave* amplitudes, except Lg scaled from SPZ, and all *long-period body-wave* amplitudes will be given in *micrometres* (*$\mu$m*) as well as the two *LP noise* amplitudes when ground amplitudes are given.

⟨magnification⟩

The standard magnification is that magnification, at the nominal period, to which the instrument magnification factor is normalized to 1. The period to which magnifications are normalized varies with the instrument type, but is generally one second for short-period instruments and that period at which the instrument magnification peaks for long-period instruments.

It is *strongly recommended* that *ground* amplitudes be furnished by all. However, contributors sending *double* trace amplitudes must obtain them from standardized instruments for which the response characteristics are known to the receiver, and they must have informed the receiver of their intention prior to transmission of such data.

Although the ⟨magnification⟩ is optional when the recipient is known to have a record of the *current* operating magnification(s) of the instruments from which *double* trace amplitudes have been supplied, it is *strongly recommended* that they be included. If a magnification has been changed since the last report, the new magnification is *required* and should have a C appended to the K or M identifier to confirm this fact. A station should not commence sending amplitudes until it has first informed the recipient(s) of the type of amplitudes (*double trace* or *ground*) that it intends to send. If *double* trace amplitudes are to be sent, the type of *standardized* instrument(s) and their magnifications must be supplied.

[G]

A station which routinely reports *double* trace amplitudes (from the channels for which they furnish magnifications) may wish to substitute *ground* amplitudes from recordings which did not go off-scale (clip) while recording a large earthquake – data from a low magnification SPZ when a 200K WWNSS SPZ clipped, for example.

To substitute a *ground* amplitude where a *double* trace amplitude would ordinarily be expected, prefix the ground amplitude with GA rather than A. This substitution is available for the 1st few cycles amplitude, the SP maximum amplitude, the LP maximum amplitude, and the Rayleigh and Love-wave maximum-amplitude groups.

⟨zero-crossing amplitude scaling times⟩

This field is available for all groups containing amplitudes except the 1st few cycles amplitude, the three noise groups, and the ⟨maximum local amplitude⟩ defined under local magnitude data.

This time is measured where the trace crosses the equilibrium point between the peak and trough that comprise the cycle whose amplitude was reported.

## P–WAVE AMPLITUDES

⟨1st few cycles amplitude⟩

This amplitude is scaled from the first "few" cycles following the onset of the first-arrival, recorded on SPZ channels only. The associated period must lie between 0.1 and 3.0 seconds and the decimal point is *required.*

⟨SP maximum amplitude⟩

This amplitude is taken from the largest amplitude in the P-wave coda recorded on SPZ channels. However, it must be obtained before the arrival of another clear phase such as pP, sP, PcP or PP. This is generally the most important SPZ scaling of the P-wave amplitude. This group, as all maximum-amplitude groups, is designated by the prefix XM. No precise period range has been defined for SP maximum amplitudes. However, the period must include a decimal point.

⟨gse SPZ first-arrival amplitudes⟩

These amplitudes are each obtained from the maximum SPZ P-wave amplitude found within specified time-intervals of the P-wave coda. They must be reported only before the arrival of the next clear phase. However, they are reported even if the coda amplitude is, in general, decaying. No precise period range has been defined for these amplitudes. However, the periods must include a decimal point.

The P-coda interval-time designators prefixing these fields are:

XA[M] 0–6 seconds after P-wave onset
XB[M] 6–12 seconds after P-wave onset
XC[M] 12–18 seconds after P-wave onset
XD[M] 18–300 seconds after P-wave onset

where the optional M is used to indicate that the amplitude also meets the criteria of the SP maximum amplitude.

⟨LP maximum amplitude⟩

This amplitude is taken from the largest amplitude in the P-wave coda recorded on an LPZ channel. It must be obtained before the arrival of another clear phase. This amplitude is generally the most important P-wave amplitude recorded from large intermediate or deep focus events. No precise period range has been defined for LP maximum amplitudes; however, the period must include a decimal point even though periods greater than 9.9 seconds must be reported to the nearest second (e.g. 10.).

### AMPLITUDES FROM THE HORIZONTAL COMPONENTS OF P

SP and LP maximum amplitudes for P may be reported from SPH and LPH channels respectively. However, to be most useful they must be obtained from matched horizontal channels and be measurements of the same cycle. Horizontal P-wave amplitudes are chiefly of interest when the vertical channels are unavailable or off-scale.

## SECONDARY PHASE AMPLITUDES

Although the code allows for maximum trace amplitudes from any channel of any secondary phase, there are only a few from which data are sought. Chief among these are S, Lg and Rg. Although Lg and Rg are surface waves, they require the same format as the secondary body waves.

⟨SP maximum amplitude⟩

This amplitude is taken from the largest amplitude in the coda of the phase being measured. For regional earthquakes with foci in the upper crust and a continental propagation path, the amplitude of the Lg from the SPZ is important.

⟨gse SPH S-wave amplitude⟩

This amplitude is the largest SPN/SPE amplitude found within the first ten seconds of the S-wave and should be reported from both horizontal components. The respective zero-crossing amplitude scaling times should not differ by more than one-half the signal period. For large, shallow-focus earthquakes this amplitude will generally not correspond to the maximum for S.

⟨LP maximum amplitude⟩

This amplitude is taken from the largest amplitude in the coda of the phase. For regional earthquakes with foci in the upper crust and a continental path, the amplitude of the Rg from the SPZ is important in some localities.

⟨gse LPH S-wave amplitude⟩

This amplitude is the largest LPN/LPE amplitude found within the first 40–60 seconds of the S-wave. The respective zero-crossing amplitude scaling times should not differ by more than one-half the signal period.

## LONG-PERIOD SURFACE-WAVE AMPLITUDES

Please note that for all long-period surface-wave groups (other than the old surface-wave group) the ⟨channel⟩ and *phase codes* are *required.* The ⟨channel⟩ must be given even if it is the same as that of the preceding phase.

### LOVE WAVES

⟨mantle-wave amplitude⟩

This group is measured for large earthquakes, will have a period in the neighbourhood of 200 seconds and should be reported from both components. This group is not prefixed.

⟨Love maximum amplitude⟩

This group is obtained from the maximum *trace* amplitude observed in the Love-wave train, regardless of period, and should be reported from both components. This group is prefixed by XM.

### RAYLEIGH WAVES

Data from the vertical components in these groups are emphasized.

⟨Rayleigh mantle-wave amplitude⟩

This group is measured for large earthquakes and will have a period near 200 seconds.

⟨Rayleigh max amplitude⟩

This group is obtained from the maximum *trace* amplitude observed in the Rayleigh-wave train regardless of period. For continental paths, this period might well be near 15 seconds. This group is prefixed with XM.

⟨gse Rayleigh amplitudes⟩

The four amplitudes are each obtained from the maximum trace amplitude associated with waves of their respective period range. They need not all be present to report one or more.

The Rayleigh-wave period-range designators are:

XA[M] 36–44-second waves<br>
XB[M] 27–33-second waves<br>
XC[M] 18–22-second waves<br>
XD[M] 09–11-second waves

where the optional M is used to indicate that the amplitude also meets the criteria of the ⟨Rayleigh max amplitude⟩. These intervals are available for vertical channels only, with the exception of XC[M], which may be used for the horizontal "20-second" waves as well.

## OLD SURFACE-WAVE GROUP

As this group has been retained in the seismic code to maintain upward compatibility, it is hoped that such data will be sent using the new forms available. Here is how the "20-second" Rayleigh waves may be sent using ⟨Rayleigh wave⟩:

1. If the period is between 17 and 23 seconds inclusive, and the amplitude is the maximum LPZ trace amplitude in the Rayleigh-wave train, use ⟨Rayleigh max amplitude⟩, employing the appropriate channel codes. The period and amplitude for each component will thus be prefixed with XM.
2. If the period lies between 18 and 22 seconds inclusive, but the amplitude is not the maximum LPZ trace amplitude in the Rayleigh-wave train, use ⟨gse Rayleigh amplitudes⟩ for each component, employing the appropriate channel codes. The period and amplitude for each group will thus be prefixed with XC.
3. If the period is either 17 or 23 seconds but not as in 1. above, do not report it.

## NOISE AMPLITUDES

⟨SPZ noise⟩

The short-period noise amplitude is taken from the SPZ channel and is the maximum amplitude with a period either between 0.2 and 1.0 second or close to that of the signal, found within 30 seconds *before* the onset of the first arrival.

⟨1 minute before P noise⟩

This noise amplitude is taken from the LPZ channel and is the maximum amplitude with a period between 2.0 and 8.0 seconds found within one minute *before* the onset of the first arrival. The period should include a decimal point even if reported to the nearest second.

⟨1–30 second noise⟩

This noise amplitude is taken from the LPZ channel and is the maximum amplitude with a period between 10–30 seconds found within five minutes *before* the onset of the first arrival. The period should be reported to the nearest second.

## FIRST MOTIONS

Generally, first motions will be reported only for the first arrival and then only when clear. However, if a Pg following a Pn is clear, its first motion may be reported with that phase – likewise that of pP when clear.

⟨appended first motion⟩

This field has been retained only for the sake of *upward compatibility* (see Introduction). It contains the short-period and/or long-period *vertical* first motions only. This field is found appended to the first-arrival phase code. Long-period compressions must be reported in this group as U and dilatations as R. *It is strongly recommended that the* ⟨first motion⟩ *field be used instead of the* ⟨appended first motion⟩.

⟨first motion⟩

This group has been introduced to facilitate the reporting of first motions from any channel, to make the reporting of compressions (C) and dilatations (D) uniform and to allow reporting of first motions from secondary P-type phases when desirable.

The ⟨first motion⟩ field consists of the symbolic prefix "FM" followed by the optional short-period first motions which is followed by the optional long-period first motions. The first character of the LP first-motion group is always a *comma.* Within each short- and long-period group the vertical component is given first, followed by the north-south and then east-west components. Any component may be absent, and corresponding long- and short-period components need not have the same directions.

The reported ⟨first motion⟩ field may be associated with any channel and generally it will be included with the SPZ channel data. However, when SPZ channel data are not reported, it may be associated with another channel. Also, since "long-period" is used as a generic term to indicate not only long-period but also intermediate-period (MP), broad-band (BP) and ultralong-period (UP) instruments, the contributor who wishes to make these long-period distinctions or to report first motions from several of these may do so by including this field with any channel of the appropriate class.

### LOCAL MAGNITUDE DATA

When a local earthquake has been recorded, if individual phases are recognizable, their maxima may be reported using ⟨SP maximum amplitude⟩. Amplitudes from P and S from subcrustal events, and such crustal phases as Pn, Pg, Sg from crustal foci, may be reported in this manner.

However, when individual phases cannot be discerned or the period of the signal accurately measured, the ⟨maximum ground amplitude⟩ can be given for one or more components. This value will necessarily be a rough estimate if an associated period must be adopted.

⟨SP duration time⟩ may also be used in this case. However, it may also be used not only when the recording has clipped, but also for any local event where a suitably calibrated formula exists.

### SECONDARY PHASE GROUP

A ⟨secondary phase group⟩ is specified for each secondary phase reported that is a body wave or Lg or Rg. All of the data for each secondary phase reported are thus given before data for the next secondary phase within a station-event appear.

## EXAMPLES OF TELEGRAMS

### SINGLE-STATION GROUP FORM

The first example shows a message in which the data are arranged by station. The first station, ALQ, supplied data using nearly all the new forms made available by this edition of the code form. The second station, TUC, employed many of the new forms, but in general did not supply gse first-arrival or gse Rayleigh amplitudes.

SEISMO GSEPA N5119 ((GSEXY SEXX1 850502 1445)) ALQ BEG APR30 141512 END MAY02 141522 OUT ALL MAY01 140816 TO MAY01 141522 OUT MAY02 140322 TO MAY02 141116 STATP PROCA TRACE 200K 3000M APR30 SPZ DEFAULT IPKP1606350 FMD T1.0A7.9 NT1.0A1.0 LPZ NAT7.7A2.0 SPZ I06440 LPZ EPP0840 EPPP1056 LPE ESKS1337 LPZ ESKKP2001 LPE ESS2528 ESSS2940 LPE LQ XM4112 T44A77 LPN XM T44A37 LPZ LR XAM4728 T41A112 XB4848 T30A70 XC5710 T20A56 LPE XC T20A52 LPN XC T20A47 EP225837.5 T1.5A8.0 IP225845.8 FMC T1.8A39.5 XA5851.0 T1.5A24.5 XB5858.0 T1.5A45.0 XC5901.9 T0.9A50.0 XDM5939.4 T1.1A302 NT1.0A0.3 LPZ NAT7.3A3.5 SPE ES230819.0 XM0903 T6.5A63.0 XA0827 T6.0A9.0 SPN XM0902 T6.5A38.5 XA T6.1A5.0 BPZ LR XM2740 T28GA54 MAY01 IP105316.8 FMCW,CNW XA5327.8 T1.1A31.0 XB5336.0 T1.1A31.0 XCM5333.3 T1.2A37.8 XD5344.0 T1.4A37.0 LPZ XM T15A38.0 NAT8.0A2.0 SPZ I5409.3 IPP5610.2 EPPP5803.5 SPN ES110253.0 XM T6.0A11.0 SPE ES0254.0 XM T6.0A8.0 LPN ES0256.0 XM T20A85.0 LPE ES0256.0 XM T20A64 ESS0742 ESSS1121 SPZ EPKPPKP2040.8 ESKPPKP2417 LPE LQ XM1408 T31A73 LPN XM T32A40 LPZ LR XB1942 T32A103 XCM2124 T20A286 LPN XC T20A218 LPE XCM T20A139 IPG 1459084 FMC ((ROCKBURST 31 DEG 14.6 MIN N, 111 DEG 2.42 MIN W 3 INJURED)) / ELG 150116.3 / IPLOC DUR126

TUC BEG APR30 151000 END MAY01 151000 OUT MPZNE APR30 151000 TO MAY01 151000 PROCG GRND IP1752303 FMC,C XM T0.8 A30.0 SLO6.84 AZ357 LPZ SLO7.0 AZ355 SPZ I52530 LPZ LR XM T31A100 LPN XM T32A99 LPE XM T32A00 / LPZ PDIF2355110 SPZ PKP2358101 I58452 ISKP00011401 / MAY01 QP003742 IUNK0123456 IP0200373 XM T2.9 A43.6 IAP00552 EAWP00581 EXP01042 / IPN041922.66 FMC,D IPB19252 FMD SPE IPG1930.1 FMCNE SPN ISN19558 ISB20024 SPZ ELG2006 XM2021 T1.2 A14.6 MAG ML5.8 D2.1 DR5.6 ((DAMAGE VII YUMA)) / IP0606150 FMC,C XM0606155 T1.0 A22.6 SPN ES09060 SPZ IPCP10521 IAPCP11280 EXPCP11520 ESCP14080 STOP

## COMMENTS ON EXAMPLE

Following the message identifier, SEISMO, is the three-part message heading. GSEPA indicates that this message transmits primarily measurements from seismographic recordings. N5119 indicates this is the 119th message sent by ALQ to this receiver for 1985, and is used by the receiver to detect the loss of a message in transmission. The items enclosed in double parenthesis can be sent only via GTS. The first such item is the GSE test code, the second is the GTS data/geographical designator group and the last two fields are the date and time of transmission.

Following the station abbreviation, ALQ, is the report times group which indicates that the message covers the period from 30 April at 14:15:12 UTC to 2 May at 14:15:22 and includes two outage periods for all instruments, apparently the times during which the records were being changed. Note that the time spanned by the beginning and ending times will always be somewhat greater than the time spanned by the times of the first and last measurements reported in the seismic data.

STATP, the status code indicates that these data constitute a preliminary report for this period. Any report which represents reinterpreted data and/or additional data for a period is considered final.

PROCA, the process code indicates that the data were scaled from an analog recording (e.g. photographic paper or film, etc.). This is the default (i.e., had this field not been included, these recording and measuring conditions would have been assumed).

TRACE confirms that the amplitude data are double trace amplitudes. This is followed by the standard SPZ magnification in thousands and the standard LPZ magnification. Since no horizontal magnifications are given, the vertical values are understood to apply to their respective horizontal channels.

APR30 is the date of all the data which follow until a new date group is encountered. This field must be included even if this date can be inferred from that of the BEG indicator.

SPZ DEFAULT indicates that the data include channel codes and thus is establishing SPZ, as the channel that will be ascribed to the initial data of each first arrival, unless otherwise indicated, eliminating the need to include the channel code with each first arrival.

The data from the first seismic event reported pertain to an event about 13 900 km distant with a magnitude of about 6.6 $M_S$. The first arrival, PKP, has a clarity of I and an arrival time of 16:06:35.0 UTC. The time was scaled to the nearest tenth of a second. Had it been scaled to the nearest second, it would have been reported as 160635. The SPZ first motion is reported as D, for a dilatation, and is prefixed with FM, the first-motion field indicator. It is followed by a first few cycles amplitude group which reports a period of 1.0 s and an amplitude of 7.9 mm. The SPZ noise group is indicated by N. The noise period is 1.0 s with a double trace amplitude of 1.0 mm. The channel code, LPZ, indicates the data following it are from that component. NA indicates the one minute before P noise.

The next SPZ indicates that the group I06440 was scaled from the SPZ. The phase is unidentified, has a clarity code of I and an arrival time of 16:06:44.0. The hour was not included as it is the same as that of the preceding phase in this station-event. Next are found PP and PPP data obtained from the LPZ. Then SKS data from the LPE, followed by SKKP data taken from LPZ. The SS and SSS were scaled from the LPE.

The channel code LPE is repeated as the Love-wave group is introduced by the phase code LQ. The XM indicates that a Love-wave maximum trace-amplitude group will follow. The 4112 appended to XM is the zero-crossing amplitude scaling time, for the double trace amplitude of 77 mm with a period of 44 s. Data from the corresponding LPN channel follow, but the XM does not have a zero-crossing amplitude scaling time included as it is nearly identical to that of the east-west component.

The LPZ channel code precedes the phase code LR which indicates data from the Rayleigh-wave train follows. The XAM indicates the 36–44 s amplitude group, and that it is the maximum not only within that period range but also for the entire LPZ Rayleigh-wave train. XB and XC indicate the maximum within the 27–33 and 18–22 s groups respectively. The 18–22 s data taken from the LPE and LPN follow.

The P-phase at 22:58:37.5 signals the beginning of a new station-event. The decimal in the seconds was optional in this case. Notice that this event precedes a much larger event by only a few seconds.

The P-phase at 22:58:45.8 begins a station-event recorded at a distance of 8 400 km with a magnitude of 7.8 $M_S$. The first few cycles amplitude of 39.5 mm was scaled from the fifth cycle (a scaling time cannot be specified for this kind of amplitude). The XB and XC indicate the gse SPZ first-arrival amplitude for the time increments of 0–6, 6–12 and 12–18 s after the P onset. The XDM indicates the 18–300 s after the onset group and that it was also the largest amplitude in the P-coda. The SPZ noise and LPZ's one minute before P noise groups complete the P-phase data.

SPE then precedes the S-phase data. Note the inclusion of an hour in the S arrival time as the hour changed to 23 within the station-event. XM indicates the maximum S-coda SPE amplitude. XA indicates the maximum SPE amplitude within the first 10 s of the S arrival time. SPN precedes the same data groups from the north-south component.

BPZ indicates that data taken from a broad-band vertical component follow. The LR phase identifier means that Rayleigh-wave data are next. The XM indicates the maximum in the Rayleigh-wave train. The period is 28 s and the *ground amplitude* (*centre-to-peak*) is 54 $\mu$m. Evidently the quake was so large that the surface waves were off scale on the LP instruments, but a lower magnification broad-band instrument recorded the Z amplitude which was reduced to a ground amplitude by the observer. The amplitude in this case was preceded by GA rather than A to indicate ground amplitude as a trace amplitude was expected.

The next event is a 6.6 $M_S$ aftershock of the previous event. C and W for the SP first motions and C, N and W for the LP first motions have been included. Note the *required comma* (,) preceding the LP first-motion group. PP and PPP data from the SPZ are the next phases reported. An arrival time of 110253.0 was reported for S from the SPN together with its maximum amplitude. A slightly later arrival time was reported from the SPE channel. This second arrival time for the same phase was strictly optional. The SP data for S are then followed by the corresponding LP data for S. SS and SSS from the LPE are given, followed by P′P′ and SKPP′ from the SPZ. Maximum Love-wave data and the gse Rayleigh-wave amplitudes follow, with the 20 s horizontal Rayleigh-wave data concluding this event.

The next event is represented by Pg from a rockburst. Note that the data inside double parenthesis may span several lines, which may be broken anywhere a space would normally occur.

The next station-event is delimited with *solidi* it contains no legitimate first arrival, but only an Lg from a weak local.

The last event from ALQ has a PLOC as a first-arrival phase code. This dummy phase code is used for reporting locals for which secondary phases cannot be read and for which first-arrival codes such as Pn, Pb or Pg cannot be interpreted. Use of PLOC in such cases enables analysts and computer association programs to distinguish a teleseismic P from a local P where no other clues are found by examining the phase codes within the station-event and their time differences – use of PLOC in cases of such isolated local station-events will prevent misassociation of such data with teleseisms. A duration of 126 s was furnished.

Data from TUC begin with a report period in which a three-component set of intermediate-period instruments were reported as inoperative for the entire reporting period.

The process code, G, indicates that sophisticated, computerized equipment was used in the recording and interpretation of the data.

GRND indicates that all of the amplitudes are ground amplitudes. Since no status code was given, the status code P for ALQ applies also to the TUC data. Also, since no default channel was given, the SPZ DEFAULT given by ALQ applies to TUC data.

Note the SPZ and LPZ slowness groups indicated by SLO and the related azimuths prefixed with AZ. The observer furnished maximum Rayleigh-wave amplitudes from three LP channels. The LPE amplitude has a value of 00, because the waves arrived from nearly due north. Furnishing an amplitude of 00 rather than omitting this channel served to distinguish it from the case where the LPE channel data were simply missing.

The station-event containing two legitimate first arrivals, PDIF and PKP, has been delimited so that the PDIF will not be separated from the rest of that event's data.

The clarity code Q was used for the P phase arriving on 1 May at 00:37:42 to indicate that the observer felt the timing was uncertain (questionable) by more than a second. This clarity code has been introduced to avoid some of the ambiguities surrounding the use of (P) or E(P). In no case should a time such as 0037(42) be sent.

UNK, as shown in the next group, has been introduced as a first-arrival code to indicate that the observer did not wish to identify the phase more specifically than as a first arrival. UNK must not be used for unidentified secondary phases.

Data from the next event illustrate encoding of pP, pwP and sP, very important secondary phases.

The data from a strong local were given as a delimited station-event to indicate that the phases Pn, Pb and Pg all pertained to the same event. Note that the SPZ and LPZ first motions of the Pn are of opposite sign. Do not "force" such observed first motions to be alike. Since the arrival time of Pn was reported to a precision of hundredths of a second, the decimal point was required. Pb was also scaled from the SPZ with an SPZ first-motion code of D. The Pg arrival time was scaled from the SPE, but SP first motions were given for three channels. Sn and Sb were read from the SPN and Lg was read from the SPZ.

The Lg period, amplitude and its scaling time were given and could be applied to an appropriate magnitude formula. An $M_L$ magnitude estimate of 5.8 based on a distance of 2.1 deg. was also supplied as well as a duration magnitude of 5.6. The comment gives the maximum intensity (VII) at Yuma. The intensity scale is generally understood as being based on the geographical region to which it has been applied.

In the last station-event, “depth” phases associated with PcP were reported. These phases will yield depth information at distances which may be too small to record pP or sP.

STOP is absolutely necessary to end the message.

## NET-EVENT GROUP FORM

The following example shows a message in which the data are arranged by event. Data from five seismic events are shown. Note that, within each event, the station-events have been arranged in any order convenient for the sender, probably reflecting the order of telemetered traces recorded on film strips. The blank lines between net-events are optional as is the placement of station-events on separate lines.

```
SEISMO N5041 STATP PROCA SPZ DEFAULT

MAR23
GIL     IP1919534 FMC XMT1.4 A463
ANV     IP1918485 FMC
SIT     EP1920528
KDC     EP1920528
PMR     EP1919478 FM,C XMT1.0 A65 LPZ LR XCT20A90 LPN XT21 A31 LPE XCT19 A65
NRA     EP1919058
GMA     EP1919063

ANV     EPLOC1927248

GIL     EP1953558 XMT1.5 A107
ANV     EP1952488
KDC     EP1953356
NRA     EP1953059

MAR24
GIL     IP0052368 FMD XMT1.0 A65 I53255
NKI     IP0054070
GMA     IP0053149
NRA     IP0053162
KDC     IP0053018
ADK     IP0054325
PMR     IP0052459 FMC,C XMT1.0 A102 E53305 E54582 LPZ LR XBT28 A14 LPN XBT29 A6 LPE XBT27
        A12
AVE     IP0053275 FMD

PMR     FOCUS 0532491 LAT 55.43N LON 157.84W DEP 33 NS 8 ((FELT III AT PERRYVILLE)) MAG ML6.1
        NS 2
SDN     IPLOC 0533159
KDC     IPN0533447
SVW     IPN0534155
PMR     IPN0534391
TTA     IPN0534391
TOA     IPN0534581
STOP
```

### COMMENTS ON EXAMPLE

As this example has been designed primarily to illustrate the structure of the net-event group form, it does not exhaust the parameters available to the code. Those using this form will benefit from an examination of the previous example.

In this message ground amplitudes were used throughout. If double trace amplitudes had been reported, the appropriate magnifications would have been required nearly each time an amplitude group appeared. Note also that the sender elected to insert a space between the period and amplitude groups. No other ⟨standard delimiter⟩ would be acceptable in this position and none is required.

The second event consists of just one station.

The fifth event includes a computations group with a hypocentre based on eight station-events and an $M_L$ magnitude average from two stations. Local magnitudes shown in the examples are for illustrative purposes only and do not represent a comment on the use of local magnitude schemata developed for a particular area and depth range, but applied to a different region or depth range.

ATTACHMENT IV

# GRAPHICAL REPRESENTATION OF DATA, ANALYSES AND FORECASTS

## 1. THE SURFACE PLOTTING MODEL

If it is required to plot the elements shown in the model, they should be placed in the relative positions shown. Any of the elements may be omitted.

| | | | | |
|---|---|---|---|---|
| $T_gT_g$ | $T_xT_xT_x$<br>or<br>$T_nT_nT_n$ | $C_H$ | E<br>or<br>E'sss | |
| | TTT | $C_M$ | PPPP/$P_0P_0P_0P_0$<br>or $a_3$hhh/<br>$P_0P_0P_0P_0$ | |
| V V | ww/$w_1w_1$<br>or<br>$w_aw_a/w_1w_1$ | N | PPP | a |
| | $T_dT_dT_d$ | $C_LN_h$<br>h or hh | $W_1W_2/w_1w_1$<br>or<br>$W_{a1}W_{a2}/w_1w_1$ | GG<br>or<br>GGgg |
| | $T_wT_wT_w$ | $P_{wa}P_{wa}H_{wa}H_{wa}$<br>or<br>$P_wP_wH_wH_w$ | RRR/$t_R$<br>$D_sv_s$ | |
| | | $d_{w1}d_{w1}P_{w1}P_{w1}H_{w1}H_{w1}$<br>$d_{w2}d_{w2}P_{w2}P_{w2}H_{w2}H_{w2}$ | | |

The "boxes" are included in the diagram simply to fix the relative positions of the elements and are not included in the actual plot. The wind plot is not shown in the model. Ship identification letters or buoy identifiers should be plotted above the model. In the case of automatic weather stations, an equilateral triangle should be plotted round the station circle so that the apex of the triangle (△) points towards the position of the medium-cloud symbol.

## 2. GRAPHIC REPRESENTATION OF DATA ON WEATHER CHARTS

2.1 The following rules concern the symbols to be used for the plotting of various elements figuring in a surface observation:

N — Total cloud cover

*Code*

0 = 0

1 = 1 okta or 1/10 or less, but not zero

2 = 2 oktas or 2/10–3/10

3 = 3 oktas or 4/10

4 = 4 oktas or 5/10

5 = 5 oktas or 6/10

6 = 6 oktas or 7/10-8/10

7 = 7 oktas or 9/10 or more, but not 8 oktas or 10/10

8 = 8 oktas or 10/10

9 = 9 Sky obscured, or cloud amount cannot be estimated

/ = No measurements made

*Symbol*

ddff — True direction, in tens of degrees, from which wind is blowing (dd) and wind speed in units indicated by $i_w$ (ff)

Wind is represented by barbs and solid pennants in black, the full barbs representing 5 m s$^{-1}$ or 10 knots, the half barbs representing 2.5 m s$^{-1}$ or 5 knots and the solid pennant representing 25 m s$^{-1}$ or 50 knots.

The wind shaft in black is directed along the axis of the wind towards the centre of the station circle and stops at its circumference.

All pennants and barbs lie to the left of the wind shaft in the northern hemisphere and to the right of the wind shaft in the southern hemisphere.

Barbs are at an angle of approximately 120° from the wind shaft. Pennants are triangles with their bases on the wind shaft.

A calm should be indicated by a circle drawn around the station circle:

Missing wind speed should be indicated by placing an "x" at the end of the wind shaft in lieu of the wind barbs. Wind direction is indicated in the usual manner, e.g. x—o. When the wind direction is missing, no wind should be plotted.

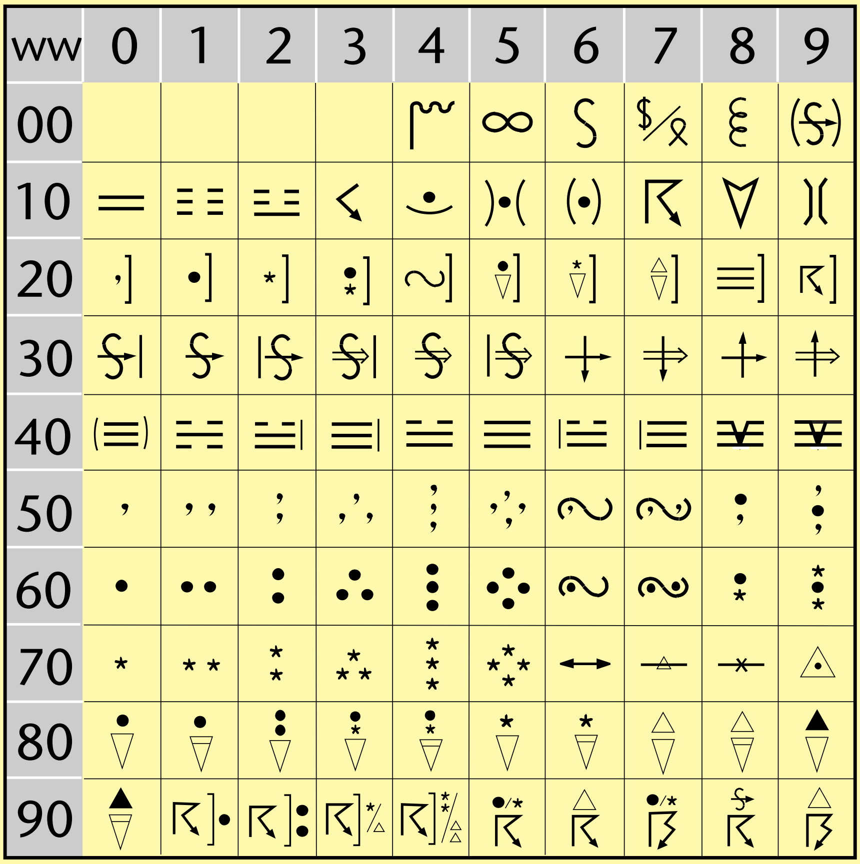
VV — Horizontal visibility at surface

The code figures are plotted.

ww

Present weather reported from a manned weather station (see Note 1)

The symbols for the appropriate code figures are given in the following table:




In the polychromatic method, black is used.

In the symbols and , Δ or * are alternatives, according to the observation.

In the symbols and , the rain symbol and the snow symbol are alternatives, either • or * being used, except in cases of doubt.

NOTES: (1) The meanings of the code figures for present weather are given in Code table 4677 in the *Manual on Codes* (WMO-No. 306) (Annex II to the *Technical Regulations*).

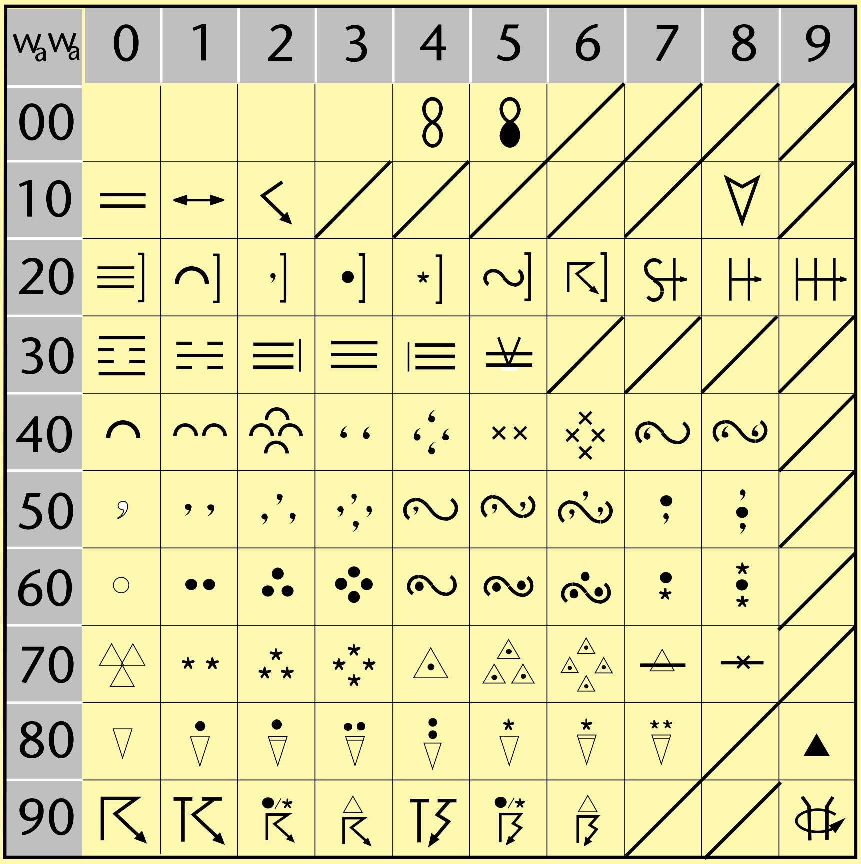
(2) When present and past weather are not included because:

(*a*) They are not significant ($i_x$ = 2 or 5), the spaces for ww and $W_1W_2$ are left blank;

(*b*) No observation was made ($i_x$ = 3 or 6) or the data are missing ($i_x$ = 1 or 4, but no 7-group in the message), ww and $W_1W_2$ are both plotted as //.

$w_a w_a$ Present weather reported from an automatic weather station (see Note 2)

The symbols for the appropriate code figures are given in the following table:



The symbols 30, 50, 60 and 70 represent the generic form of weather phenomena and may be plotted in an enlarged form.

The symbol ⌒ can specify any form of precipitation. ʻ specifies rain or drizzle. × specifies solid precipitation.

The symbols in row 80 represent intermittent precipitation, including showers.

NOTES: (1) The meaning of the code figures for present weather reported from an automatic station are given in Code table 4680 in the *Manual on Codes* (WMO-No. 306) (Annex II to the *Technical Regulations*).

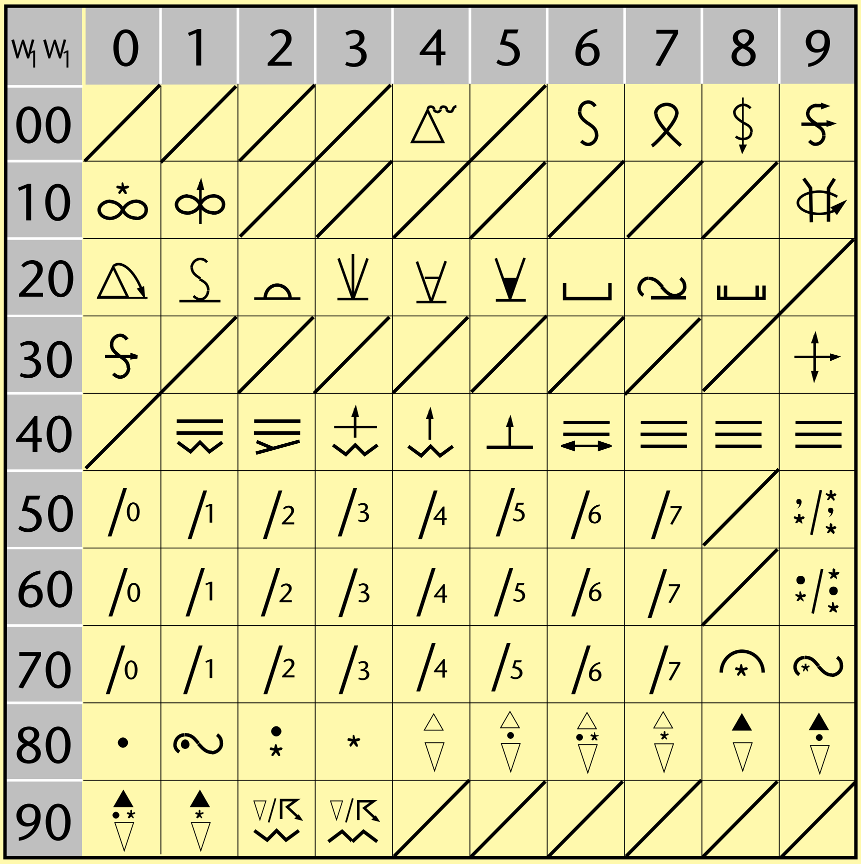
(2) When present weather and past weather are not included because:

(*a*) They are not significant ($i_x$ = 5), the squares for $w_a w_a$ and $W_{a1}W_{a2}$ are left blank;

(*b*) No observation was made ($i_x$ = 6) or the data are missing ($i_x$ = 7 but no 7-group in the message), $w_a w_a$ and $W_{a1}W_{a2}$ are both plotted as //.

$w_1w_1$ Present weather (in addition to ww or $w_a$ $w_a$)

The symbols for the appropriate code figures are given in the following table:



The pairs of symbols ∇/K , ;/* or :/* are alternatives according to the observation.

The symbol /2 means drizzle, rain or snow whose rates of fall are indicated by code figures 52, 62, and 72 respectively. The symbols are plotted in conjunction with ww, present weather, or $w_aw_a$ or $W_1W_2$ or $W_{a1}W_{a2}$. (e.g. ’ ’/2).

Symbol means over sea, lake or river (over water).

Symbol means on or over mountains.

Symbol means in or over valleys.

NOTE: The meanings of code figures for present weather are given in Code table 4687 in the *Manual on Codes* (WMO-No. 306) (Annex II to the *Technical Regulations*).

$W_1W_2$ Past weather reported from a manned station

The symbols to be plotted for both $W_1$ and $W_2$ are taken from the following list:

| *Code figure* | | *Symbol* |
|---|---|---|
| 3 | Sandstorm or dust storm | |
| 3 | Blowing snow | |
| 4 | Fog or ice fog or thick haze | ≡ |
| 5 | Drizzle | , |
| 6 | Rain | • |
| 7 | Snow or rain and snow mixed | * |
| 8 | Shower(s) | ▽ |
| 9 | Thunderstorms | |

The two symbols are plotted as $W_1W_2$.

In the polychromatic method, red is used.

NOTE: See Note (2) under ww.

$W_{a1}W_{a2}$ Past weather reported from an automatic station

| *Code figure* | | *Symbol* |
|---|---|---|
| 1 | VISIBILITY REDUCED | ||| |
| 2 | Blowing phenomena, visibility reduced | |
| 3 | FOG | ≡ |
| 4 | PRECIPITATION | ⌒ |
| 5 | Drizzle | , |
| 6 | Rain | • |
| 7 | Snow or ice pellets | */△ |
| 8 | Snow shower(s) or intermittent precipitation | ▽ |
| 9 | Thunderstorm | |

NOTE: The meanings of code figures for past weather reported from an automatic station are given in Code table 4531 in the *Manual on Codes* (WMO-No. 306) (Annex II to the *Technical Regulations*).

PPPP
or
$a_3$hhh

Pressure at mean sea-level in tenths of a hectopascal omitting thousands digit of hectopascal of the pressure value or geopotential of the standard "constant pressure level" given by $a_3$ in standard geopotential metres omitting the thousands digit

Normally the pressure is that which has been reduced to mean sea-level. It may be plotted as reported in four figures or alternatively in three figures by plotting the last three figures only of the group. If $a_3$hhh has been reported instead of pressure reduced to mean sea-level and it is to be plotted on the same chart as mean sea-level pressure observations then it is plotted in four figures and the first figure ($a_3$) can be used to indicate the datum plane, other than mean sea-level, to which the plotted value refers.

TTT

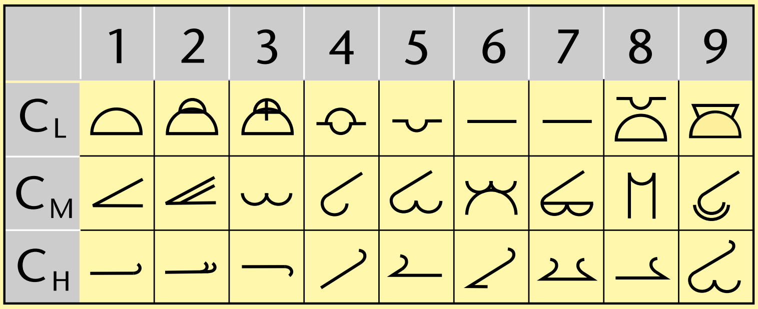
Air temperature in tenths of a degree Celsius, its sign given by $s_n$

The actual value of this temperature may be plotted in degrees and tenths of a degree Celsius, the tenths figure being separated by a decimal point , or it may be plotted in whole degrees Celsius, having first been rounded to the nearest degree. Negative values are preceded by a minus sign.

$C_LC_MC_H$

Cloud of the genera Stratocumulus, Stratus, Cumulus and Cumulonimbus ($C_L$); Altocumulus, Altostratus and Nimbostratus ($C_M$); and Cirrus, Cirrocumulus and Cirrostratus ($C_H$)

The symbols for the appropriate code figure are given in the following table:




In the polychromatic method, black is used. However, the use of red for plotting $C_H$ symbols is optional.

NOTES: (1) The meanings of the code figures for type of cloud are given in Codes tables 0509, 0513 and 0515 in the *Manual on Codes* (WMO-No. 306) (Annex II to the *Technical Regulations*).

(2) If, with $C_L$ = 8, it is known that the base of the Sc is below the base of the Cu, the symbol  is used.

$N_h$

Amount of all $C_L$ cloud(s) present or, if no $C_L$ cloud is present, the amount of all the $C_M$ cloud(s) present

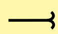
The code figure for $N_h$ is entered to the right of the position allotted to $C_L$.

h or hh

Height, above ground, of the base of the lowest cloud seen. The cloud figure for h is entered below the position allotted to $C_L$. If hh is reported, the two code figures for hh may be entered in lieu of h.

$8N_sCh_sh_s$

Genus of cloud (C)

| *Code figure* | | *Monochromatic* |
|---|---|---|
| 0 | Cirrus Ci |  |
| 1 | Cirrocumulus Cc |  |
| 2 | Cirrostratus Cs |  |

| *Code figure* | | *Monochromatic* |
|---|---|---|
| 3 | Altocumulus Ac |  |
| 4 | Altostratus As |  |
| 5 | Nimbostratus Ns |  |
| 6 | Stratocumulus Sc |  |
| 7 | Stratus St |  |
| 8 | Cumulus Cu |  |
| 9 | Cumulonimbus Cb |  |

The symbols corresponding to code figures 6 to 9 will be plotted in the position allotted to $C_L$, those corresponding to code figures 3 to 5 in the position allotted to $C_M$ and those corresponding to code figures 0 to 2 in the position allotted to $C_H$. The symbols should be arranged in ascending order of height of cloud base, i.e. the lowest cloud will be at the bottom.

The code figures for $N_s$ and $h_sh_s$ relating to the lowest cloud layer should normally be plotted in the positions reserved for $N_h$ and h. If the purpose of the chart requires it, the code figures for $N_s$ and $h_sh_s$ for each cloud layer may be plotted against the corresponding cloud symbol in the same manner as are $N_h$ and h for $C_L$.

$T_dT_dT_d$ Dew-point temperature in tenths of a degree Celsius, its sign being given by $s_n$

The actual value of this temperature may be plotted in degrees and tenths of a degree Celsius, the tenths figure being separated by by a decimal point, or it may be plotted in whole degrees Celsius, having first been rounded to the nearest degree. Negative values are preceded by a minus sign.

a Characteristic of pressure tendency during the three hours preceding the time of observation

| *Code figure* | | *Monochromatic* |
|---|---|---|
| 0 | Increasing, then decreasing; atmospheric pressure the same as or higher than three hours ago |  |
| 1 | Increasing, then steady; or increasing, then increasing more slowly; atmospheric pressure now higher than three hours ago |  |
| 2 | Increasing (steadily or unsteadily); atmospheric pressure now higher than three hours ago |  |
| 3 | Decreasing or steady, then increasing; or increasing, then increasing more rapidly; atmospheric pressure now higher than three hours ago |  |
| 4 | Steady; atmospheric pressure the same as three hours ago |  |
| 5 | Decreasing, then increasing; atmospheric pressure the same as or lower than three hours ago |  |
| 6 | Decreasing, then steady; or decreasing, then decreasing more slowly; atmospheric pressure now lower than three hours ago |  |
| 7 | Decreasing (steadily or unsteadily); atmospheric pressure now lower than three hours ago |  |
| 8 | Steady or increasing, then decreasing; or decreasing, the decreasing more rapidly; atmospheric pressure now lower than three hours ago |  |

ppp

Amount of pressure tendency at station level during the three hours preceding the time of observation, expressed in tenths of a hectopascal

The pressure change is plotted in two figures by plotting only the last figures of ppp unless the first figure of ppp is other than zero, in which case the pressure change is plotted as reported in three figures. The plotting figures may be preceded by a plus sign when a = 0, 1, 2 or 3 and by a minus sign when a = 5, 6, 7 or 8. In this case the symbol for a = 2, 4 (if used) or 7 may be omitted.

$D_s v_s$

Direction (true) of resultant displacement of the ship ($D_s$) and ship's average speed made good ($v_s$) during the three hours preceding the time of observation

The direction $D_s$ is plotted by means of an arrow pointing in the direction towards which the ship is moving and the code figure for the speed $v_s$ is entered to the right of the arrow.

$T_w T_w T_w$

Sea-surface temperature in tenths of a degree Celsius, its sign given by $s_n$

The actual value of this temperature is plotted in degrees and tenths of a degree Celsius, the tenths figure being separated by a decimal point, or it may be plotted in whole degrees Celsius, having first been rounded to the nearest degree. Negative values are preceded by a minus sign.

$d_{w1}d_{w1}$ $d_{w2}d_{w2}$

True direction, in tens of degrees, from which swell waves are coming

This is represented by an arrow with a wavy shaft; the arrow-heads point in the direction towards which the waves are moving. If $d_{w1}d_{w1}$ is reported as 00, a wavy line without an arrow-head is drawn in a north-south direction.

If $d_{w1}d_{w1}$ is reported as 99, crossed arrows with wavy shafts are drawn one from south-west to north-east and the other from south-east to north-west, thus .

If $d_{w1}d_{w1}$ is missing, it is plotted as for $d_{w1}d_{w1}$ 99 but the arrowheads are omitted.

When there is a second swell system reported by $d_{w2}d_{w2}$, this is plotted below the first.

$P_{w1}P_{w1}$ $P_{w2}P_{w2}$

Period of swell waves in seconds

The code figures for $P_{w1}P_{w1}$ and $P_{w2}P_{w2}$ are plotted immediately to the right of the symbol for $d_{w1}d_{w1}$ and $d_{w2}d_{w2}$.

When there are no swell waves $P_{w1}P_{w1}$ and $P_{w2}P_{w2}$ are not plotted.

$H_{wa}H_{wa}$ $H_wH_w$ $H_{w1}H_{w1}$ $H_{w2}H_{w2}$

Height of waves, obtained by instrumental methods ($H_{wa}H_{wa}$), wind waves ($H_wH_w$) or swell waves ($H_{w1}H_{w1}$ and $H_{w2}H_{w2}$), respectively in units of 0.5 metre

These code figures are plotted immediately to the right of the symbols for $P_{wa}P_{wa}$, $P_wP_w$, $P_{w1}P_{w1}$ or $P_{w2}P_{w2}$ respectively.

When there are no swell waves $H_{w1}$ and $H_{w2}$ are not plotted.

NOTE: If instrumental wave data, as reported in group $1P_{wa}P_{wa}H_{wa}H_{wa}$, are plotted, they should be underlined.

$P_{wa}P_{wa}$ $P_wP_w$

Period of waves, obtained by instrumental methods ($P_{wa}P_{wa}$) or period of wind waves ($P_wP_w$), in seconds

The code figure either for $P_{wa}P_{wa}$ or for $P_wP_w$ is plotted under the symbol for low clouds.

NOTE: If instrumental wave data, as reported in group $1P_{wa}P_{wa}H_{wa}H_{wa}$, are plotted, they should be underlined.

RRR

Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by $t_R$

If following a national decision this element is to be plotted, the following cases may occur:

(*a*) Precipitation amount is reported ($i_R$ = 1 or 2), the figures of RRR are entered at the appropriate place in the plotting model (see paragraph 1 of this Appendix);

(*b*) Precipitation amount is zero ($i_R$ = 3), RRR is not entered on the map;

(*c*) No observation was made ($i_R$ = 4), RRR is entered as ///.

$t_R$ Duration of period of reference for amount of precipitation, expressed in units of six hours, and ending at the time of the report

The code figure for $t_R$ is entered, except in cases where precipitation is not reported ( $i_R$ = 3 or 4).

$T_xT_xT_x$ or $T_nT_nT_n$ Maximum ($T_xT_xT_x$) or minimum ($T_nT_nT_n$) temperature in degrees Celsius and tenths, its sign given by $s_n$

The actual maximum or minimum temperature is entered in degrees and tenths of a degree Celsius, the tenths figure being separated by a decimal point and negative values being preceded by a minus sign.

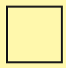
$T_gT_g$ Ground (grass) minimum temperature of the preceding night in whole degrees Celsius, its sign given by $s_n$

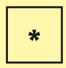
The actual value is entered in degrees Celsius, negative values being preceded by a minus sign.

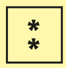
E or E' State of the ground without ( E) or with (E') snow or measurable ice cover

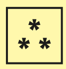
One of these is plotted using the appropriate symbol from the following tables:

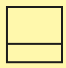
*Code figure for* E

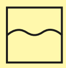
0 Surface of ground dry (without cracks and no appreciable amount of dust or loose sand) 

1 Surface of ground moist 

2 Surface of ground wet (standing water in small or large pools on surface) 

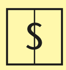
3 Flooded 

4 Surface of ground frozen 

5 Glaze on ground 

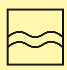
6 Loose dry dust or sand not covering ground completely 

7 Thin cover of loose dry dust or sand covering ground completely 

8 Moderate or thick cover of loose dry dust or sand covering ground completely 

9 Extremely dry with cracks 

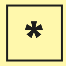
*Code figure for* E'

0 Ground predominantly covered by ice 

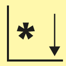
1 Compact or wet snow (with or without ice) covering less than one-half of the ground 

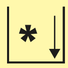
2 Compact or wet snow (with or without ice) covering at least one-half of the ground but ground not completely covered 

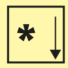
*Code figure for* E' (continued)

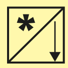
3 Even layer of compact or wet snow covering ground completely 

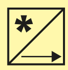
4 Uneven layer of compact or wet snow covering ground completely 

5 Loose dry snow covering less than one-half of the ground 

6 Loose dry snow covering at least one-half of the ground (but not completely) 

7 Even layer of loose dry snow covering ground completely 

8 Uneven layer of loose dry snow covering ground completely 

9 Snow covering ground completely; deep drifts 

sss Total depth of snow in centimetres

This is plotted in code figures or actual depths in accordance with national or regional decisions.

GG Actual time of observation to the nearest hour UTC

GG is plotted only if it is different from the reference hour of the chart.

2.2 The following rules determine the symbols to be used for the plotting of the various upper-air observation elements which appear on the constant pressure charts.

(*a*) The wind at the level of the chart should be plotted with a solid shaft touching the station circle, the barbs and solid pennants flying to the left of the wind shaft in the northern hemisphere and to the right of the wind shaft in the southern hemisphere. The full barbs represent 5 m $s^{-1}$ or 10 knots, the half-barbs represent 2.5 m $s^{-1}$ or 5 knots, and the solid pennant represents 25 m $s^{-1}$ or 50 knots.

Derived winds should be plotted with the shaft touching the station circle and the barbs and solid pennants flying towards the side of higher pressure. If one derived wind is plotted, the shaft should be a solid line. If two derived winds are plotted, one of them should be plotted with a broken shaft.

Colour separation between the observed and derived winds is recommended. In wind field analyses code figures may replace the barbs and pennants.

(*b*) Clouds should be plotted with the same symbols as used on surface charts.

## 3. ANALYSES AND FORECASTS ON WEATHER CHARTS

### 3.1 General rules

(*a*) The basic symbol shown in the table below is placed on the chart along the line of the phenomenon and it is repeated as necessary to indicate the extent of the phenomenon;

(*b*) The arrows on items 1 to 10 of the table are not part of the symbol but are entered to indicate the orientation of the symbol with respect to the direction of motion of the phenomenon.

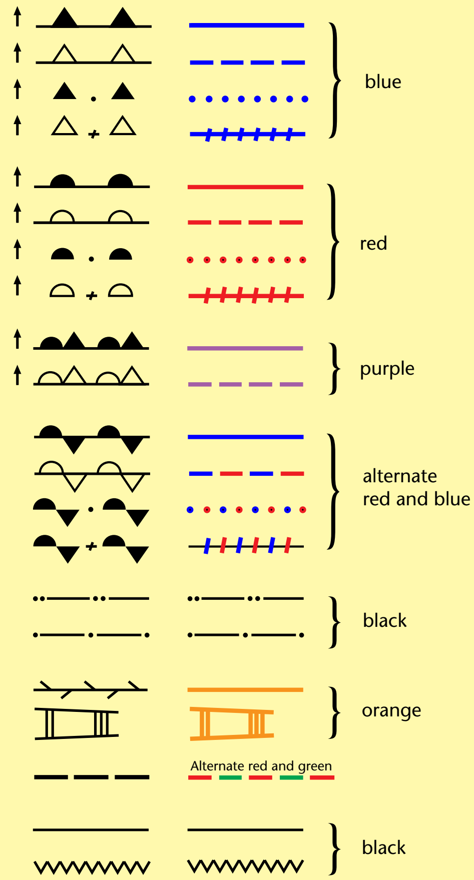
## 3.2 Symbols

*Term*

*Symbol*

*Monochromatic* *Polychromatic*

1. Cold front at the surface
2. Cold front above the surface
3. Cold front frontogenesis
4. Cold front frontolysis
5. Warm front at the surface
6. Warm front above the surface
7. Warm front frontogenesis
8. Warm front frontolysis
9. Occluded front at the surface
10. Occluded front above the surface
11. Quasi-stationary front at the surface
12. Quasi-stationary front above the surface
13. Quasi-stationary front frontogenesis
14. Quasi-stationary front frontolysis
15. Instability line
16. Shear line
17. Convergence line
18. Intertropical convergence zone
19. Intertropical discontinuity
20. Axis of trough
21. Axis of ridge




NOTE: The separation of the two lines gives a qualitative representation of the width of the zone; the hatched lines may be added to indicate areas of activity.

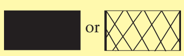
## 3.3 Representation of weather features

Weather features on charts may be shown in the manner indicated below:

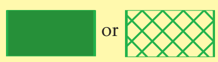
*Feature*

*Monochromatic* *Polychromatic*

(*a*) Zones of continuous precipitation

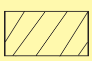



Solid shading or cross-hatching

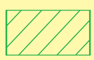



Solid shading or cross-hatching in green

(*b*) Zones of intermittent precipitation

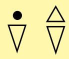
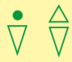


Single hatching



Single hatching in green

The appropriate weather symbol may be distributed over the zone.

| *Feature* | *Monochromatic* | *Polychromatic* |
|---|---|---|
| (*c*) Areas of showers | Large shower symbols distributed over the area with the symbol for rain, snow or hail added as appropriate, e.g.  | As monochromatic system but in green  |
| (*d*) Areas of thunderstorms | Large thunderstorm symbols distributed over the area with the symbol for rain, snow or hail added as appropriate, e.g.  | As monochromatic system but in red  |
| (*e*) Areas of fog | Large fog symbols distributed over the area |  Solid shading in yellow |
| (*f*) Areas of duststorm, sandstorm or dust haze | Large symbols for the appropriate phenomenon distributed over the area |  Solid brown shading with the appropriate weather symbol distributed over the area |

NOTE: In all cases, the extent of the area affected by the phenomena may be delineated by a thin boundary line of the same colour. The shading, hatching or superimposed symbols should not obliterate the plotted data.

## 4. REPRESENTATION OF THE ANALYSIS AND FORECAST ON SPECIFIC CHARTS

### 4.1 Surface charts

#### 4.1.1 *Fronts*

Fronts will be shown using the symbols given in paragraph 3.2.

#### 4.1.2 *Isobars*

It is recommended that isobars be drawn at intervals of 4 or 5 hPa. Multiples or sub-multiples of these basic intervals may be used depending on the scale and purposes of the chart but, whatever the intervals, the 1 000 hPa isobar should always be included in the series.

#### 4.1.3 *Pressure centres*

(*a*) The location of a pressure centre may be indicated by a cross. To indicate the nature of the centre, a capital letter appropriate to the language of the country is entered above the symbol marking the centre.

(*b*) In the case of tropical cyclonic circulations the centre is marked by a special symbol as shown below:

 For a tropical cyclonic circulation with observed or estimated maximum winds of 17 to 63 kt (29 to 117 km/h);

 For a tropical cyclonic circulation with observed or estimated maximum winds of 64 kt (118 km/h) or more.

(*c*) The letter or the symbol for a tropical cyclonic circulation should be aligned parallel to the adjacent meridian.

(*d*) Pressure centres may be given an identifying letter to assist in their tracking from chart to chart. This should be written as a suffix to the letter or symbol defining the pressure centre. A tropical cyclonic circulation may have a name assigned to it. This may be entered in block letters near to the centre.

(*e*) The value of the pressure at the centre should be entered in whole hectopascals immediately below the symbol marking the centre, the number being parallel to the adjacent line of latitude.

#### 4.1.4 *Tracks of pressure centres*

The previous positions of a pressure centre may be entered by means of symbols in the same way as the present position. Above each symbol may be entered the corresponding time in hours (two figures) and below it the pressure of the centre at that time in hectopascals. The symbols should be joined by a thick broken line. The forecast position of a pressure centre may also be indicated by a symbol in the same way as the present position, the time and the estimated pressure being entered above and below the symbol respectively. The present position and the forecast position should be joined by a solid arrow drawn along the track the centre is forecast to take.

#### 4.1.5 *Isallobars*

Isallobars of three-hour change should normally be drawn for intervals of single hectopascals. Large intervals may be used if the scale of the chart is small or if the period is longer than three hours. The “no change” line will be numbered with a zero and the numbers on the other lines will be preceded by a plus sign if the pressure has risen and a minus sign if it has fallen.

### 4.2 Charts of isobaric surfaces

#### 4.2.1 *Fronts*

If fronts are entered, the symbols given in paragraph 3.2 should be used.

#### 4.2.2 *Isohypses of absolute topography or contour lines*

It is recommended that contour lines be drawn at intervals of either 40 gpm (80, 20 and 10 when appropriate) or 60 gpm (120, 30, 15 when appropriate). The lines should be numbered in geopotential decametres, e.g. 5280 gpm should be labelled 528.

#### 4.2.3 *Height centres*

The positions present, past and forecast of high and low centres in the contours may be indicated in the same way as for pressure centres on surface charts (see paragraphs 4.1.3 and 4.1.4). Above the symbol marking a centre may be entered a capital letter appropriate to the language of the country. The value of the height at the centre should be entered immediately below the symbol marking the centre to the nearest ten metres, e.g. 5280. The number should be entered parallel to the adjacent line of latitude.

#### 4.2.4 *Isotachs*

Isotachs should normally be drawn at intervals of 20 kt (40, 10 and 5 when appropriate). Centres of regions of minimum and maximum speed may be marked according to national practices. On the maximum wind charts, however, the maximum should be marked by a “J” followed by the estimated maximum speed, e.g. J 120.

#### 4.2.5 *Jet streams*

A jet stream should be marked by a heavy, solid line with arrow-heads placed at intervals along it pointing in the direction of the flow in the stream.

#### 4.2.6 *Isohypses of relative topography or thickness lines*

If thickness lines are drawn, the following intervals are recommended: either 40 gpm (80, 20 and 10 when appropriate) or 60 gpm (120, 30, 15 when appropriate).

#### 4.2.7 *Isotherms*

Isotherms will not normally be drawn on charts on which thickness lines are entered. Isotherms should be drawn at intervals of either 5 °C (10 °C and 2.5 °C when appropriate) or 2 °C (1 °C when appropriate).

#### 4.2.8 *Moisture lines*

If lines of equal dew point are drawn, the same intervals as for isotherms may be used.

For more information, please contact:

**World Meteorological Organization**

7 bis, avenue de la Paix – P.O. Box 2300 – CH 1211 Geneva 2 – Switzerland

**Communication and Public Affairs Office**

Tel.: +41 (0) 22 730 83 14/15 – Fax: +41 (0) 22 730 80 27

Email: cpa@wmo.int

**public.wmo.int**

JN 181217