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Commission for Marine Meteorology

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Appendix to recommendation 11 (CMM-X)

(sections 1-11 and Annex I are abridged)

SIGRID Format for Gridded Sea Ice Data

Content

1. Introduction

The SIGRID grids are prepared by assigning numerical values to the ice parameters within the SIGRID code at given grid points on the chart. The value read at each grid point is representative for the ice conditions in a well defined area around the grid point. A large degree of flexibility has therefore been built into the design of both code, format and grid. It allows digitization of historical ice charts as well as current ones in order to obtain a comprehensive computer-compatible sea ice data bank which is currently being updated as part of a WMO project. The SIGRID format is mainly designed to meet larger scale climate requirements but it may also be used by national services for other purposes.

2. Encoding of Sea Ice Information

On sea ice charts the ice parameters are represented by symbols and accompanying numbers giving the actual values of the parameters. The various sea ice services have up to now used their own symbols and one of the problems encountered when designing a coding system for sea ice information is this lack of uniformity. A new international system of sea ice symbols has however recently been developed and approved by WMO. This symbology forms the basis for the coding system proposed for digitizing sea ice charts. The symbology covers most parameters contained in the various sea ice charts and, as the parameters are basically the same on all charts irrespective of symbology, used it is possible to digitize charts based on the old as well as the new international sea ice symbols.

As the various ice charts do not contain the same number of parameters and as these may have different accuracy and resolution the code has been designed to allow for an arbitrary number of parameters to be digitized. The grid system can further be varied to cover the required resolution. As an example it will be possible to digitize only the total ice concentration with a resolution of say 4 degrees longitude X 2 degrees latitude. It will also be possible to digitize 20 parameters for each grid point with a resolution of for instance 0 degrees, 30 minutes longitude by 0 degrees 15 minutes latitude. The grid will be geographical but it can easily be expanded to a Cartesian if such a requirement occurs.

3. Coding Procedures

All information is coded for easy identification of all background information, as well as all data for the digitized ice charts. One exception is the possibility of including plain language information on the header file for additional information. This plain language information should follow after the coded information.
Header File (SIGRIDINF)
:AAFcFcNNN (:AQcLaLaLaLaLoLoLoLoLo :Bn_n_n_n_n-n:Cd2d2d2d2):DNtNtPtPt...PtPt
Chart Data File (SIGRIDNN)
Header Record :EJJJMMYYGGGpGp:FNsNsNs
:GNpNpP2P2:HP=P=NpNn
Grid Line Record :KZZ:Lmmmppp:MNpNpNp
Data Group: NGIRNrNrP2P2

4. Specification of Symbolic Letters

In this report the symbolic letters are typed in italics: letters used as indicators on the tape record are printed in normal letter style. The following specifications of identifiers and symbolic letters are given in the order in which they appear in the record.

SIGRIDINF - identifier of header file
: - start of a new information group
AA - area or country from which the data originate (See WMO Pub No. 365, Part 11, Attachment 11-6, Table 8)
FcFc - Centre, Service or institution from which the data originate (table to be established)
NN - Catalogue number of grid used (See WMO Pub. No. 9, Volume 3). If the grid specification is not included in this publication, the grid can be defined by the following groups identified by the letters A, B and C. Use in this case NN = 099
( ) - If the grid is specified by means of a WMO catalogue number, groups within parentheses are omitted.
A B C ...R - indicators
QcLaLaLaLaLoLoLoLoLo - latitude and longitude of origin (starting point) of a geographical grid. The grid lines are scanned towards increasing latitudes (south to north in the Northern Hemisphere and north to south in the Southern). The grid points are scanned from west to east along grid lines (applies to the Southern as well as the Northern Hemisphere)
nlnlnl - maximum number of grid lines (along meridian)
npnpnp - maximum number of grid points (along parallels)
dldldldl - mesh width of grid (distance between grid lines along meridians) in degrees and minutes.
NtNt - total number of sea ice parameters occurring on the charts
PtPt...PtPt - identifiers of all sea ice parameters occurring on the charts
SIGRIDNN - identifier of Chart Data File with sequential number (NN)
JJJ - century, decade and year (e.g. 982 = 1982)
MM - month of the year; from 01 to 12
YY - day of the month, from 01 to 31
GG - time of chart in whole hours, GMT
GpGp - period (+/- whole hours)of observations on which chart is based
NsNs - serial number of chart (determined by national center)
NpNp - number of sea ice parameters included in each grid point without being separately identified in these points (see note 1).
PiPi...PiPi - identifiers of sea ice parameters and order in which they are included in each grid point without being separately identified in these points (see note 1).
PIPI - identifier of sea ice parameters defined individually for actual chart
Np - number of parameters defined by PIPI
Nn - number of digits per parameter defined by PIPI
= - sign that identifies the start of grid line record
ll - longitude/latitude mesh width ratio (example: distance between grid lines (N-S) 2 degrees, distance between grid points (E-W) 4 degrees,
ll = mmmppp - coordinates of first grid point of a grid line, expressed as the number of grid points along the meridian (mmm) and along the parallel (ppp) counted from the origo (the origo has the coordinates 001001)
NpNpNp - number of grid points on grid line : - start of data group indicator, used to separate data groups
GI - grid subdivision indicator
NrNr - number of consecutive grid points for which the identical information is repeated. (The RNrNr should not occur when the information only refers to one point). When, for instance RnrNr = RO2, the actual and the following point contain identical information.

PiPi - identifier of sea ice parameter within a data group. The data group may include one or several sea ice parameters all identified by PiPi, unless all grid points contain the same parameters in which case the parameters are identified in the Header Record (see Note 1).

5. Data Groups

A data group consist of one or several sea ice parameters which correspond to a grid point. The parameters in a data group are representative for one mesh rectangle (for instance a geographical rectangle where the length along the parallels is 2 degrees and along the meridians 1 degree). the grid point is in the middle of the rectangle. The parameters are divided into nine main categories which contain one or several sub-elements.

The sea ice parameters are defined according to the new International System of Sea Ice Symbols. Each parameter is identified in the record by two letters, e.g. CT (total concentration of ice). The first letter identifies the category of the parameter while the second identifies parameters within the category. In the following tables the letters B,C,D,E,L,O,R,S,T and W are used as category indicators; the rest of the alphabet is left for future use.

The letters X, Y and Z are however reserved for use by individual services should they wish to include parameters not contained in the internationally agreed list. The X, Y, and Z may be used together with any other letter of the alphabet. The use of X, Y, Z should be clearly explained in the Tape Header File at the beginning of each tape. The number of parameters defined in the following tables is 53.

The following categories are proposed for general use:

Category Element Indicators:

C	Concentration, stage of development and form of ice (including strips and patches)
D	Dynamic processes
W	Water openings
R	Topography features
E	Thickness of ice
S	Surface features and melting forms
B	Ice bergs or ice of land origin
T	Sea surface temperature
O	Source of information on which chart is based
L	Land area

6. Identification of parameters within a data group

In order to identify unambiguously a parameter within a data group, each parameter is defined by an identifier. The identifier can be used in the header record to define the parameter or parameters and the order in which they appear at each grid point. The identification of parameters in the header record shall be used when they occur at all or most of the grid points. Parameters not occurring at most of the grid points could preferably be identified at each grid point.

It should be noted that the recording of parameters on a tape record is less subject to space restrictions than are their coding for telecommunication reports or plotting in the form of symbols on a sea ice chart. For archiving purposes, there is a greater freedom of choice of the number of digits to be used to record a parameter; this facilitates later processing of the data. Thus, for the recording of for instance, sea ice concentration, two digits are proposed.

The following parameter identifiers are defined:

- Concentration
- Stage of development
- Form of ice

According to the New International System of Sea Ice Symbols, seven cases need to be distinguished. LL identifies grid points over land.

1. CT Total concentration, CC (code table 1)
2. CA Partial concentration, stage of development (or thickness) and form of thickest ice CaCaSaSaFaFa (code tables 1, 2 and 3)
3. CB Partial concentration, stage of development, and form of second thickest ice, CbCbSbSbFbFb (code tables 1, 2 and 3)
4. CC Partial concentration, stage of development and form of third thickest ice, CcScScFcFc (code tables 1, 2 and 3)
5. CF Predominant FpFp and secondaryFsFs form of ice (code table 3)
6. CN Stage of development of ice thicker than reported by SaSc, but with a concentration less than 1/10, SoSo (code table 2)
7. CD Stage of development of any remaining class of ice, SdSd, not reported under CA, CB or CC (code table 2); note that no concentration or form of ice is reported for SoSo and SdSd

Coding: CTCC CACaCaSaSaFaFa CBCbCbSbSbFbFb CCCcCcScScFcFc (CFFpFpFsFs) CNSoSo CDSdSd

7. The Grid Layout

Provision is only made for one type of grid, the geographical. This in order to facilitate the compilation of data from different centers, which cover over-lapping geographical areas. The following definitions are used in this report:

Grid Line: Line connecting all grid points having the same latitude

Grid Point: A point in the middle of a square or rectangle where the dimension corresponds to the mesh width along parallels and meridians. The distance between the grid points corresponds to the above mesh width. The ice information for a grid point is representative for the grid square in which the grid point lies.

Data Group: Group which contains information on one or several ice parameters relative to one grid point (or several consecutive grid points with identical information on a grid line).

Mesh Width: The length of the sides of the rectangles, in the middle of which the grid point lies. The sides of the rectangle will in most cases have different lengths in a geographical grid (e.g. 2 degrees along parallels and 1 degree along meridians).

Scanning Mode: the order in which the grid points are scanned. In a geographical grid the grid points are scanned along grid lines from west to east (0 to 360 degrees). The grid lines are scanned towards increasing latitudes (south to north in the Northern Hemisphere and north to south in the Southern).

8. Positioning of the Grid

A grid will consist of a number of sequential grid lines along which lie a number of sequential grid points. The grid covers an area from 67 degrees N to 83 degrees N and 33 degrees W to 40 degrees E corresponding a Norwegian ice chart. The grid squares have a mesh width of 2 degrees Long. X 1 degree Lat from 67 degrees N to 75 degrees N and 4 degrees Long. X 1 degree Lat. from 76 degrees N to 83 degrees N. The origin is placed in the lower left corner. The grid lines are numbered and scanned from south to north and the grid points from west to east. When digitizing a chart, the "coordinates" of the first point on each grid line shall be given, e.g. 008007. This would mean that the first point on grid line 008 to be scanned is No. 007.
To identify a grid the following information is needed:

- the coordinates of the origin
- the mesh width (grid distance) along meridians which is constant for each chart
- the longitude/latitude ratio for each grid line (this will allow the ratio long/lat to be changed when moving along the meridians)

The following ratio (Long/Lat) is recommended if mesh width along meridians is 60 nm (1° lat):

00° - 50°	1 (60 nm - 39 nm)
50° - 75°	2 (77 nm - 31 nm)
75° - 80°	4 (52 nm - 42 nm)
80° - 85°	6 (63 nm - 31 nm)
85° - 87°	12 (63 nm - 38 nm)
87° - 89°	20 (63 nm - 21 nm)
89° - 89°30'	40 (42 nm - 21 nm)
89°30' - 90°	80 (42 nm)

9. Variation of Grid Resolution

The information contained in an ice chart will generally not be evenly distributed. Over large areas the conditions may be fairly uniform and a course grid may suffice here. In other areas more detailed information may be shown, especially along coast lines and along the ice edges. A more detailed recording of information in such limited areas without having to use a fine grid for the entire chart is made by the insertion of local subdivisions of the grid. The subdivision is then indicated by a "subdivision indicator."

Three levels of subdivisions have been provided for, with a view to dividing the original grid square into four, nine or 16 areas. The basic grid may be defined as "first order" and the following finer meshes as second, third and fourth respectively. The number of sub-areas for each of these orders will be 12 =1, 22 =4, 32 =9 and 42 =16.
Example: a geographical grid has a basic mesh width of 1 latitude by 2 longitude; the second order will have 4 grid squares with a mesh width of 1/2 latitude by 1 longitude, the third order 9 grid squares with a mesh width of 1/3 latitude by 2/3 longitude, and the fourth order 16 grid squares with a mesh width of 1/4 latitude by 1/2 longitude. Expressed in degrees and minutes this would be 1 x 2, 30'x 1, 20' x 40', and 15' x 30'. The grid subdivision is indicated by a subdivision indicator which for the basic grid is set to 1, second order to 2, third order to 3 and fourth order to 4.

10. Example Grids

As an example of gridding and digitizing a sea ice chart, the Norwegian ice chart from 1 October 1979 was chosen. The mesh width of the grid is constant 1 degree along the meridians and 2 degrees along the parallels south of 75 degrees N and 4 degrees north of 75 degrees N. The origo of the grid lies at 67 degrees north, 33 degrees west. The sea ice information has only been digitized for two grid lines 009 and 010. In Example 1 each parameter is identified at each grid point, while in Example 2 the parameter CT (total concentration of ice) is defined in the Header Record and identified at each grid point by its position.

Example 1. Digitized Norwegian Ice Chart of 1 February 1979

```
SIGRIDINF
:NOMI:099:A7670003300:B018036:C0100:D05CTCAWFWDTT
SIGRID01
:E97902011200:F009
=K02:L009007:M032
:R02CT92CA929908:RO3CT90:407CT80:N2CT80:CT402F6WD3
:CT00:CT60Wf6WD7:CT00:TT000:TT010:TT015:N2CT10:TT000:TT005
:CT40WF6WD7:CT50WF6WD7:RO3CT80:N2CT40:CT20WF6WD5:CT80:CT70
:CT30WF6WD1:R02CT20WF6WD2:CT60WF6WD3:CT70:RC2CT90:R02CT80  =K04:L010004:M016
:CT92CA929908:R02CT90:CT90:CT80:CT60WF6WD3:CT0CTT005
:CT01TT005:N2CT0155005:CT40WF6WD4:CT60WF6WD7:CT00
:CT70WF6WD3:R02CT80:CT90:R04CT90  =k04:L011004:M016  :99:99:99
```

Example 2. Digitized Norwegian Ice Chart of 1 February 1979

```
SIGRIDINF
:NOMI:099:A7670003300:B018036:C0100:D05CTCAWFWDTT
SIGRID01
:E97902011200:F0009:G01CT
=K02:L009007:M032
:R0292CA929908:R0390:R0780:N280:40WF6WD3:00:60WF6WD7:00
:00TT000:00TT01000TT015:N210:00TT000:00TT005:40WF6WD7
:50WF6WD7:R0380:N240:20WF6WD5:80:70:30WF6WD1:R0220WF6WD2
:60WF6WD2:70:R0290:R0280
=K04:L010004:M016
:R92CA929908:R0290:90:80:60WF6WD3:00TT005:01TT005:N201TT005
:40WF6WD4:60WF6WD7:00:70WF6WD3:R0280:90:R0490
=K04:L011004:M016  :99:99:99
```

11. Explanation of the Code Figures

NO = Norway
MI = Meteorological Institute
099 = Geographical Grid with definitions
A7670003300 = Coordinates of origo (67 00' N, 3300' W)
B0018036 = number of grid lines (18) and number of grid points (36)
C0100 = Grid mesh (1 degree along meridians)
D05CTCAWFWDTT = Total number of parameters (5) and identifiers
E97902011200 = Date of chart (1 February 1979 12 GMT)
F009 = Serial number of chart (no 9/1979)
G01CT (example 2) = Number of parameters (1) and parameter in each grid point
K02 = Ratio between longitude and latitude (2 long/1 lat)
L009007 = coordinates of starting point of grid line
M032 = number of grid points along grid line
R02 = number of grid points for which the same data apply (two grid points)
CT92 (example 1) = total concentration = 10/10
92 (example 2) = total concentration = 10/10

CA92 = Partial concentration of thickest ice = 10/10
99 = stage of development of ice unknown
08 = form of ice = fast ice
R03 = number of grid points for which the same data apply (three grid points)
CT90 (example 1) = total concentration = 9/10
90 (example 2) = total concentration = 9/10
R07 = seven consecutive grid points are identical
CT80 (example 1) = total concentration = 8/10
80 (example 2) = total concentration = 8/10
N2 = grid square subdivided into four subsquares
CT80 (example 1) = total concentration in first subsquare = 8/10
80 (example 2) = total concentration in first subsquare = 8/10
CT40 (example 1) = total concentration = 4/10
40 (example 2) = total concentration = 4/10
WF6 = form of water opening = ice edge (6)
WD3 = orientation of ice edge = SE - NE (3)
CT00 (example 1) = open water 00 (example 2) = open water
CT60 (example 1)= total concentration = 6/10
60 (example 2) = total concentration = 6/10
WF6 = form of water opening = ice edge (6)
WD7 = orientation of ice edge = NW - SE (7)
CT00 (example 1)= open water 00 (example 2) = open water
TT000 = sea surface temperature = 00.0 c

Annex I - List of Parameter Identifiers and Parameters

Parameter(s)	Identifier
CT	CC
CA	CaCaSaSaFaFa
CB	CbCbSbSbFbFb
CC	CcCcScScFcFc
CF	FpFpFsFs
CN	SoSo
CD	SdSd
DP	dp
DD	D
DR	ViVi
DO	Op
WF	Wf
WN	No
WD	D
WW	WwWw
WO	Op
RN	Rn
RA	Ra
RD	D
RC	CrCr
RF	RfRf
RH	RhRh
RO	Op
RX	RIRI
EM	tEtEtE
EX	txtxtx
EI	tntntntxtxtx
EO	Op
SC	CsCs
SN	s
SD	D
SM	ms
SA	mama
SO	Op
BL	BiBs
BD	D
BR	ViVi
BN	nBnB
BY	YY
BO	Op
TT	TwTwTw
TO	Op
OP	Op
OS	Os
OT	Ot
LL	

Total: 46

Annex II - List of Sea Ice Variables

BiBs	type and size of iceberg (code table 12)
CC	total concentration of all ice in the area, reported in tenths (code table 1)
CaCa, CbCb and CcCc	Partial concentration of respectively thickest, second thickest and third thickest ice, reported in tenths (code table 1)
CrCr	concentration of topography features, in tenths (code table 1)
CsCs	concentration of snow coverage in tenths (code table 1)
D	1) Direction of dynamic processes (code table 5) 2) Orientation of water openings (code table 5) 3) Orientation of sastrugies (code table 5) 4) Orientation of topography feature (code table 5) Note: compacting of ice in for instance NE-SW direction is recorded either as 1 or 5
dp	dynamic processes (code table 4)
FaFa, FbFb and FcFc	form of ice corresponding to SaSa, SbSb, and ScSc respectively (code table 3)
FpFp and FsFs	predominant (FpFp) and secondary (FsFs) form (code table 3)
MaMa	area coverage of melt water in tenths
Ms	melting forms (code table 11)
No	number of water openings (code table 7)
BnBn	number of icebergs (code table 13, WMO code 2877)
Op	Observational method for individual parameters (code table 14)
Op, Os and Ot	Primary (Op), secondary (Os) and tertiary (Ot) Os source of observation on which the ice chart is based (code table 14)
Ra	Age of topography feature (code table 9)
RfRf	frequency of topography feature, in number per nautical mile
RhRh	mean height of topography feature, in decimeters
RxRx	maximum height of topography feature, in decimeters
Rn	nature of topography feature (code table 8)
SaSa, SbSb and ScSc	stage of development of respectively thickest, second thickest and third thickest ice, of which the concentration is reported by CaCa, CbCb and CcCc (code table 2)
SdSd	stage of development of any remaining class of ice not reported by SaSa , SbSb , ScSc or SoSo (code table 2)
SoSo	stage of development of ice thicker than SaSa but with a concentration less than 1/10 (code table 2)
s	snow depth (code table 10, WMO code 3870)
TwTwTwTw	sea surface temperature, in tenths of degrees
tetete	mean thickness of ice in centimeters
tntntn	minimum thickness in thickness interval, in centimeters
txtxtx	maximum thickness of ice, in centimeters
ViVi	rate of ice drift, in tenths of knots
Wf	form of water openings (code table 6)
WwWw	width of water openings, in hundreds of meters
YY	day of month when icebergs were sighted

Annex IIa – List of sea ice variable identifiers

Identifier	Description
Dynamic Processes	
DP	Dynamic processes
DD	Direction of dynamic processes
DR	Rate of ice drift in tenths of knots
DO	Source of information
Water Openings	
WF	Form of water openings
WN	Number of water openings
WD	Orientation (direction) of water openings
WW	Width of water openings
WO	Source of information
Topography Features	
RN	Nature of topography feature
RA	Age of topography feature
RD	Orientation of topography feature
RC	Concentration of topography feature
RF	Frequency of topography feature
RH	Height (mean) of topography feature
RO	Source of information
RX	Maximum height of topography feature
Thickness of Ice	
EM	Mean thickness of level ice in cm
EX	Maximum thickness of level ice in cm
EI	Thickness interval
EO	Source of information
Surface features and melting forms	
SC	Concentration of snow
SN	Snow depth
SD	Orientation (direction) of sastrugies
SM	Melting forms
SA	Area coverage of water on ice in tenths
SO	Source of information
Icebergs or ice of land origin	
BL	Type of iceberg
BD	Direction of drift of iceberg
BE	Rate of drift in tenths of knots
BN	Number of icebergs
BY	Day of month
BO	Source of information
Sea surface temperature	
TT	Sea surface temperature in tenths of degrees
TO	Source of information
Source of information	
OP	Primary source of information on which the chart is based
OS	Secondary source of information on which the chart is based
OT	Tertiary source of information on which the chart is based

Annex III - Code tables

Table 1. Concentration codes for variable identifiers CC, CaCa, CbCb, CcCc, CrCr, CsCs.

Definition	Code Figure
Ice Free	00
Less than 1/10 (open water)	01
Bergy Water	02
1/10	10
2/10	20
.	.
.	.
.	.
.	.
.	.
.	.
9/10	90
More than 9/10 but less than 10/10 (9+)	91
10/10	92
Concentration intervals (lowest concentration in interval followed by highest concentration in interval)	
Samples:	
1/10 –3/10	31
4/10 – 6/10	46
7/10 – 9/10	79
7/10 – 10/10	71
Unknown	99

Table 2. Thickness of ice or stage of development codes for variable identifiers SaSa, SbSb, ScSc, SdSd, SoSo.

Stage of Development	Thickness	Code Figure
Ice Free		00
Ice thickness in cm		01
		.
		.
		.
==========	55 cm	51
Ice thickness interval measured with 5 cm accuracy	60 cm	52
	65 cm	53
	70 cm	54
	75 cm	55
	80 cm	56
	85 cm	57
	90 cm	58
	95 cm	59
==========	100 cm	60
Ice thickness interval measured with 10 cm accuracy	110 cm	61
	120 cm	62
	130 cm	63
	140 cm	64
	150 cm	65
	160 cm	66
	170 cm	67
	180 cm	68
	190 cm	69
==========	200 cm	70
Ice thickness interval measured with 50 cm accuracy	250 cm	71
	300 cm	72
	350 cm	73
==========	400 cm	74
Ice thickness interval measured with 100 cm accuracy	500 cm	75
	600 cm	76
	700 cm	77
	800 cm	78
==========	900 cm	79
No Stage of Development		80
New Ice		81
Nilas, Ice Rind	< 10 cm	82
Young Ice	10 - 30 cm	83
Grey Ice	10 - 15 cm	84
Grey - White Ice	15 - 30 cm	85
First Year Ice	30 - 200 cm	86
Thin First Year Ice	30 - 70 cm	87
Thin First Year Stage 1	30 - 50 cm	88
Thin First Year Stage 2	50 - 70 cm	89
For Later Use		90
Medium First Year Ice	70 - 120 cm	91
For Later Use		92
Thick First Year Ice	> 120 cm	93
For Later Use		94
Old Ice		95
Second Year Ice		96
Multi-Year Ice		97
Glacier Ice		98
Undetermined/Unknown		99

Table 3. Form of ice codes for variable identifiers FaFa, FbFb, FcFc, FpFp, FsFs.

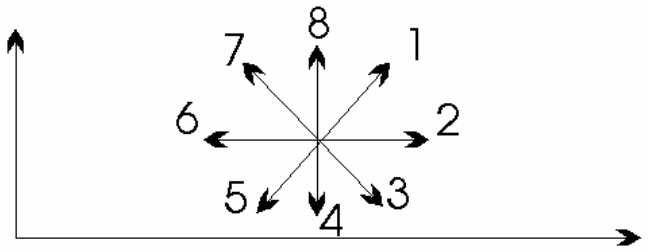
Form	Size / concentration	Code Figure
Pancake Ice	30 cm - 3 m	00
Shuga/Small Ice Cake, Brash Ice	< 2 m across	01
Ice Cake	< 20 m across	02
Small Floe	20 m - 100 m across	03
Medium Floe	100 m - 500 m across	04
Big Floe	500 m - 2 km across	05
Vast Floe	2 km - 10 km across	06
Giant Floe	> 10 km across	07
Fast Ice		08
Growlers, Floebergs or Floebiits		09
Icebergs		10
Strips and Patches	concentrations 1/10	11
Strips and Patches	concentrations 2/10	12
Strips and Patches	concentrations 3/10	13
Strips and Patches	concentrations 4/10	14
Strips and Patches	concentrations 5/10	15
Strips and Patches	concentrations 6/10	16
Strips and Patches	concentrations 7/10	17
Strips and Patches	concentrations 8/10	18
Strips and Patches	concentrations 9/10	19
Strips and Patches	concentrations 10/10	20
Level Ice		21
Undetermined/Unknown		99

Table 4. Dynamic processes (dp)

Compacting ice, no intensity given	0
Compacting ice, slight	1
Compacting ice, considerable	2
Compacting ice, strong	3
Diverging ice	4
Shearing ice	5
Ice drift, rate 0,1 – 0,9 knots	6
Ice drift, rate 1,0 – 1,9 knots	7
Ice drift, rate 2,0 – 2,9 knots	7
Ice drift, rate 3,0 knots or more	9

Note: When measured ice drift rate (ViVi) are coded, the code “99” is used for undetermined/unknown ice drift rate

Table 5. Direction indicator (D)



Note: Direction is determined in relation to geographical grid. In geographical grid “1” corresponds to NE direction, 2 – east, 3 – SE, etc.

Table 6. Form of water opening (Wf)

Cracks	1
Crack at specific location	2
Lead	3
Frozen lead	4
Polynia	5
Ice edge	6

Table 7. Number of water openings (No)

1	1
2	2
3-5	3
5-10	4
> 10	5

Table 8. Nature of topographic feature (deformation) (Rn)

Rafting	1
Hummocks	2
Ridges	3
Jammed brash barrier	4

Table 9. Age of topographic feature (Ra)

New	1
Weathered	2
very weathered	3
Aged	4
Consolidated	5

Table 10. Snow depth (s)

WMO code

Table 11. Melting forms (Ms)

No melt	0
Few puddles	1
Flooded ice	3
Few thaw holes	4
Many thaw holes	5
Dried ice	6
Rotten ice	7
Few frozen puddles	8
All frozen puddles	9

Table 12. Ice of land origin (type of iceberg)

Form		Size	
Growler and or bergy bit	1	unspecified	0
Iceberg, unspecified	2	small	1
Iceberg, glacier berg	3	medium	2
Iceberg, dome	4	large	3
Iceberg, pinnacled	5	very large	4
Iceberg, tabular	6		
Ice island	7		
Floeberg	8		
Radar target	9		

Table 13. Number of icebergs (BnBn)

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Table 14. Observational method (Op, Os, Ot)

Visual surface observation	1
Visual aircraft observation	2
Visual and infrared satellite observation	3
Passive microwave satellite observation	4
Radar satellite surface or airborne observation	5
Radar satellite observation (SAR)	6
Laser/scatterometer/sonar	7
Data buoys	8
Estimated (temporal and/or spatial)	9
Unknown	0