Input paper: [[1]](#footnote-1) ENG6-9.13

Input paper for the following Committee(s): check as appropriate Purpose of paper:

**□** ARM **□** ENG **□** PAP **X** Input

**X** ENAV **□** VTS **□** Information

Agenda item [[2]](#footnote-2) 9

Workplan Task Number / Technical Domain 2 …………………………………

Working Group 1

Author(s) / Submitter(s) Mahesh Alimchandani

**S-412, A Weather Overlay Product Specification for Electronic Chart Display and Information Systems (ECDIS)**

|  |  |
| --- | --- |
| ***Submitted by:*** | United States, NOAA National Weather Service Ocean Prediction Center |
| ***Executive Summary:*** | Two links are provided below for (1) 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 and (2) a publically accessible site containing S-412 documentation  Current Features are provided in Annex A and Attributes are provided in Annex B and C. Symbols that have completed ETMSS review provided in Annex D. |
| ***Related Documents:*** | [S-100](http://www.iho.int/iho_pubs/standard/S-100/S-100_Version_1.0.0.zip) *IHO Universal Hydrographic Data Model* |
| ***Related Projects:*** | All other S-100 product specifications and related Working Group documentation. |

## Introduction / Background

**Introduction / Background**

The International Maritime Organization has identified the need for electronic navigation systems to facilitate the safe and secure navigation of vessels with regard to hydrographic, meteorological and navigational information and risks. To meet this need, the Joint WMO-IOC (World Meteorological Organization – Intergovernmental Oceanographic Commission) Technical Commission for Oceanography and Marine Meteorology (JCOMM) made Electronic Chart Display and Information System (ECDIS) weather overlay products a priority in 2012 and designated the U.S. National Oceanic and Atmospheric Administration’s (NOAA) National Weather Service (NWS) Ocean Prediction Center (OPC) to lead the development of this product specification. This product specification is one of many (sea ice, tides, currents, nautical publications, etc.) that is being developed to meet the requirements of the S-100 *Universal Hydrographic Data Model*.

The project requires international collaboration to ensure a consensus is reached on the form and contents of the final product specification. Overall, this project is being reviewed by JCOMM’s Expert Team on Maritime Safety Services (ETMSS) during the development process. Additional support has been provided by the International Hydrographic Organization’s (IHO) S-100 Working Group, the Brazilian Navy’s Hydrographic Centre, South Korea’s Korean Hydrographic and Oceanographic Agency (KHOA) and the Korea Research Institute of Ships and Ocean Engineering (KRISO), and the United States’ NOAA National Ocean Service.

The development of the S-412 "Weather Overlay" product specification is described in "[Designing a New Way to Deliver Marine Weather Data](http://www.hydro-international.com/content/article/designing-a-new-way-to-deliver-marine-weather-data)" in the November-December 2015 issue of *Hydro International*. The S-412 Product Specification will include a feature catalogue, comprised of meteorological features with attributes (Annex A, B and C) relevant to the mariner, and the symbols (Annex D) that visually represent marine meteorological data within an ECDIS. Complete copies of the S-412 Encoding Guides and the GML Schema can be found at <http://www.opc.ncep.noaa.gov/s412/>.

**Analysis / Discussion**

Developing the S-412 Product Specification has been ongoing since 2012 when meteorological features relevant to marine weather forecasting agencies and mariners were first identified. These features are part of the draft feature catalogue encoding guide, which currently comprises 37 objects and 135 attributes (Annex A, B, C). Feature encoding will follow the future S-100 *Universal Hydrographic Data Model*, a flexible machine readable data model that makes data integration and overlays possible within the electronic charting environment. Merging these features into the IHO’s Registry database is underway with the WMO having domain control over marine meteorological concepts within this registry. OPC has been working with the IHO to rectify issues within the IHO Registry as they are encountered. Additionally, S-412 feature designs have introduced new challenges to the S-100 concept and include how to reuse enumerated values between two different attributes that have separate definitions. An example of this includes how a cardinal direction can be applied to two attributes, one where the direction is defined as ‘to’ and the other where direction is defined as ‘from.’ When these issues are addressed by the IHO S-100 Working Group and all features and their attributes are added into the IHO Registry, the S-412 Feature Catalogue will be built.

Point, line and area symbols will be available and defined as part of the portrayal catalogue. This portrayal catalogue will include Scalar Vector Graphics (SVG) and eXtensible Markup Language (XML) files to define how these symbols will interact with the features defined in the feature catalogue. Identifying the symbols to use for each feature is ongoing; however, 13 point symbols and 27 line symbols (Annex D) have been reviewed by ETMSS. The SVG and XML files for each of these symbols will be available in the next few months. Additional symbols, including area geometries are currently being developed.

Challenges have been encountered while identifying how features will be used in S-412. For example, in some cases the terminology used to define a system has evolved into describing the potential impact the system may have. This could have serious impacts to the maritime industry if, for example, weather phenomena or warnings are misrepresented. This presents a challenge specifically with terminology used to define tropical cyclones, where multiple and sometimes conflicting terms are used in different ocean basins to describe a similar tropical system (hurricane, typhoon, very severe cyclonic storm, tropical storm, severe tropical storm, etc). It would be highly inappropriate and potentially dangerous to use a term that misrepresents a storm’s potential impact to the end user. The solution to remedy this and similar feature problems is to use a feature’s lowest common denominator and leverage feature attributes and portrayal capabilities. In the case of the Tropical Cyclone feature, the lowest common denominator term to describe these storms is “tropical cyclone” and each type of ‘tropical cyclone’ would be represented differently using the appropriate symbols triggered by the feature’s wind speed range attribute, as opposed to the type or category of the system. Weather advisories, watches and warnings associated with these and other meteorological systems would be triggered in a separate feature called Watch/Warning.

It is still early in the portrayal development process; however, reaching a consensus on S-412 symbols is also encountering its challenges as well. WMO publications do not have standardized symbology for all the features identified for inclusion in this product specification’s feature catalogue. Because this symbology has not been established by the WMO, marine weather forecasting agencies have evolved into using different symbols to produce slightly different forecasting products and services for their forecasting area of responsibility. This, compounded by the limited technological capabilities of some forecasting agencies, makes envisioning a weather overlay product specification difficult.

South Korea’s KHOA and CRISO have developed a viewer that will enable the various S-100 compliant product specifications to be tested in an S-100 electronic navigation environment. An S-412 test scenario aimed at recreating a 2016 North Pacific early summer forecast product produced by the OPC was created for testing in this environment. This scenario included testing 4 features commonly found on forecasting charts and draft interoperability requirements specific to S-412 features. The results of this test identified limitations within the S-412 portrayal designs, including the need for defining scaling requirements and dynamic physical sizing rules for each feature and its portrayal. These new rules are currently in development. Additionally, KHOA and CRISO identified issues in their viewing software that prevented symbols from being displayed correctly at different scales and an inability to display information seamlessly across the International Date Line, an issue encountered by other geographic information system softwares and supported by previous IHO charting specifications. Additional results and future testing within this environment and others will be used to better understand the S-100 and electronic navigation environment S-412 needs to adhere to, refine the S-412 product specification including the portrayal and feature catalogues, and identify file formatting constraints directly related to product dissemination.

As testing continues, this and other product specifications will focus on the interoperability requirements needed to ensure the various overlays are presented safely for the mariner’s operational usage. This includes S-412 specific interoperability requirements designed to prevent the cluttering of meteorological features and display hierarchies.

Future development includes continuing to focus on portrayal development, feature catalogue refinement, merging features and portrayals into the IHO’s Registry database, and on testing the S-412 product specification in an S-100 electronic navigation environment.

**Conclusions**

The effort to develop a weather overlay for future S-100 compliant ECDIS’ has made significant progress since the project started in 2012. The product specification is still in development and recently began the testing phase of S-412 features and portrayals.

**Justification and Impacts**

This new product, together with other new products, shall impact industry and users transitioning to the S-100 standard. Once implemented, marine forecast and analysis products created using this product specification will enhance the situational awareness and safety of vessel operators by overlaying marine meteorological information atop a navigational chart within ECDIS. It is expected that continued support from the international communities will contribute significantly to this project’s development.

**Action required of IALA**

IALA is invited to:

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

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

c. Support JCOMM/ETMSS S-412 activities

ANNEX A: S-412 Feature List

## S-412 Objects as of 1/29/2016

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature Number** | **Feature Name** | **Acronym** | **Feature Type** |
| 1.01 | Air Temperature | AIRTEM | Geo |
| 1.02 | Atmospheric Pressure | AIRPSR | Geo |
| 1.03 | Centre Of High | CENHIP | Geo |
| 1.04 | Centre Of Low | CENLOW | Geo |
| 1.05 | Cloud | CLOUDS | Geo |
| 1.06 | Complex Sea | COMSEA | Geo |
| 1.07 | Convergent Boundary | CONVBO | Geo |
| 1.08 | Dew-Point Temperature | DPTEMP | Geo |
| 1.09 | Freezing Spray | FZSPRY | Geo |
| 1.10 | Front | FRONTS | Geo |
| 1.11 | Gust | GUSGUS | Geo |
| 1.12 | Isoheight | ISOHGT | Geo |
| 1.13 | Low Water Level | LOWATR | Geo |
| 1.14 | Maximum Air Temperature | MAXTEM | Geo |
| 1.15 | Maximum Dew-Point Temperature | MAXDPT | Geo |
| 1.16 | Maximum Sea Surface Temperature | MAXSST | Geo |
| 1.17 | Metarea | METARE | Geo |
| 1.18 | Minimum Air Temperature | MINTEM | Geo |
| 1.19 | Minimum Dew-Point Temperature | MINDPT | Geo |
| 1.20 | Minimum Sea Surface Temperature | MINSST | Geo |
| 1.21 | Observation | OBSERV | Geo |
| 1.22 | Precipitation | PRECIP | Geo |
| 1.23 | Pressure Tendency | PRETEN | Geo |
| 1.24 | Primary Swell | PSWELL | Geo |
| 1.25 | Ridge | RIDGES | Geo |
| 1.26 | Sea Surface Temperature | SSTEMP | Geo |
| 1.27 | Secondary Swell | SSWELL | Geo |
| 1.28 | Significant Wave | SIGWAV | Geo |
| 1.29 | Storm Surge | STOSUR | Geo |
| 1.30 | Surface Visibility | SURVIS | Geo |
| 1.31 | Surface Wind | SUWIND | Geo |
| 1.32 | Thickness | THKNSS | Geo |
| 1.33 | Thunderstorm | TSTORM | Geo |
| 1.34 | Tropical Cyclone | TROCYC | Geo |
| 1.35 | Tsunami | TSUNAM | Geo |
| 1.36 | Watch/Warning | WRNING | Geo |
| 1.37 | Wind Wave | WINWAV | Geo |

ANNEX B: Attributes defined within the S-412 IHO domain

## S-412 Attributes as of 1/29/2016

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Number** | **Register**  **Dictionary** | **Attribute Name** | **Camel Case** | **Acronym** |
| 2.001 | WxFCD | Amount Of Atmospheric Pressure Change | amountOfAtmosphericPressureChange | AMPRCH |
| 2.002 | WxFCD | Area Of Complex Sea | areaOfComplexSea | ARCOSE |
| 2.003 | WxFCD | Area Of Fog | areaOfFog | AROFOG |
| 2.004 | WxFCD | Area Of Freezing Precipitation | areaOfFreezingPrecipitation | ARFZPR |
| 2.005 | WxFCD | Area Of Freezing Spray | areaOfFreezingSpray | ARFZSP |
| 2.006 | WxFCD | Area Of Heavy Showers | areaOfHeavyShowers | ARHVSR |
| 2.007 | WxFCD | Area Of Heavy Swell | areaOfHeavySwell | ARHVSW |
| 2.008 | WxFCD | Area Of Gales (8 Beaufort or more) | areaOfGales | ARGALE |
| 2.009 | WxFCD | Area Of Precipitation | areaOfPrecipitation | AROFPR |
| 2.010 | WxFCD | Area Of Reduced Visibility | areaOfReducedVisibility | ARRDVI |
| 2.011 | WxFCD | Area Of Snow | areaOfSnow | AROSNO |
| 2.012 | WxFCD | Area Of Squally Weather | areaOfSquallyWeather | ARSQWX |
| 2.013 | WxFCD | Area Of Strong Winds (6 and 7 Beaufort) | areaOfStrongWinds6And7Beaufort | ARSTWD |
| 2.014 | WxFCD | Area Of Thunderstorms | areaOfThunderstorms | ARTSOR |
| 2.015 | WxFCD | Area Of Water-Spouts | areaOfWaterSpouts | ARWTSP |
| 2.016 | WxFCD | Atmospheric Pressure Change | atmosphericPressureChange | ATMPRC |
| 2.017 | WXFCD | Atmospheric Pressure Observation | atmosphericPressureObservation | ATPROB |
| 2.018 | WxFCD | Azimuth Degrees Of Wave Direction | azimuthDegreesOfWaveDirection | DEGWAV |
| 2.019 | WxFCD | Azimuth Degrees Of Wind Direction | azimuthDegreesOfWindDirection | DEGWND |
| 2.020 | WxFCD | Beaufort Force | beaufortForce |  |
| 2.021 | WxFCD | Category Of Convergent Boundary | categoryOfConvergentBoundary | CATCON |
| 2.022 | WxFCD | Category Of Front | categoryOfFront | CATFRO |
| 2.023 | WxFCD | Category Of Low | categoryOfLow | CATLOW |
| 2.024 | WxFCD | Category Of Precipitation | categoryOfPrecipitationType | CATPRE |
| 2.025 | WxFCD | Category Of Surface Visibility | categoryOfSurfaceVisbility | CATVIS |
| 2.026 | WxFCD | Category Of Swell Wave Height | categoryOfSwellWaveHeight | CATSWH |
| 2.027 | WxFCD | Category Of Wave Height | categoryOfWaveHeight | CATWAV |
| 2.028 | WxFCD | Category Of Weather Warning | categoryOfWeatherWarning | CATWRN |
| 2.029 | WxFCD | Change In Wave Height | changeInWaveHeight | CHWAHE |
| 2.030 | WxFCD | Change In Wave Period | changeInWavePeriod | CHWAPE |
| 2.031 | WxFCD | Change In Wind Direction | changeInWindDirection | CHAWDI |
| 2.032 | WxFCD | Change In Wind Speed | changeInWindSpeed | CHCWDS |
| 2.033 | WxFCD | Characteristic Of Pressure Change | characteristicOfPressureChange | CHPRCH |
| 2.034 | WxFCD | Coverage | coverage | COVERG |
| 2.035 | WxFCD | Direction Of Expected Movement | directionOfExpectedMovement | DREXMO |
| 2.036 | WxFCD | Expected Change In Intensity | expectedChangeInIntensity | EXPINT |
| 2.037 | WxFCD | Expected Movement | expectedMovement | EXPMOV |
| 2.038 | WxFCD | Front Level | frontLevel | FROLEV |
| 2.039 | WxFCD | Frontal Development | frontalDevelopment | FRODEV |
| 2.040 | WxFCD | Height Contour | heightContour | HGTCON |
| 2.041 | WxFCD | Height Of Cloud Base | heightOfCloudBase | HCLOBA |
| 2.042 | WxFCD | Height Of Storm Surge | heightOfStormSurge | HEISUR |
| 2.043 | WxFCD | Horizontal Visibility Range | horizontalVisibilityRange | HZVBRG |
| 2.044 | WxFCD | Icing Intensity | icingIntensity | ICIINT |
| 2.045 | WxFCD | Issue Time | issueTime | ISSTIM |
| 2.046 | WxFCD | Level Of Front | levelOfFront | LVLFRT |
| 2.047 | WxFCD | Low Water Level | lowWaterLevel | LOWLVE |
| 2.048 | WxFCD | Low Water Level Value | lowWaterLevelValue | LOWLVL |
| 2.049 | WxFCD | Lower Isobaric Level | lowerIsobaricLevel | LOWLEV |
| 2.050 | WxFCD | Metarea Number | metareaNumber | METNUM |
| 2.051 | WxFCD | Next Update Time | nextUpdateTime | NUPTIM |
| 2.052 | WxFCD | Observation Information | observation | OBSINF |
| 2.053 | WxFCD | Precipitation Rate | precipitationRate | PRRATE |
| 2.054 | WxFCD | Predicted Tsunami Maximum Wave Height | predictedTsunamiMaximumWaveHeight | PTWHGT |
| 2.055 | WxFCD | Predicted Tsunami Wave Arrival Time | predictedTsunamiWaveArrivalTime | TWATIM |
| 2.056 | WxFCD | Primary Swell Wave Direction | primarySwellWaveDirection | PSWDIR |
| 2.057 | WxFCD | Primary Swell Wave Height | primarySwellWaveHeight | PSWHGT |
| 2.058 | WxFCD | Primary Swell Wave Height Change | primarySwellWaveHeightChange | PSWHTC |
| 2.059 | WxFCD | Primary Swell Wave Period | primarySwellWavePeriod | PSWPRD |
| 2.060 | WxFCD | Primary Swell Wave Period Change | primarySwellWavePeriodChange | PSWPDC |
| 2.061 | WxFCD | Probability Of Heights Exceeding | probabilityOfHeightsExceeding | PROHEI |
| 2.062 | WxFCD | Probability Of Speed Exceeding | probabilityOfSpeedExceeding | PROSPD |
| 2.063 | WxFCD | Probability Percentage | probabilityPercentage | PROPER |
| 2.064 | WxFCD | Probability Threshold | probabilityThreshold | PROTHD |
| 2.065 | WxFCD | Saffir-Simpson Category | saffirSimpsonCategory | SAFSIM |
| 2.066 | WxFCD | Secondary Swell Wave Direction | secondarySwellWaveDirection | SSWDIR |
| 2.067 | WxFCD | Secondary Swell Wave Height | secondarySwellWaveHeight | SSWHGT |
| 2.068 | WxFCD | Secondary Swell Wave Height Change | secondarySwellWaveHeightChange | SSWHTC |
| 2.069 | WxFCD | Secondary Swell Wave Period | secondarySwellWavePeriod | SSWPRD |
| 2.070 | WxFCD | Secondary Swell Wave Period Change | secondarySwellWavePeriodChange | SSWPDC |
| 2.071 | WxFCD | Significant Wave Direction | significantWaveDirection | SIGWDR |
| 2.072 | WxFCD | Significant Wave Height | significantWaveHeight | SIGHGT |
| 2.073 | WxFCD | Significant Wave Height Change | significantWaveHeightChange | SIGHCG |
| 2.074 | WxFCD | Significant Wave Period | significantWavePeriod | SIWAPE |
| 2.075 | WxFCD | Significant Wave Period Change | significantWavePeriodChange | SIGPCG |
| 2.076 | WxFCD | Speed Of Expected Movement | speedOfExpectedMovement | SPEXMO |
| 2.077 | WxFCD | Speed Units | speedUnits | SUNITS |
| 2.078 | WxFCD | Storm Surge Height | stormSurgeHeight | SSHGHT |
| 2.079 | WxFCD | Surface Gust Direction | surfaceGustDirection | SURGDR |
| 2.080 | WxFCD | Surface Gust Speed | surfaceGustSpeed | SURGSD |
| 2.081 | WxFCD | Surface Wind Direction | surfaceWindDirection | SURWDD |
| 2.082 | WxFCD | Surface Wind Direction Change | surfaceWindDirectionChange | SUWDDC |
| 2.083 | WxFCD | Surface Wind Direction Observation | surfaceWindDirectionObservation | SRWDOB |
| 2.084 | WxFCD | Surface Wind Speed | surfaceWindSpeed | SURWSD |
| 2.085 | WxFCD | Surface Wind Speed Change | surfaceWindSpeedChange | SUWDSC |
| 2.086 | WxFCD | Thickness Height | thicknessHeight | THKNSS |
| 2.087 | WxFCD | Thunderstorm Risk Category | thunderstormRiskCategory | TSRKCA |
| 2.088 | WxFCD | Time | Time | TIMECC |
| 2.089 | WxFCD | Total Cloud Cover | totalCloudCover | TCLOCO |
| 2.090 | WxFCD | Tsunami Wave | tsunamiWave | TSUWAV |
| 2.091 | WxFCD | Tsunami Wave Period | tsunamiWavePeriod | TSUPER |
| 2.092 | WxFCD | Upper Isobaric Level | upperIsobaricLevel | UPRLEV |
| 2.093 | WxFCD | Valid Time | validTime | VALTIM |
| 2.094 | WxFCD | Value Of Air Temperature | valueOfAirTemperature | VALTMP |
| 2.095 | WxFCD | Value Of Atmospheric Pressure | valueOfAtmosphericPressure | VALPSR |
| 2.096 | WxFCD | Value Of Dew-Point Temperature | valueOfDewPointTemperature | VALTDT |
| 2.097 | WxFCD | Value Of Height Contour | valueOfHeightContour | VALHGT |
| 2.098 | WxFCD | Value Of Sea Surface Temperature | valueOfSeaSurfaceTemperature | VALSST |
| 2.099 | WxFCD | Value Of Wind Speed | valueOfWindSpeed | VALWND |
| 2.100 | WxFCD | Visibility Range | visibilityRange | VIZRNG |
| 2.101 | WxFCD | Warning End Time | warningEndTime | WRNEND |
| 2.102 | WxFCD | Warning Start Time | warningStartTime | WSTART |
| 2.103 | WxFCD | Watch/Warning | watchWarning | WATWAR |
| 2.104 | WxFCD | Wave Direction, Compass Point | waveDirectionCompassPoint | WADRCP |
| 2.105 | WxFCD | Wave Height | waveHeight | WAVHEI |
| 2.106 | WxFCD | Wave Height Change Time Interval | waveheightChangeTimeInterval | WAHETI |
| 2.107 | WxFCD | Wave Period Change Time Interval | wavePeriodChangeTimeInterval | WAPCTI |
| 2.108 | WxFCD | Weather Observation Source | weatherObservationSource | OBSRCE |
| 2.109 | WxFCD | Weather Watch/Warning Type | weatherWatchWarningType | WTCWRN |
| 2.110 | WxFCD | Wind Average Period | windAveragePeriod | WNDAVP |
| 2.111 | WxFCD | Wind Change Time Interval | windChangeTimeInterval | WNDTIM |
| 2.112 | WxFCD | Wind Direction, Compass Points | windDirectionCompassPoints | COMDIR |
| 2.113 | WxFCD | Wind Speed Range | windSpeedRange | WDSPRG |
| 2.114 | WxFCD | Wind Warning Probability | windWarningProbability | WDWAPD |
| 2.115 | WxFCD | Wind Warning Threshold | windWarningThreshold | WDWATD |
| 2.116 | WxFCD | Wind Wave Direction | windWaveDirection | WDWADR |
| 2.117 | WxFCD | Wind Wave Height | windWaveHeight | WWHGHT |
| 2.118 | WxFCD | Wind Wave Height Change | windWaveHeightChange | WWHGCG |
| 2.119 | WxFCD | Wind Wave Period | windWavePeriod | WIWAPE |
| 2.120 | WxFCD | Wind Wave Period Change | windWavePeriodChange | WWPDCG |

ANNEX C: Additional Attributes used in S-412 but defined in other IHO Domains

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reference Number** | **Register**  **Dictionary** | **Attribute Name** | **Camel Case** | **Acronym** |
| 3.001 | Hydro | Display Name | displayName |  |
| 3.002 | Hydro | Distance of Unit Measurement | distanceOfUnitMeasurement |  |
| 3.003 | Hydro | Feature Name | featureName |  |
| 3.004 | Hydro | File Reference | fileReference | TXTDSC |
| 3.005 | Hydro | Height/Length Units | heightLengthUnits | HUNITS |
| 3.006 | Hydro | Information | Information | INFORM |
| 3.007 | Hydro | Language | language |  |
| 3.008 | Hydro | Object Name | objectName | OBJNAM |
| 3.009 | Hydro | Scale maximum | scaleMaximum | SCAMAX |
| 3.010 | Hydro | Scale minimum | scaleMinimum | SCAMIN |
| 3.011 | Hydro | Status | status | STATUS |
| 3.012 | Hydro | Source Indication | sourceIndication |  |
| 3.013 | Hydro | Text | text |  |
| 3.014 | Hydro | Textual Description | textualDescription |  |
| 3.015 | Hydro | Vertical Datum | verticalDatum | VERDAT |

Annex D: S-412 Portrayals

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feature** | **Acronym** | **Attribute** | **Geometry** | **Complete Symbol** | **Significant Notes** |
| Centre of High | CENHIP |  | Point | CEHIPR |  |
| Centre of Low | CENLOW | CATLOW 1: Extra-Tropical Cyclone | Point |  | -Symbol will be used for all low pressure systems below 34 knots and all extra-tropical cyclones. |
| Centre of Low | CENLOW | CATLOW 2: Post-Tropical Cyclone | Point |  | -Symbol shall be used for post-tropical cyclones with wind speeds ≥ 34 knots. |
| Freezing Spray | FZSPRY | ICINT 1: Light Icing | Point |  |  |
| Freezing Spray | FZSPRY | ICINT 2: Moderate Icing | Point |  |  |
| Freezing Spray | FZSPRY | ICINT 3: Severe Icing | Point |  |  |
| Freezing Spray | FZSPRY | ICINT 4: Very Severe Icing | Point |  |  |
| Tropical Cyclone | TROCYC | WDSPRG 1:  34 knots – 63 knots | Point |  | -Symbol shall be used for named tropical cyclones until wind speed decreases below 34 knots or increases above 63 knots. |
| Tropical Cyclone | TROCYC | WDSPRG 2: ≥ 64 knots | Point |  | -Symbol shall be used for named tropical cyclones with wind speeds above 63 knots. |
| Primary Swell | PSWELL | WAVHEI  DEGWAV | Point | 2  2  2  2  2 | -WAVHEI determines colour and magnitude value  -DEGWAV determines direction  -User has option of displaying vector magnitude and direction separately or together |
| Secondary Swell | SSWELL | WAVHEI  DEGWAV | Point | 2  2 | -WAVHEI determines colour and magnitude value  -DEGWAV determines direction  -User has option of displaying vector magnitude and direction separately or together |
| Significant Wave | SIGWAV | WAVHEI  DEGWAV | Point | 2 | -WAVHEI determines colour and magnitude value  -DEGWAV determiens direction  -User has option of displaying vector magnitude and direction separately or together |
| Wind Wave | WINWAV | WAVHEI  DEGWAV | Point | 2 | -WAVHEI determines colour and magnitude value  -DEGWAV determiens direction  -User has option of displaying vector magnitude and direction separately or together |
| Atmospheric Pressure | AIRPSR | VALPSR | Curve |  |  |
| Convergent Boundaries | CONVBO | CATCON 1: Intertropical Convergence Zone | Curve |  |  |
| Convergent Boundaries | CONVBO | CATCON 2: Instability Line | Curve | O:\ECDIS_Project\WxO_Portrayal\ETMSS_PortrayalReview1\Simulated Symbology\Squall.png |  |
| Convergent Boundaries | CONVBO | CATCON 3: Trough | Curve | O:\ECDIS_Project\WxO_Portrayal\ETMSS_PortrayalReview1\Simulated Symbology\Trough.png |  |
| Convergent Boundaries | CONVBO | CATCON 5: Shear line | Curve |  |  |
| Convergent Boundaries | CONVBO | CATCON 6: Convergence line | Curve |  |  |
| Convergent Boundaries | CONVBO | CATCON 7: Monsoon trough | Curve |  |  |
| Convergent Boundaries | CONVBO | CATCON 8: Tropical wave | Curve |  |  |
| Freezing Spray | FZSPRY |  | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 1: Surface | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 1: Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 1: Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 2: Above surface | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 2: Above surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 1: Cold  FROLEV 2: Above surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 1: Surface | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 1: Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 1: Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 2: Above surface | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 2: Above Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 2: Warm  FROLEV 2: Above Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 1: Surface | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 2: Above Surface | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 1: Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 1: Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 2: Above Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 3: Occluded  FROLEV 2: Above Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 1: Surface | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 1: Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 1: Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 2: Above surface | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 2: Above Surface  FRODEV 1: Developing | Curve |  |  |
| Front | FRONTS | CATFRO 4: Quasi-stationary  FROLEV 2: Above Surface  FRODEV 2: Dissipating | Curve |  |  |
| Front | FRONTS | CATFRO 6: Dry line | Curve |  |  |
| Ridge | RIDGES |  | Curve |  |  |

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Input papers should be assigned to a work task as listed in the Committee work plan which is available in input papers. Leave open if uncertain but consider how the paper is to be processed if not relevant to a work task [↑](#footnote-ref-2)