Canadian Ice Service SIGRID-3 Implementation 2006

Revision History

Date	Author	Modifications
22-Sep-2005	Brian Scarlett	First Draft for NAIS September 2005 tele-conference
06-Oct-2005	Brian Scarlett	Minor revisions following tele-conference.
16-Dec-2005	Brian Scarlett	Update following release of ISIS 3.4.1 in December 2005 Reformatted with CIS document template
20-Jan-2006	Brian Scarlett	Updates following review by Dan Fequet
16-Mar-2006	A. Cardinal	Added meta data comments
21-Mar-06	Dan Fequet	“Beefed” up…
05-April-2006	Dan Fequet	Updates (and review by Brian Scarlett)

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1. Introduction

SIGRID-3: A VECTOR ARCHIVE FORMAT FOR SEA ICE CHARTS

The SIGRID-3 format has been adopted at the CIS as the vector data exchange format for all ice analyses. Although legacy exchanges continue to be supported, the SIGRID-3 specification has become the preferred format for the transfer of vector data.

The current implementation of the specification adheres as close as possible to the JCOMM SIGRID-3 document of 2004. The few exceptions to the specification are noted in the appropriate sections of this document.

Where the standard is not definitive in the usage of an attribute, we have documented our interpretation and subsequent implementation. As well, identified omissions in the specification have been addressed with amendments which propose additional mandatory fields.

These additions are required to incorporate all the ice information available in CIS analyses. The proposed amendments are listed in Annex 1 and 2.

2. Metadata

The generation and implementation of the SIGRID-3 metadata for the Canadian Ice Service ice analyses[1] was done in accordance with the guidelines listed in the 2004 version of the SIGRID-3: A Vector Archive Format for Sea Ice Charts document, WMO/TD-No. 1214. In order to better represent our products, some deviations were made from this standard during implementation (see following section for further details). These changes also have implications on the documentation.

Deviations from the CIS SIGRID-3 metadata format

- We have chosen to exclude the stylesheet reference to the FGDC_V2.xsl from the XML due to the possible problems (availability, updates...) that can be encountered when referencing to off site information.
- The **Time_Period_of_Content** is described using the Single Date/Time option since it better represents the valid date and time of our scheduled products.
- Our **Contact_Address** section includes the **Address** and **Country** elements since they are required for mailing purposes.
- We included **Contact_Facsimile** and **Contact_Electronic_Mail_Address** elements to offer more contacting options to our clients, since this is the only section in the metadata where contact information is found.
- Our **Spatial_reference_Information** refers to Geographic (not Polar Stereographic) along with its mandatory information (as agreed at the last IICWG meeting in Ottawa)

[1] See attached XML file

- We included (and defined) the **COVSHP_** and the **COVSHP_ID** attribute labels (after the Perimeter label), since they are automatically inserted when we convert from coverage to shape file using the ESRI application.

3. Coastline

SIGRID-3 files issued from CIS contain coastline vector features which are derived from the Digital Chart of the World (DCW) dataset of 1993. The DCW was originally created by the Environmental Systems Research Institute (ESRI) at the request of the US Defence Mapping Agency (DMA) using aeronautical charts at a 1:1,000,000 scale as the primary data source.

The DCW dataset contains vector data organized into thematic layers and has been heavily customized at CIS to correct gross errors, particularly in the Canadian Arctic and Greenland.

This modified DCW coastline for North America is incorporated into data products generated by CIS. The underlying reference frame for the data is the World Geodetic System of 1984 (WGS84) using the updated WGS Earth ellipsoid (2004)

4. File Names

Filenames use Sigrid productIDs (e.g. SGRDREC); this applies to the .tar file as well as all files in it.

EG> The first instance of a Sigrid ice analysis for NFLD is
`cis_SGRDANFLD_20060213_pl_a.tar .`

5. Packaging

CIS is now delivering SIGRID-3 files as a packaged shapefile and metadata file.

6. CIS Schema for SIGRID-3

Field Name	Field Type	Status	Detail	Domain or Comments
Shape	Float	Complete	Object Shape	Default Shapefile field
Area	Float	Complete	Object Area	Default Shapefile field
Perimeter	Float	Complete	Object Perimeter	Default Shapefile field
Covshp_	Integer	Complete	Internal id	Default conversion field
Covshp_id	Integer	Complete	Internal id	Default conversion field
CT	Char	Complete	Total Concentration	Concentration Codes for SIGRID-3
CA	Char	Complete	Partial Concentration	Concentration Codes for SIGRID-3
SA	Char	Complete	Stage of Development	Stage of Development Codes for SIGRID-3
FA	Char	Complete	Form of ice	Floe Size Codes for SIGRID-3
CB	Char	Complete	Partial Concentration	Concentration Codes for SIGRID-3
SB	Char	Complete	Stage of Development	Stage of Development Codes for SIGRID-3
FB	Char	Complete	Form of ice	Floe Size Codes for SIGRID-3
CC	Char	Complete	Partial Concentration	Concentration Codes for SIGRID-3
SC	Char	Complete	Stage of Development	Stage of Development Codes for SIGRID-3
FC	Char	Complete	Form of ice	Floe Size Codes for SIGRID-3
CN	Char	Complete	Stage of Development (S0)	Stage of Development Codes for SIGRID-3
CD	Char	Complete	Stage of Development (Sd)	Stage of Development Codes for SIGRID-3
CF	Char	Complete	Form of ice	Codes for SIGRID-3 CF
POLY_TYPE	Char	Complete	Polygon Type	POLY_TYPE Codes for SIGRID-3
CFP	Char	Proposed	Predominant Form of Ice	Floe Size Codes for SIGRID-3
CFS	Char	Proposed	Secondary Form of Ice	Floe Size Codes for SIGRID-3
CS	Char	Proposed	Strips and Patches concentration	Strips and Patches Codes for SIGRID-3
ICE_CODE	Char	Proposed	Original MANICE code	ISIS EGG_ATTR or NIC ICECODE
ICE_TYPE	Char	Proposed	The type of ice	SEAICE or LAKEICE
VALID_DT	DateTime	Proposed	Valid date-time of the analysis	YYYYMMDDHH24MISS
REGION_CODE	Char	Proposed	Original AOI of the analysis	To Be Defined
ISSUER _CODE	Char	Proposed	Organization	To Be Defined
VERSION_CODE	Char	Proposed	Analysis version	To Be Defined
WMO_TCT	Char	Proposed	Display of Total Concentration	To Be Defined
WMO_SDP	Char	Proposed	Display of Stage of Development	To Be Defined

Note: CIS does not currently implement those fields which have a Status of "Proposed".

POLY_TYPE Codes for SIGRID-3

Polygon Type Code (POLY_TYPE)	MANICE Description	CIS Ice-Code Mapping
L	Land	Not Applicable
I	Ice of any concentration	Not Applicable
W	Water (Sea Ice Free)	Ice Free Symbol
N	No Data	No Data Symbol
S	Ice Shelf / Ice of Land Origin	Ice Shelf Symbol

Concentration Codes for SIGRID-3

Concentration Code (CT,CA,CB,CC)	MANICE Description	CIS Ice-Code Mapping
00	Ice Free	Symbol object
01	Open Water (< 1/10 ice)	Symbol object
02	Bergy Water	Symbol object
10	1/10 ice	1_1
12	1/10 to 2/10 ice	1_2
13	1/10 to 3/10 ice	1_3
20	2/10 ice	2_2
23	2/10 to 3/10 ice	2_3
24	2/10 to 4/10 ice	2_4
30	3/10 ice	3_3
34	3/10 to 4/10 ice	3_4
35	3/10 to 5/10 ice	3_5
40	4/10 ice	4_4
45	4/10 to 5/10 ice	4_5
46	4/10 to 6/10 ice	4_6
50	5/10 ice	5_5
56	5/10 to 6/10 ice	5_6
57	5/10 to 7/10 ice	5_7
60	6/10 ice	6_6
67	6/10 to 7/10 ice	6_7
68	6/10 to 8/10 ice	6_8
70	7/10 ice	7_7
78	7/10 to 8/10 ice	7_8
79	7/10 to 9/10 ice	7_9
80	8/10 ice	8_8
81	8/10 to 10/10	8_10
89	8/10 to 9/10 ice	8_9
90	9/10 ice	9_9
91	9/10 to 10/10 ice, 9+/10 ice	9_10
92	10/10 ice	10_10
99	Unknown/Undetermined	X
-9	Null Value	@

Stage of Development Codes for SIGRID-3

Development Code (SA,SB, SC,CN,CD)	MANICE Description	CIS Ice-Code Mapping
00	Ice Free	
80	No stage of development	?
81	New Ice (<10 cm)	1
82	Nilas Ice Rind (<10 cm)	2
83	Young Ice (10 to 30 cm)	3
84	Grey Ice (10 to 15 cm)	4
85	Grey – White Ice (15 to 30 cm)	5
86	First Year Ice (>30 cm) or Brash Ice	6 or Brash (dash)
87	Thin First Year Ice (30 to 70 cm)	7
88	Thin First Year Ice (stage 1)	See Note
89	Thin First Year Ice (stage 2)	See Note
90	*Code not currently assigned*	
91	Medium First Year Ice (70 to 120 cm)	1 dot
92	*Code not currently assigned*	
93	Thick First Year Ice (>120 cm)	4 dot
94	*Code not currently assigned*	
95	Old Ice	7 dot
96	Second Year Ice	8 dot
97	Multi-Year Ice	9 dot
98	Glacier Ice (Icebergs)	Triangle dot
99	Unknown/Undetermined	X
-9	Null Value	Null

Note: CIS does not currently implement Thin First Year Ice stage 1 or stage 2 in their operational analyses
Note: CIS currently codes brash ice (-) as a stage of development and assigns the sigrid code 86. We will propose a new code (94?) for brash ice.

Floe Size Codes for SIGRID-3

Floe Size Code (FA,FB,FC)	MANICE Description	CIS Ice-Code Mapping
00	Pancake Ice	0
01	Shuga/Small Ice Cake, Brash Ice	1
02	Ice Cake	2
03	Small Floe	3
04	Medium Floe	4
05	Big Floe	5
06	Vast Floe	6
07	Giant Floe	7
08	Fastened (Fast) Floe	8
09	Growlers, Floebergs, Floebits	9
10	Icebergs	9
99	Unknown/Undetermined	X
-9	Null Value	Null

Strips and Patches Codes for SIGRID-3

Strips and Patches Code (CS)	MANICE Description	CIS Ice-Code Mapping
11	Strips and Patches (1/10)	1
12	Strips and Patches (2/10)	2
13	Strips and Patches (3/10)	3
14	Strips and Patches (4/10)	4
15	Strips and Patches (5/10)	5
16	Strips and Patches (6/10)	6
17	Strips and Patches (7/10)	7
18	Strips and Patches (8/10)	8
19	Strips and Patches (9/10)	9
20	Strips and Patches (9+/10)	9+
99	Unknown/Undetermined	X
-9	Null Value	Null

Note: CIS currently encodes Strips and Patches exclusive of Fa,Fb,Fc values. When a Strips and Patches value is supplied, Floe values (Fa,Fb,Fc) are null.

Codes for SIGRID-3 CF

Note: The CF field as defined by the JCOMM SIGRID-3 Specification of 2004 requires some interpretation since it is a compound field (CF*predominant*CF*secondary*) representing predominant and secondary forms of ice yet the field can also be used to indicate Strips and Patches or Fast ice.

It is expected that this field will require further refinement in terms of content and usage.

Current usage is to use one of the following three, mutually exclusive scenarios;

1. If fast ice is present anywhere then CF is assigned 08-9
2. Else if strips and patches are present, then CF*predominant* contains the strips and patches details and CF secondary is assigned -9 (e.g. 19-9)
3. Otherwise, CF*predominant* contains the predominant form of ice and CF*secondary* contains the secondary form of ice. If there is no secondary form, then CF*secondary* is assigned -9

CF Code	Usage	CF Predominant	CF Secondary
08-9	Fastened (Fast) Floe	08	-9
11-9	Strips and Patches (1/10)	11	-9
12-9	Strips and Patches (2/10)	12	-9
13-9	Strips and Patches (3/10)	13	-9
14-9	Strips and Patches (4/10)	14	-9
15-9	Strips and Patches (5/10)	15	-9
16-9	Strips and Patches (6/10)	16	-9
17-9	Strips and Patches (7/10)	17	-9
18-9	Strips and Patches (8/10)	18	-9
19-9	Strips and Patches (9/10)	19	-9
20-9	Strips and Patches (9+/10)	20	-9
20-9	Strips and Patches (10/10)	20	-9
00-9	Pancake Ice	00	-9
01-9	Shuga/Small Ice Cake, Brash Ice	01	-9
02-9	Ice Cake	02	-9
03-9	Small Floe	03	-9
04-9	Medium Floe	04	-9
05-9	Big Floe	05	-9
06-9	Vast Floe	06	-9
07-9	Giant Floe	07	-9
09-9	Growlers, Floebergs, Floebits	09	-9
10-9	Icebergs	10	-9
99-9	Unknown/Undetermined	99	-9

XX01	Shuga/Small Ice Cake, Brash Ice	XX from Floe Size Codes for SIGRID-3	01
XX02	Ice Cake	XX from Floe Size Codes for SIGRID-3	02
XX03	Small Floe	XX from Floe Size Codes for SIGRID-3	03
XX04	Medium Floe	XX from Floe Size Codes for SIGRID-3	04
XX05	Big Floe	XX from Floe Size Codes for SIGRID-3	05
XX06	Vast Floe	XX from Floe Size Codes for SIGRID-3	06
XX07	Giant Floe	XX from Floe Size Codes for SIGRID-3	07
XX09	Growlers, Floebergs, Floebits	XX from Floe Size Codes for SIGRID-3	09
XX10	Icebergs	XX from Floe Size Codes for SIGRID-3	10
XX99	Unknown/Undetermined	XX from Floe Size Codes for SIGRID-3	99
-9-9	Null Value	-9	-9

Additional Notes - Mandatory fields

Use of -9 (not used/not applicable)

Use this value when **some** egg code fields are not needed such as when only one or two ice types are present..

Ex. When only **Sa** and **Sb** are present then **Sc** would be -9.

Use of 99 (unknown/undetermined)

Use this value when **some** ice attributes are not known for an existing ice type (X).

Ex. When **Ct** is 10/10 and **Fa** is 07 and the stage of development is not known then **Sa** would be 99.

Use Blank Fields for all polygons other than (**I)** Ice .

The SIGRID-3 Specification *says all polygons that are not **I** for ice should have blank fields. CIS makes an exception for **W** polygons as proposed below.*

Use of (**W)** Water- sea ice free - polygons and field values

Use the **Ct** field only, (code as 00) all the rest will be coded -9.

Use of (**I)** Ice- For **Bergy Water** - polygons and field values

Use the **Ct** field only, (code as 02) all the rest will be coded -9.

Use of (**I)** Ice- For **Ice/Glace** polygons

Use code 99 for mandatory fields – Ice is present but type and amount are not known or analysed.

Use of (**N)** No Data- polygons and field values

Use *blank fields*.

Annex A. Proposed changes - tables

1. On page 4, the reference to polar stereographic projection should be changed to unprojected geographic units (as agreed at the last IICWG meeting in Ottawa).

2. **Table 1,** Mandatory columns - the CF field, which is actually two merged fields (CFPrimary (Fp) and CFSecondary (Fs)), split into two distinct fields. It is much easier to implement and validate as separate items.

3. **Table 4.1,** Concentration – Add the term 9+10ths to the definition field and the associated code figure ***93*** ?

4. **Table 4.2,** Stage-of-development – Include a code for Brash Ice. Current CIS practice is to use a dash (-) in the Stage of Development field and a code 01 in the form of ice field. This practice falls outside SIGRID-3 rules but is very important to Canadian users. It will be necessary to add fields for categories of thickness as well.

5. **Table 4.3**, Update the Size/Concentration description for the Code figure 20 to be "concentration 9+/10".

6. **Add following option fields**

   ICE CODE – egg code attributes in an ISIS string
   WMO CT - RGB values for colour code
   WMO SD - RGB values for colour code

Annex B. Proposed changes - meta data

1. On page 7, the other time information options should be included (**Single Date/Time and Multiple Dates/Times**), also indicate that the time element is optional (not mandatory – not bold)
2. On page 7, **Use_Constraints** element should be moved to same level as **Access_Constraints**
3. On page 7, the **Metadata _date** element should be bold as it is a mandatory
4. On page 7, the **Contact_Address** section should include the **Address** and **Country** elements (as they are FDGC mandatory elements).
5. On page 7, the **Contact_Information** section should include options of including the **Contact_Facsimile** and the **Contact_Electronic_Mail_Address**
6. *Note that point 5 and 6 refer to the contact information which is only available in the Metadata section (none available for **Identification_Information**, **Data Quality_Information/Lineage/Process_Contact** ,**Distribution_Information/Distribution**) it should contain as much information as possible since it is the only section which contains=-9087t information for clients and will be used for general inquiries.*
7. On page 8, the **Originator** and **Publication_date** element should be bold
8. On page 8, the **Source_Time_Period_of_Content** text should not be bold as it is a section identifier and not an element where information must be entered.
9. On page 9, the **Process_Step** text element should not be bold as it is a section identifier and not an element where information must be entered
10. On page 9, the **Spatial_Reference_Information** section should refer to a **Horizontal_Coordinate_System_Definition** that is Geographic rather than Planar. The **Latitude_Resolution**, **Longitude_Resolution** and the **Geographic_Coordinate_Units_elements** should also be included as part of this section to facilitate the projection of the data by a third party
11. On page 9, the **Entity_Type_Label**, **Entity_Type_Label**, **Entity_Type_Definition** and the **Entity_Type_Definition_Source** element should be bold
12. On page 9, there should be a blank line between the words **Entity_Type_Definition_Source** and **Attribute**, also remove the one between **Attribute** and Attribute_Label: {FID} (to group the FID information in one section)
13. On page 9, maybe we could add the **COVSHP_** and the **COVSHP_ID** attribute labels (after to the Perimeter), since they are automatically inserted when we convert from coverage to shape file using the ESRI application (not bold, since it is optional as the FID one).