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| **WORLD METEOROLOGICAL ORGANIZATION****\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **INTERGOVERNMENTAL OCEANOGRAPHICCOMMISSION (OF UNESCO)****\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| EXPERT TEAM ON SEA ICE – FIFTH SESSIONSTEERING GROUP FOR THE PROJECT GLOBAL DIGITAL SEA ICE DATA BANK (GDSIDB) – THIRTEENTH SESSIONOTTAWA, CANADA, 25 TO 28 MARCH 2014 | **ETSI-5/GDSIDB-13/Doc. 5.5**Submitted by: Vasily SmolyanitskyDate: 25.03.2014Original Language: ENGLISH Agenda Item: 5.5Status: 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 DocumentThis 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