SURFACE CURRENTS WORK PKGS

WP3: Gridded Product
WP4: Surface Currents Product Specification

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1. **Unresolved Comments on S-111, version 1.6**
2. **S-111, version 1.7**
3. **S-111, version 1.8**
4. **Old Business from SCWG3**
5. **Questions for S-100WG**
6. **Next Steps**

1. Unresolved Comments on S-111, V. 1.6

(resulting in Version 1.7, sent out in Dec. 2015)

A. Plot points (not arrows) when speed is below minimum (p. 2 in comments form)
    1. Would require defining a new symbol

B. Spatial interpolation, if used, should be explained in speed legend (p. 6)
    1. Would require additional text in legend
    2. Temporal interpolation – should this be explained?

C. Thinning algorithm needed (p. 6) – See below

D. If current is a layer average, the depth value should be mid-depth, not total depth (p. 7)

E. Add 'Official' and 'Official Sensitive' to classifications (p. 8)
    A. Must be approved by S-100WG

F. Define a Boolean variable in HDF5 (p. 17)

G. Use GRIB2 compression for data (p. 11) (see next slide)

GRIB2 Compression

GRIB is the World Meteorological Organization standard
for GRIdded Binary data exchange

An original data value Y (in SI Standard Units as shown in Code Table 4.2) can be recovered with the formula:

$$Y * 10^D = R + (X1 + X2) * 2^E ,$$

For simple packing

D = Decimal scale factor

E = Binary scale factor

R = Reference value of the whole field

X1 = 0

X2 = Scaled (encoded) value

For complex grid point packing schemes, D, E, and R are as above, but

X1 = Reference value (scaled integer) of the group the data value belongs to,

X2 = Scaled (encoded) value with the group reference value (X1) removed.

2. S-111, Ver. 17.

A. Data Product Architecture

Data Product
Product Metadata

Group XY (conditional)
X values array (m=1,*numPOS*)
Y values array (m=1,*numPOS*)

Group 1
$Title_1$
$Date\text{-}Time_1$
Surface current speed array (i=1,*numCOL*,j=1,*numROW*)
Surface current direction array (i=1,*numCOL*,j=1,*numROW*)

Group 2
$Title_2$
$Date\text{-}Time_2$
Surface current speed array (i=1,*numCOL*, j=1,*numROW*)
Surface current direction array (i=1,*numCOL*, j=1,*numROW*)

Group *numGRP*
$Title_{numGRP}$
$Date\text{-}Time_{numGRP}$
Surface current speed array (i=1,*numCOL*, j=1,*numROW*)
Surface current direction array (i=1,*numCOL*,j=1,*numROW*)

A. Data Product Architecture (Continued)

Coding Format

Data Type	Coding Format	numPOS	numCOL	numROW	numGRP
Fixed Platforms, Time Series	1	numberOfStations	numberOfTimes	1	numberOfStations
Regular Grid	2	(not used)	numberPointsLong	numberPointsLat	numberOfTimes
Irregular Grid	3	numberOfNodes	numberOfNodes	1	numberOfTimes
Moving Platform, Time Series	4	numberOfTimes	numberOfTimes	1	1

HDF5 Schematic of a Data Product

Group	HDF5 Category	Data Type	Data Space
'/' *(root)*	Attributes: Metadata See Table 10.3	Integer, Float, Enumeration, or Character	-
'/Group XY'	Dataset: X (Longitude)	Float	Vector (1-d): n=1, *numPOS*
	Dataset: Y (Latitude)	Float	Vector (1-d): n=1, *numPOS*
'/Group 1'	Attribute: Title	Character	
	Attribute: Date-Time	Character	
	Dataset: Speed	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*
	Dataset: Direction	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*
'/Group 2'	Attribute: Title	Character	
	Attribute: Date-Time	Character	
	Dataset: Speed	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*
	Dataset: Direction	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*
'/Group *numGRP*'	Attribute: Title	Character	
	Attribute: Date-Time	Character	
	Dataset: Speed	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*
	Dataset: Direction	Float	Vector (2-d): i=1, *numCOL*, j=1,*numROW*

3. S-111, version 1.8

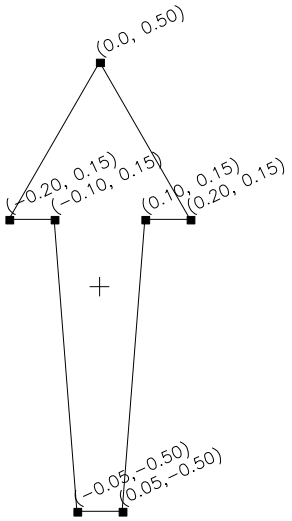
After distribution of v 1.7, further changes were made

A. Corrections in response to comments on v. 1.7 by Sullivan, Powell

B. Coordinate Reference System: single vs <u>compound</u> (Cl. 5.2)
   1. Horizontal: X,Y axes (deg) are 2-D Geodetic System (ellipsoid without vertical)
   2. Vertical: Z axis (meters) pointing upward

C. Arrow size (in mm), Scalable Vector Graphics (Cl. 9.2.4)

D. Thinning algorithm for reg. gridded data (Cl. 9.3.2).
   Sullivan, Weaver (see next slide)



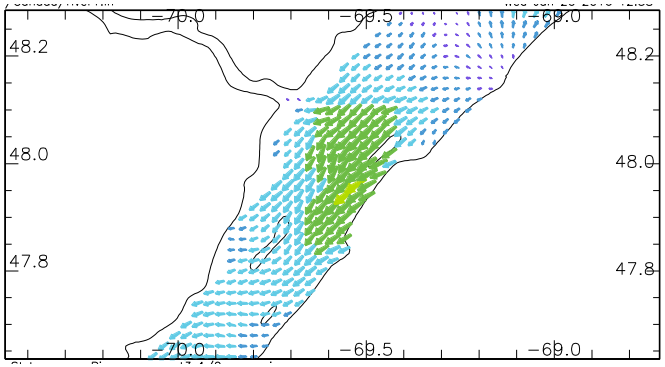
Thinning Algorithm for Reg. Gridded Data

D = grid diagonal length (mm)

Lsmax = length of max. speed vect. (mm)

(max. speed of vectors displayed in image)

Overlap occurs when D and Lsmax are about the same size.



n = 1

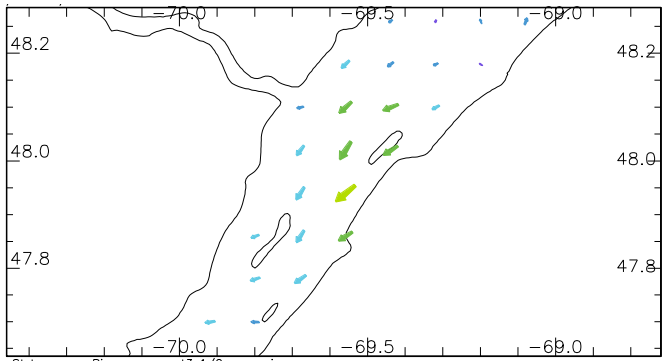
n = vect. interval (i.e., display every n-th vector)

R = Lsmax/nD

Thus, constrain R:

$R \leq Rc$

n = 1 + fix(Lsmax/DRc)



Rc = 0.5, n = 4

Irregular grid: $\max\{Lsi/nDi\} \leq Rc$

S-111, Ver. 1.8 (cont'd)

E. Sample HDF5 files were added (Annex G).

Coding Format	File Name	H5 Size (KB)	num POS	num GRP	num COL x num ROW	Zipped* Size (KB)	
1	USastroTS20160122.h5	29.5	4	4	481	8.8	28.8
2	USloofsGR20150903.h5	89.3	0	6	1525	18.2	148.1
3	USchesbay20151231.h5	117.8	1560	6	1560	48.4	181.2
4	US_argos_20150925.h5	16.9	384	1	384	8.5	16.8

F. File size specified: is 10 MB limit too large? (Cl. 11.1)

Based on above four files:

KB = 8.0 + 0.015*numPOS + 1.3*numGRP + 0.0082*numGRP*numCOL*numROW $\pm$1.4

G. Edition: Date, plus number of release in that day. Don't need updates(?) (Cl. 11.1, Table 10.3)

Edition = major revision of entire field

Update = minor revision to a portion of field

H. Explanation of Lagrangian drifter (i.e. moving platform) data was added (Annex F.4)

I. New discussion of the vertical datum transformation and uncertainty (F.6)

J. Revised Table 10.3, the List of Attributes (see below)

Table 10.3

N	Name	Camel Case	Data Type	Remarks and/or Units
		Administrative Information		
1	Country of Origin	nationalOriginator	Character	Country code for producer (ISO 3166-1)
2	Producing agency	producingAgency	Character	Agency responsible for producing the data.
3	Product Spec and version	productSpecification	Character	This must be encoded as 'S-111.X.X.X', with Xs representing the version number
4	Date of edition issue	dateOfIssue	Character	Date
5	Number of this edition	editionNumber	Integer	Edition for the date of issue
6	~~Date of update~~	~~updateApplicationDate~~	~~Character~~	~~Date~~
7	~~Update number of this product~~	~~updateNumber~~	~~Integer~~	~~Update number is assigned to each new dataset~~
8	Name of Data Product file	fileName	Character	File name. e.g.: CAxxxxxxxxxxxxxxx.hdf5
9	Data file format	dataType	Character	ISO HDF5
10	Name of geographic region	nameRegion	Character	
11	Name of geographic sub-region	nameSubregion	Character	
12	Horizontal datum	horizontalDatumReference	Character	EPSG
13	Horizontal datum number	horizontalDatumValue	Integer	4326 (for WGS84)
		Area and Time Coverage Information		
14	Westmost longitude	westBoundLongitude	Float	Arc Degrees
15	Eastmost longitude	eastBoundLongitude	Float	Arc Degrees
16	Southmost latitude	southBoundLatitude	Float	Arc Degrees
17	Northmost latitude	northBoundLatitude	Float	Arc Degrees
18	Valid Time of Earliest Value	dateTimeOfFirstRecord	Character	Date-time
19	Valid Time of Latest Value	dateTimeOfLastRecord	Character	Date-time
20	Time interval	timeRecordInterval	Integer	Seconds
21	Number of time records	numberOfTimes	Integer	

Table 10.3 (cont'd)

		Surface Current Information		
22	Type of current data	typeOfCurrentData	Enumeration	1: Historical observation 2: Real-time observation 3: Astronomical prediction 4: Analysis 5: Model-based hindcast 6: Model-based forecast
23	Data organization index	dataCodingFormat	Enumeration	1: Time series at one or more fixed stations with same starting date-time, ending date-time, and number of points 2: Regularly-gridded arrays 3: Irregularly-gridded arrays 4: Lagrangian drifters
24	Number of stations with time series data	numberOfStations	Integer	Used only if dataCodingFormat = 1 or 4
25	Methodology, instrument, or model	methodOrSource	Character	Instrument or model type
26	Vertical reference	depthTypeIndex	Enumeration	1: Layer average 2: Sea surface 3: Vertical datum (see verticalDatum) 4: Sea bottom
27	Depth value	surfaceCurrentDepth	Float	Layer thickness (depthTypeIndex=1), or height (depthTypeIndex=2, 3, 4) (m)
28	Vertical datum reference	verticalDatum	Enumeration	1 : Mean low water springs 2 : Mean lower low water springs 3 : Mean sea level 4 : Lowest low water 5 : Mean low water 6 : Lowest low water springs 7 : Approximate mean low water springs 8 : Indian spring low water 9 : Low water springs Etc.

Table 10.3 (cont'd)

		Grid Information		
29	Longitude of grid origin	gridOriginLongitude	Float	Arc Degrees (if dataCodingFormat=2)
30	Latitude of grid origin	gridOriginLatitude	Float	Arc Degrees (if dataCodingFormat=2)
31	Grid spacing, long.	gridSpacingLongitudinal	Float	Arc Degrees (if dataCodingFormat=2)
32	Grid spacing, lat.	gridSpacingLatitudinal	Float	Arc Degrees (if dataCodingFormat=2)
33	Number of points, long.	numberPointsLong	Integer	iMax (if dataCodingFormat=2)
34	Number of points, lat.	numberPointsLat	Integer	jMax (if dataCodingFormat=2)
35	First grid point num., long.	minimumGridPointLongitudinal	Integer	0 (if dataCodingFormat=2)
36	First grid point num., lat.	minimumGridPointLatitudinal	Integer	0 (if dataCodingFormat=2)
37	Nodes in irregular grid	numberOfNodes	Integer	Used if dataCodingFormat=3
38	Land mask	gridLandMaskValue	Float	Negative value (e.g. -1.0 or -99.999). Also denotes a missing value.
		Uncertainty Information		
39	Speed uncertainty	uncertaintyOfSpeed	Float	kn. Negative value indicates unknown
40	Direction uncertainty	uncertaintyOfDirection	Float	Arc Deg. Negative value indicates unknown
41	Horizontal position uncertainty	uncertaintyOfHorizontalPosition	Float	m. Negative value indicates unknown
42	Vertical position uncertainty	uncertaintyOfVerticalPosition	Float	m. Negative value indicates unknown
43	Time uncertainty	uncertaintyOfTime	Float	s. Negative value indicates unknown

K. Portrayal: Pick Report Text Box

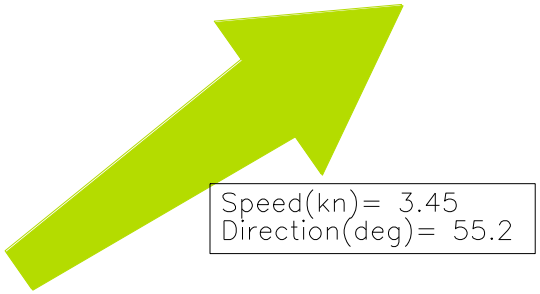


Table 9.2.

Priority Level	Information
1	Speed Direction
2	Data source or station name Latitude Longitude Date-time Depth
3	Uncertainty in speed Uncertainty in direction Uncertainty in horizontal position Uncertainty in vertical position Uncertainty in time

Text box requires: border (black), text (black), background (white).

Do we need a border for the first priority level?

Is there a standard for 'pick reports'?

Is the information in the priority levels useful? Cf. Jeppesen comments.

How to select next priority levels?

L. Portrayal: Scale bar

Figure 9.2.

Must define this figure in portrayal catalogue: size, position, text.

Is there a standard for scale bars?

Do we need a border?

Should there be additional information?

Data source/s, interpolation method, etc.

M. UTC Time standard: *yyyymmdd*T*hhmmss*Z

4. Old Business

At SCWG3 , there was a suggestion to include time of slack water (ROK)

Possibly revise the definition of slack water

Hydrographic Dictionary:
4766 **slack water**. The interval when the SPEED of the TIDAL CURRENT is very weak or zero; usually refers to the period of reversal between EBB and FLOOD currents. Also called slack tide.

Do we wish to include and portray time of slack water?

If yes, how do we calculate times of slack water, and for which datasets?

How do we portray time of slack water?

5. Request for S-100WG

- Provide a review of the present S-111 v 1.8 document
- Insure harmonization of variable names
- Provide revised UML diagrams
- Provide guidance for defining spatial quality for point sets
- Provide naming standard for exchange datasets
- Assure that S-111 symbols are compatible with other S-100 products
- Determine whether there will be user-selectable input

6. Next Steps

- Continued Revision of the PS
  - Issue, Review, Comment, Revise (All, PT)
  - Incorporate comments from S-100WG
  - Include a portrayal catalogue (XML)

- Testing the Portrayal of Vectors
  - SPAWAR, ROK

- Finalizing the HDF5 Format, Attributes, etc.
  - SPAWAR, USA, CAN, Caris

- Interaction with Manufacturers
  - CAN, Caris

- Transition/customization of HO Products to S-111
  - USA, CAN

O Fim.

Obrigado!