1st S100 MEETING
Tokyo 14-18 March 2016

Paper for Consideration by the Nautical Cartography Working Group (NCWG)

JCOMM/ETMSS: Update on Development of S-412, "Weather Overlay"

Submitted by:	United States (NOAA NWS) and Brazil (DHN)
Executive Summary:	A link is provided to a recent article in *Hydro International*, which describes the effort to design an S-100 *IHO Universal Hydrographic Data Model* compliant product specification for a marine weather overlay product. A set of symbols that have been proposed to portray the product in ECDIS is provided in Annex C.
Related Documents:	S-100 *IHO Universal Hydrographic Data Model*
Related Projects:	S-100 Work Plan

Introduction / Background

The Joint WMO-IOC (World Meteorological Organization – Intergovernmental Oceanographic Commission) Technical Commission for Oceanography and Marine Meteorology (JCOMM) made ECDIS weather overlay products a priority in 2012 and designated the U.S. National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) as the project lead. The Brazilian Hydrographic Office recognised the importance of delivering life-saving weather information via ECDIS and joined the project in 2014.

Analysis / Discussion

Recently, LCDR Cesar Reinert B. Morais (Brazil) and LT Christine Schultz (US) wrote an article for *Hydro International* that describes the effort to design an S-100 *IHO Universal Hydrographic Data Model* compliant product specification. S-100 provides the framework for defining separate digital overlay products that may be displayed individually or together with other S-100 based products in ECDIS.

The development of the IHO S-412 "Weather Overlay" product specification is described in "Designing a New Way to Deliver Marine Weather Data" in the November-December 2015 issue of *Hydro International*. As all other S-100 based product specifications do, S-412 will define (among many other properties) the features (or objects) that the product data holds (see Annex A), the attributes that are used to describe each feature (see Annex B), and the symbols that are used to portray the data within an ECDIS (see Annex C).

NOAA NWS has uploaded into the IHO Registry the following 38 objects:

AIRPSR, Atmospheric Pressure

AIRTEM, Air Temperature

CEHIPR, Centre of High Pressure

CENDEP, Centre of Depression (*this will change to Centre of Low)

CLOUDS, Cloud

CONVBO, Convergent Boundaries

DPTEMP, Dew-point Temperature

FRONTS, Front

FZSPRY, Freezing Spray

GUSGUS, Gust

ICEBRG, Limit of Known Icebergs (*may be removed since it might be in the Ice Specification)

ICEDGE, Ice Edge (*may be removed since it might be in the Ice Specification)

ISOHGT, Isoheight

LOWATR, Low Water Level

MAXDPT, Maximum Dew-point Temperature

MAXPDE, Maximum Pressure Decrease/Minimum Pressure Increase

MAXPIN, Maximum Pressure Increase/Minimum Pressure Decrease

MAXSST, Maximum Sea Surface Temperature

MAXTEM, Maximum Air Temperature

METARE, Metarea (*may be removed since this is more metadata)

MINDPT, Minimum Dew-point Temperature

MINSST, Minimum Sea Surface Temperature

MINTEM, Minimum Air Temperature

OBSERV, Observations

PRETEN, Pressure Tendency

RIDGES, Ridge

SIGWAV, Significant Wave Height

SIGWET, Significant Weather

SSTEMP, Sea Surface Temperature

STOSUR, Storm Surge

SURVIS, Surface Visibility

SUWIND, Surface Wind

SWELLS, Swell (*will be changed to Primary Swell and Secondary Swell will be added)

THKNSS, Thickness

TROCYC, Tropical Cyclone

TSUNAM, Tsunami

WINWAV, Wind Wave

WRNING, Watch/Warning

And also uploaded these following 23 attributes:

Wave Height Change Time Interval

DEGSWL, Azimuth Degrees of Swell Direction

DEGWAV, Azimuth Degrees of Significant Wave Direction

DEGWND, Azimuth Degrees of Surface Wind Direction

DEGWWA, Azimuth Degrees of Wind Wave Direction

SIWAHE, Significant Wave Height

SIWAPE, Significant Wave Period

SPEXMO, Speed of Expected Movement

SWHTTI, Swell Wave Height Change Time Interval

SWLGH, Swell Wave Height

SWLPRD, Swell Wave Period

SWPETI, Swell Wave Period Change Time Interval

THKNSS, Thickness Height

THPROB, Tsunami Height Probability

TSUPER, Tsunami Wave Period

VALHGT, Value of Height Contour

VALPSR, Value of Atmospheric Pressure

WIWAHE, Wind Wave Height

WIWAPE, Wind Wave Period

WNDAVP, Wind Average Period

WNDTIM, Wind Change Time Interval

WWHETI, Wind Wave Height Change Time Interval

WWPETI, Wind Wave Period Change Time Interval

The Portrayal Catalogue draft is still under review by ETMSS members and other interested international weather agencies. This process includes multiple review and comment periods over several months.

Conclusions

The effort to develop a weather overlay to be displayed in ECDIS has made significant progress and has uploaded a set of objects and attributes into the IHO Registry. Reviewing process by WMO member states is still underway.

Recommendations

It is requested that S-100WG:

a. Continue providing advice and support for NOAA/DHN technical issues during S-412 development

b. Continue engaging private industry to develop an S-100 viewer for testing portrayal rules and conducting overlay quality control

c. Foster Coordination with other working groups to ensure there is no duplication in the feature definitions.

Justification and Impacts

As additional S-100 product specifications are developed, the potential for conflicting symbology and portrayals within ECDIS will increase. It is expected that S-100WG comments will contribute significantly to this project's development, assuring user requirements in this interdisciplinary project are met. This new product, together with other new products, shall impact industry and users interests transitioning to S-100 standard.

Action required of S-100WG

S-100WG is invited to:

a. Note the progress being made in the development of this particular S-100 overlay product;

b. Provide recommendations that may be helpful in developing S-412; and

c. Support JCOMM/ETMSS S-412 activities

ANNEX A: S-412 Object List

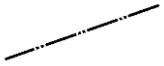
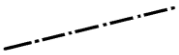
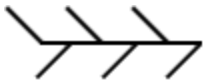
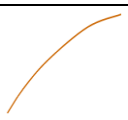
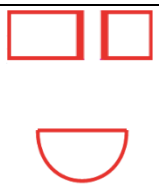
Object Number	Object Name	Acronym	Feature Type
1.1	Air Temperature	AIRTEM	Geo
1.2	Atmospheric Pressure	AIRPSR	Geo
1.3	Centre of Anticyclone	CEHIPR	Geo
1.4	Centre of Depression	CENDEP	Geo
1.5	Cloud	CLOUDS	Geo
1.6	Convergent Boundaries	CONVBO	Geo
1.7	Dew-point Temperature	DPTEMP	Geo
1.8	Freezing Spray	FZSPRY	Geo
1.9	Front	FRONTS	Geo
1.10	Gust	GUSGUS	Geo
1.11	Ice Edge	ICEDGE	Geo
1.12	Isoheight	ISOHGT	Geo
1.13	Limit of Known Icebergs	ICEBRG	Geo
1.14	Low Water Level	LOWATR	Geo
1.15	Maximum Air Temperature	MAXTEM	Geo
1.16	Maximum Dew-point Temperature	MAXDPT	Geo
1.17	Maximum Pressure Decrease/Minimum Pressure Increase	MAXPDE	Geo
1.18	Maximum Pressure Increase/Minimum Pressure Decrease	MAXPIN	Geo
1.19	Maximum Sea Surface Temperature	MAXSST	Geo
1.20	Metarea	METARE	Meta
1.21	Minimum Air Temperature	MINTEM	Geo
1.22	Minimum Dew-point Temperature	MINDPT	Geo
1.23	Minimum Sea Surface Temperature	MINSST	Geo
1.24	Observations	OBSERV	Geo
1.25	Pressure Tendency	PRETEN	Geo
1.26	Ridge	RIDGES	Geo
1.27	Sea Surface Temperature	SSTEMP	Geo
1.28	Significant Wave Height	SIGWAV	Geo
1.29	Significant Weather	SIGWET	Geo
1.30	Storm Surge	STOSUR	Geo
1.31	Surface Visibility	SURVIS	Geo
1.32	Surface Wind	SUWIND	Geo
1.33	Swell	SWELLS	Geo
1.34	Thickness	THKNSS	Geo
1.35	Tropical Cyclone	TROCYC	Geo
1.36	Tsunami	TSUNAM	Geo
1.37	Watch/Warning	WRNING	Geo
1.38	Wind Wave	WINWAV	Geo

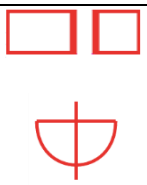
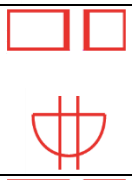
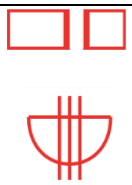
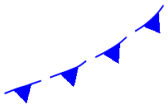
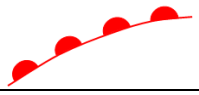
ANNEX B: S-412 Attribute List

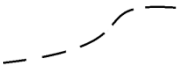
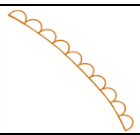
Attribute Number	Attribute Name	Acronym
2.1	Amount of Pressure Change	AMPRCH
2.2	Atmospheric Pressure Accuracy	ATPACC
2.3	Azimuth Degrees of Significant Swell Direction	DEGSWL
2.4	Azimuth Degrees of Significant Wave Direction	DEGWAV
2.5	Azimuth Degrees of Surface Wind Direction	DEGWND
2.6	Azimuth Degrees of Wind Waves Direction	DEGWWA
2.7	Beaufort Force	BEAUFOR
2.8	Category of Convergent Boundaries	CATCON
2.9	Category of Front	CATFRO
2.10	Category of Significant Swell Wave Height	CATSWH
2.11	Category of Significant Swell Direction	CATSWD
2.12	Category of Significant Wave Height	CATSEH
2.13	Category of Significant Wave Direction	SIWADE
2.14	Category of Significant Weather	CATSWE
2.15	Category of Surface Visibility	CATVIS
2.16	Category of Tropical Cyclone	CATCYC
2.17	Category of Warning	CATWRN
2.18	Category of Wind Wave Direction	CATWWD
2.19	Category of Wind Wave Height	CATWWH
2.20	Change in Significant Swell Height	CHSWHE
2.21	Change in Significant Swell Period	CHSWPE
2.22	Change in Significant Wave Height	CHWAHE
2.23	Change in Significant Wave Period	CHWAPE
2.24	Change in Surface Wind Direction	CHAWDI
2.25	Change in Surface Wind Speed	CHCWDS
2.26	Change in Wind Wave Height	CHWWHE
2.27	Characteristic of Pressure Change	CHPRCH
2.28	Compass Point of Surface Wind Direction	COMDIR
2.29	Direction of Expected Movement	DREXMO
2.30	Expected Change in Intensity	EXPINT
2.31	Front Level	FROLEV
2.32	Frontal Development	FRODEV
2.33	Height of Cloud Base	HCLOBA
2.34	Height of Storm Surge	HEISUR
2.35	Height Probability	HTPROB
2.36	Icing Intensity	ICIINT
2.37	Isallobar Time Interval	ISLOTM
2.38	Issue Time	ISSTIM
2.39	Length Units	LUNITS
2.40	Low Water Level	LOWLVL
2.41	Lower Isobaric Level	LOWLEV
2.42	Metarea Number	METNUM
2.43	Next Update Time	NUPTIM
2.44	Observation Source	OBSRCE
2.45	Observation Source Identification	OBSIDS
2.46	Observation Source Status	OBSTAT
2.47	Predicted Tsunami Maximum Wave Height	TMWHGT

2.48	Saffir-Simpson Category	SAFSIM
2.49	Significant Swell Wave Height	SSWHGT
2.50	Significant Swell Wave Period	SWLPRD
2.51	Significant Wave Height	SIWAHE
2.52	Significant Wave Period	SIWAPE
2.53	Speed of Expected Movement	SPEXMO
2.54	Swell Height Change Time Interval	SWHTTI
2.55	Swell Period Change Time Interval	SWPETI
2.56	Temperature Accuracy	TMPACC
2.57	Thickness Height	THKNSS
2.58	Tidal Datum	LEVREF
2.59	Total Cloud Cover	TCLOCO
2.60	Tsunami Wave Arrival Time	ARRTIM
2.61	Tsunami Wave Period	TSUPER
2.62	Upper Isobaric Level	UPRLEV
2.63	Valid Time	VALTIM
2.64	Value of Atmospheric Pressure	VALPSR
2.65	Value of Dew-point Temperature	VALTDT
2.66	Value of Height Contour	VALHGT
2.67	Value of Sea Surface Temperature	VALSST
2.68	Value of Surface Wind Gust	VALGST
2.69	Value of Surface Wind Speed	VAWISP
2.70	Value of Temperature	VALTMP
2.71	Velocity Units	VUNITS
2.72	Visibility Range	VIZRNG
2.73	Warning End Time	WRNEND
2.74	Warning Start Time	WSTART
2.75	Watch/Warning Type	WTCWRN
2.76	Water Height Units	HUNITS
2.77	Wave Height Change Time Interval	WAHETI
2.78	Wave Period Change Time Interval	WASWTI
2.79	Wind Average Period	WNDAVP
2.80	Wind Change Time Interval	WNDTIM
2.81	Wind Wave Height	WIWAHE
2.82	Wind Wave Height Change Time Interval	WWHETI
2.83	Wind Wave Period	WIWAPE
2.84	Wind Wave Period Change Time Interval	WWSWTI

ANNEX C: S-412 Symbols (as of 29 Jan 2016)

Feature	Acronym	Attribute	Geometry	SVG Symbols Used	Complete Symbol
Atmospheric Pressure	AIRPSR	All Attributes	Curve		
Atmospheric Pressure	CENHIP	All Attributes	Point		
Atmospheric Pressure	CENDEP	All Attributes	Point		
Convergent Boundary	CONVBO	Intertropical Convergence Zone	Curve		
Convergent Boundary	CONVBO	Squall Line	Curve		
Convergent Boundary	CONVBO	Trough Line	Curve		
Convergent Boundary	CONVBO	Trough	Curve		
Convergent Boundary	CONVBO	Shear Line	Curve		
Convergent Boundary	CONVBO	Convergence Line	Curve		
Convergent Boundary	CONVBO	Monsoon Trough	Curve		
Convergent Boundary	CONVBO	Tropical Wave	Curve		
Freezing Spray	FZSPRY	All Attributes	Curve		
Freezing Spray	FZSPRY	Light	Point, Curve		

Freezing Spray	FZSPRY	Moderate	Point, Curve		
Freezing Spray	FZSPRY	Severe	Point, Curve		
Freezing Spray	FZSPRY	Very Severe	Point, Curve		
Front	FRONTS	Cold Front, Developing	Curve		
Front	FRONTS	Cold Front, Dissipating	Curve		
Front	FRONTS	Cold Front, Surface	Curve		
Front	FRONTS	Cold Front, Above Surface	Curve		
Front	FRONTS	Warm Front, Developing	Curve		
Front	FRONTS	Warm Front, Dissipating	Curve		
Front	FRONTS	Warm Front, Surface	Curve		
Front	FRONTS	Warm Front, Above Surface	Curve		
Front	FRONTS	Occluded	Curve		
Front	FRONTS	Quasi-stationary Front, Surface	Curve		
Front	FRONTS	Quasi-stationary Front, Above Surface	Curve		

Front	FRONTS	Convergence Line	Curve		
Front	FRONTS	Dry Line	Curve		
Ice Edge	ICEDGE	All Attributes	Curve		
Ridge	RIDGE	All Attributes	Curve		
Surface Wind	SUWIND	Value of Surface Wind Speed = 2	Point		
Surface Wind	SUWIND	Value of Surface Wind Speed = 5	Point		
Surface Wind	SUWIND	Value of Surface Wind Speed = 10	Point		
Surface Wind	SUWIND	Value of Surface Wind Speed = 50	Point		
Tropical Cyclone	TROCYC	Tropical Disturbance	Point		
Tropical Cyclone	TROCYC	Tropical Depression	Point		
Tropical Cyclone	TROCYC	Tropical Storm	Point		
Tropical Cyclone	TROCYC	Severe Tropical Storm	Point		
Tropical Cyclone	TROCYC	Tropical Cyclone	Point		
Tropical Cyclone	TROCYC	Hurricane	Point		

Tropical Cyclone	TROCYC	Typhoon	Point		
Tropical Cyclone	TROCYC	Super Typhoon	Point		
Tropical Cyclone	TROCYC	Post-tropical Cyclone	Point		
Tropical Cyclone	TROCYC	Subtropical Cyclone	Point		
Tropical Cyclone	TROCYC	Remnant Low	Point