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| **WORLD METEOROLOGICAL ORGANIZATION**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | |
| EXPERT TEAM ON SEA ICE – FIFTH SESSION  STEERING GROUP FOR THE PROJECT  GLOBAL DIGITAL SEA ICE DATA BANK (GDSIDB) – THIRTEENTH SESSION  OTTAWA, CANADA, 25 TO 28 MARCH 2014 | | **ETSI-5/GDSIDB-13/Doc. 5.5**  Submitted by: Vasily Smolyanitsky  Date: 25.03.2014  Original Language: ENGLISH  Agenda Item: 5.5  Status: DRAFT 1 |

**REVIEW OF CODING TABLES RELATED TO SEA ICE IN WMO MANUAL ON CODES (WMO–NO.306)**

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| --- |
| Summary and Purpose of Document This document provides background information for the meeting on the coding tables related to sea ice in the WM-No.306 “Manual on Codes” for BUF/CREX and GRIB formats |

**ACTION PROPOSED**

The Expert Team on Sea Ice is invited to:

(a) Note and comment on the information provided as appropriate;

(b) Consider and, as appropriate, suggest actions to ensure harmonization and consistency between the WMO-No.306 “Manual on Codes” and WMO-No.259 “Sea-Ice Nomenclature” and WMO/TD-No. 1214 “Sea-Ice Georeferenced Information and Data”

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**References:**

Tables extracted from the Manual on Codes, Volume I.2 (<http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/LatestVERSION/LatestVERSION.html>)

**Appendices:**

1 - CODE TABLES AND FLAG TABLES ASSOCIATED WITH BUFR/CREX TABLE B

2 - CODE TABLES USED IN SECTION 4 (GRIB)

**DISCUSSION**

**1 CODE TABLES AND FLAG TABLES ASSOCIATED WITH BUFR/CREX TABLE B**

0 01 038 *Source of sea ice fraction*

0 20 032 *Rate of ice accretion (estimated)*

0 20 033 *Cause of ice accretion*

0 20 034 *Sea ice concentration*

0 20 035 *Amount and type of ice*

0 20 036 *Ice situation*

0 20 037 *Ice development*

0 21 169 *Ice presence indicator*

0 29 001 *Projection type*

0 29 002 *Coordinate grid type*

**2 GRIB Tables**

Code table 0.0 – *Discipline of processed data in the GRIB message, number of GRIB Master table*

Code table 3.15 – *Physical meaning of vertical coordinate*

Code table 4.0 – *Product definition template number*

Code table 4.1 – *Parameter category by product discipline*

Code table 4.2 – *Parameter number by product discipline and parameter category*

**Appendix 1 - CODE TABLES AND FLAG TABLES ASSOCIATED WITH BUFR/CREX TABLE B**

**…….**

**0 01 038**

***Source of sea ice fraction***

Code figure

0 No sea ice set

1 NSIDC SSM/I Cavalieri et al (1992)

2 AMSR-E

3 ECMWF

4 CMS (France) cloud mask used by Medspiration

5 EUMETSAT OSI-SAF

6–30 Reserved for future use

31 Missing value

**0 20 032**

***Rate of ice accretion (estimated)***

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

5–6 Reserved

7 Missing value

**0 20 033**

***Cause of ice accretion***

Bit No.

1 Icing from ocean spray

2 Icing from fog

3 Icing from rain

All 4 Missing value

**0 20 034**

***Sea ice concentration***

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

3 4/10 to 6/10 (3/8 to less than 6/8),  
 open pack ice

Sea ice concentration  
is uniform in the  
observation area

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

Ship in ice or within  
0.5 nautical mile of  
ice edge

6 Strips and patches of pack ice   
 with open water between

7 Strips and patches of close or   
 very close pack ice with areas   
 of lesser concentration between

Sea ice concentration  
is not uniform in the  
observation area

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   
 boundary

10–13 Reserved

14 Unable to report, because of darkness, lack of visibility, or because ship is more than   
 0.5 nautical mile away from ice edge

15–30 Reserved

31 Missing value

**0 20 035**

***Amount and type of ice***

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

10–13 Reserved

14 Unable to report, because of darkness, lack of visibility or because only sea ice is visible

15 Missing value

**0 20 036**

***Ice situation***

Code figure

0 Ship in open water with floating ice in sight

1 Ship in easily penetrable ice; conditions improving

2 Ship in easily penetrable ice; conditions not changing

3 Ship in easily penetrable ice; conditions worsening

4 Ship in ice difficult to penetrate; conditions improving

5 Ship in ice difficult to penetrate; conditions not changing

6 Ship in ice difficult to penetrate and conditions worsening. Ice forming and floes freezing  
 together

7 Ship in ice difficult to penetrate and conditions worsening. Ice under slight pressure

8 Ship in ice difficult to penetrate and conditions worsening. Ice under moderate or severe  
 pressure

9 Ship in ice difficult to penetrate and conditions worsening. Ship beset

10–29 Reserved

30 Unable to report, because of darkness or lack of visibility

31 Missing value

**0 20 037**

***Ice 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

10–29 Reserved

30 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

31 Missing value

**0 21 169**

***Ice presence indicator***

Code figure

0 No ice present

1 Ice present

2 Reserved

3 Missing value

**0 29 001**

***Projection type***

Code figure

0 Gnomonic projection

1 Polar stereographic projection

2 Lambert’s conformal conic projection

3 Mercator’s projection

4 Scanning Cone (radar)\*

5 Reserved

6 No projection

7 Missing value

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\* Projection type 4 indicates a Cartesian grid placed directly on the scanning cone defined by the azimuthal sweep of the radar.

**0 29 002**

***Coordinate grid type***

Code figure

0 Cartesian

1 Polar

2 Other

3–6 Reserved

7 Missing value

**Appendix 2 – GRIB Tables**

**Code table 0.0** – *Discipline of processed data in the GRIB message, number of GRIB Master table*

Code figure Meaning

0 Meteorological products

1 Hydrological products

2 Land surface products

3 Space products

4–9 Reserved

10 Oceanographic products

11–191 Reserved

192–254 Reserved for local use

255 Missing

**Code table 3.15** – *Physical meaning of vertical coordinate*

Code figure Meaning Unit

0–19 Reserved

20 Temperature K

21–99 Reserved

100 Pressure Pa

101 Pressure deviation from mean sea level Pa

102 Altitude above mean sea level m

103 Height above ground (see Note 1) m

104 Sigma coordinate

105 Hybrid coordinate

106 Depth below land surface m

107 Potential temperature (theta) K

108 Pressure deviation from ground to level Pa

109 Potential vorticity K m–2 kg–1 s–1

110 Geometrical height m

111 Eta coordinate (see Note 2)

112 Geopotential height gpm

113 Logarithmic hybrid coordinate

114–159 Reserved

160 Depth below sea level m

161–191 Reserved

192–254 Reserved for local use

255 Missing

**Code table 4.0** – *Product definition template number*

Code figure Meaning

0 Analysis or forecast at a horizontal level or in a horizontal layer at a point in time

1 Individual ensemble forecast, control and perturbed, at a horizontal level or in a   
 horizontal layer at a point in time

2 Derived forecasts based on all ensemble members at a horizontal level or in a  
 horizontal layer at a point in time

3 Derived forecasts based on a cluster of ensemble members over a rectangular area at a   
 horizontal level or in a horizontal layer at a point in time

4 Derived forecasts based on a cluster of ensemble members over a circular area at a  
 horizontal level or in a horizontal layer at a point in time

5 Probability forecasts at a horizontal level or in a horizontal layer at a point in time

6 Percentile forecasts at a horizontal level or in a horizontal layer at a point in time

7 Analysis or forecast error at a horizontal level or in a horizontal layer at a point in time

8 Average, accumulation, extreme values or other statistically processed values at a   
 horizontal level or in a horizontal layer in a continuous or non-continuous time interval

9 Probability forecasts at a horizontal level or in a horizontal layer in a continuous or  
 non-continuous time interval

10 Percentile forecasts at a horizontal level or in a horizontal layer in a continuous or non-   
 continuous time interval

11 Individual ensemble forecast, control and perturbed, at a horizontal level or in a   
 horizontal layer, in a continuous or non-continuous interval

12 Derived forecasts based on all ensemble members at a horizontal level or in a horizontal   
 layer, in a continuous or non-continuous interval

13 Derived forecasts based on a cluster of ensemble members over a rectangular area, at  
 a horizontal level or in a horizontal layer, in a continuous or non-continuous interval

14 Derived forecasts based on a cluster of ensemble members over a circular area, at a   
 horizontal level or in a horizontal layer, in a continuous or non-continuous interval

15 Average, accumulation, extreme values, or other statistically processed values over a   
 spatial area at a horizontal level or in a horizontal layer at a point in time

16–19 Reserved

20 Radar product

21–29 Reserved

30 Satellite product (deprecated)

31 Satellite product

32 Analysis or forecast at a horizontal level or in a horizontal layer at a point in time for  
 simulated (synthetic) satellite data

33 Individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal   
 layer at a point in time for simulated (synthetic) satellite data

34 Individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal   
 layer, in a continuous or non-continuous interval for simulated (synthetic) satellite data

35-39 Reserved

40 Analysis or forecast at a horizontal level or in a horizontal layer at a point in time for   
 atmospheric chemical constituents

41 Individual ensemble forecast, control and perturbed, at a horizontal level or in a   
 horizontal layer at a point in time for atmospheric chemical constituents

42 Average, accumulation and/or extreme values or other statistically processed values at   
 a horizontal level or in a horizontal layer in a continuous or non-continuous time interval   
 for atmospheric chemical constituents

43 Individual ensemble forecast, control and perturbed, at a horizontal level or in a   
 horizontal layer in a continuous or non-continuous time interval for atmospheric   
 chemical constituents

44 Analysis or forecast at a horizontal level or in a horizontal layer at a point in time for  
 aerosol

45 Individual ensemble forecast, control and perturbed, at a horizontal level or in  
 a horizontal layer at a point in time for aerosol

46 Average, accumulation, and/or extreme values or other statistically processed values  
 at a horizontal level or in a horizontal layer in a continuous or non-continuous time  
 interval for aerosol

47 Individual ensemble forecast, control and perturbed, at a horizontal level or in  
 a horizontal layer in a continuous or non continuous time interval for aerosol

48 Analysis or forecast at a horizontal level or in a horizontal layer at a point in time for  
 optical properties of aerosol

49–50 Reserved

51 Categorical forecasts at a horizontal level or in a horizontal layer at a point in time

52 Reserved

53 Partitioned parameters at a horizontal level or in a horizontal layer at a point in time

54 Individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal   
 layer at a point in time for partitioned parameters

55-90 Reserved

91 Categorical forecasts at a horizontal level or in a horizontal layer in a continuous or  
 non-continuous time interval

92–253 Reserved

254 CCITT IA5 character string

255–999 Reserved

1000 Cross-section of analysis and forecast at a point in time

1001 Cross-section of averaged or otherwise statistically processed analysis or forecast over a   
 range of time

1002 Cross-section of analysis and forecast, averaged or otherwise statistically processed over   
 latitude or longitude

1003–1099 Reserved

1100 Hovmöller-type grid with no averaging or other statistical processing

1101 Hovmöller-type grid with averaging or other statistical processing

1102–32767 Reserved

32768–65534 Reserved for local use

65535 Missing

**Code table 4.1** – *Parameter category by product discipline*

Note: When a new category is to be added to Code table 4.1 and more than one discipline applies, the choice of discipline should be made based on the intended use of the product.

**Product discipline 0 – Meteorological products**

Category Description

0 Temperature

1 Moisture

2 Momentum

3 Mass

4 Short-wave radiation

5 Long-wave radiation

6 Cloud

7 Thermodynamic stability indices

8 Kinematic stability indices

9 Temperature probabilities

10 Moisture probabilities

11 Momentum probabilities

12 Mass probabilities

13 Aerosols

14 Trace gases (e.g. ozone, CO2)

15 Radar

16 Forecast radar imagery

17 Electrodynamics

18 Nuclear/radiology

19 Physical atmospheric properties

20 Atmospheric chemical constituents

21–189 Reserved

190 CCITT IA5 string

191 Miscellaneous

192–254 Reserved for local use

255 Missing

Note: Entries 9, 10, 11 and 12 are deprecated.

**Product discipline 1 – Hydrological products**

Category Description

0 Hydrology basic products

1 Hydrology probabilities

2 Inland water and sediment properties

3–191 Reserved

192–254 Reserved for local use

255 Missing

**Product discipline 2 – Land surface products**

Category Description

0 Vegetation/biomass

1 Agri-/aquacultural special products

2 Transportation-related products

*(continued)*

*(Code table 4.1 – continued)*

Category Description

3 Soil products

4 Fire weather products

5–191 Reserved

192–254 Reserved for local use

255 Missing

**Product discipline 3 – Space products**

Category Description

0 Image format products (see Note 1)

1 Quantitative products (see Note 2)

2–191 Reserved

192–254 Reserved for local use

255 Missing

Notes:

(1) Data are numeric without units, although they might be given quantitative meaning through a code table defined external to this document. The emphasis is on a displayable “picture” of some phenomenon, perhaps with certain enhanced features. Generally, each datum is an unsigned, one octet integer, but some image format products might have another datum size. The size of a datum is indicated in section 5.

(2) Data are in specified physical units.

**Product discipline 10 – Oceanographic products**

Category Description

0 Waves

1 Currents

2 Ice

3 Surface properties

4 Sub-surface properties

5–190 Reserved

191 Miscellaneous

192–254 Reserved for local use

255 Missing

**Code table 4.2** – *Parameter number by product discipline and parameter category*

Notes:

(1) By convention, the flux sign is positive if downwards.

(2) When a new parameter is to be added to Code table 4.2 and more than one category applies, the choice of category should be made based on the intended use of the product. The discipline and category are an important part of any product definition, so it is possible to have the same parameter name in more than one category. For example, “water temperature” in discipline 10 (oceanographic products), category 4 (sub-surface properties) is used for reporting water temperature in the ocean or open sea, and is not the same as “water temperature” in discipline 1 (hydrological products), category 2 (inland water and sediment properties), which is used for reporting water temperature in freshwater lakes and rivers.

**…..**

**Product discipline 10 – Oceanographic products, parameter category 2: ice**

Number Parameter Units

0 Ice cover Proportion

1 Ice thickness m

2 Direction of ice drift degree true

3 Speed of ice drift m s–1

4 u-component of ice drift m s–1

5 v-component of ice drift m s–1

6 Ice growth rate m s–1

7 Ice divergence s–1

8 Ice temperature K

9 Ice internal pressure Pa m

10–191 Reserved

192–254 Reserved for local use

255 Missing