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

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

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”.

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:

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

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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	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		
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, CO_2)
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.

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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	