

Surface Weather Observation XML (SWOB-XML)

-Client User Guide-

**June 5, 2023
Version 8.10**

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1. Document Information¹

1.1 History

| Author | Date | Ver. | Remarks |
|---------------------|----------------|------|---|
| Thinesh Sornalingam | June 7, 2012 | 1.0d | Initial draft |
| AbdulAziz Raouf | June 8, 2012 | 1.1d | Added in Section 4 Datasets |
| Thinesh Sornalingam | June 11, 2012 | 1.2d | Added units of measures and conversions |
| Dale Boudreau | June 13, 2012 | 1.3d | 1 st overall edit of whole document |
| Dale Boudreau | June 19, 2012 | 1.4d | 2 nd overall edit of whole document |
| Dale Boudreau | June 20, 2012 | 1.5d | Changed max_vis to vis for RA XML sample and mapping table |
| Dale Boudreau | June 21, 2012 | 1.6d | Minor tweaks to data set mapping tables. Dropped vis_code and horizontal_visibility code table |
| Dale Boudreau | June 25, 2012 | 1.7d | NC-AWOS: cld_cvr_# becomes sum_cld_cvr_#, added 'sum' to Appendix 6.2 |
| Dale Boudreau | June 26, 2012 | 1.8d | Updated RA XML example (Sect. 4.3) |
| Dale Boudreau | June 28, 2012 | 1.9d | Changed references to External XML and E-ML to "SWOB-XML" or "SWOB". Added details (table) on incoming code source meanings in section 3.2.3. |
| Abdulaziz Raouf | June 29, 2012 | 1.9d | Updated NCHWOS dataset table to include full list of elements present section 5.5 |
| Dale Boudreau | July 9, 2012 | 2.0d | Changed rpt_typ to stn_typ for NC-AWOS (code table 002196). |
| Dale Boudreau | July 10, 2012 | 2.1d | Added clg_hgt to WinIDE and RA mapping tables. |
| Dale Boudreau | July 24, 2012 | 2.2d | Edited XML structure example. New RA sample. Section 4.2 part D added info in "MSNG". Changed avg_vis_mt50-60 to just vis for NC-AWOS. |
| Dale Boudreau | July 27, 2012 | 2.3d | Removed ceiling height (clg_hgt) from RA dataset |
| Dale Boudreau | July 30, 2012 | 2.4d | For NC-HWOS dataset, added prsnt_wx_# and changed cld_amt_code to cld_amt_code_#. Also did global search from std_code_source and replaced with std_code_src. |
| Tahreem Ali | July 30, 2012 | 2.5d | Removed indexed temperatures for CA (air_temp_#, min_air_temp_pst1hr_#, max_air_temp_pst1hr_#) and duplicate row for pcpn_amt_pst1hr |
| Abdulaziz Raouf | July 30, 2012 | 2.6d | Changed label name and description for NCAWOS element wnd_dir_10m_mt50-60_max_spd to wnd_dir_10m_pst1hr_max_spd |
| Dale Boudreau | August 9, 2012 | 2.7d | Added std code 88 to report_type code table (from |

¹ For more details on additions and changes to the actual SWOB-ML product, please refer to the Release Notes cited in Section 1.3

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| | | | incoming of 126 from BUFR58 descriptor 001196). Added icao_stn_id to WinIDE and RA. |
| Dale Boudreau | August 29, 2012 | 2.8d | Added word “snow” to descriptions of codes 83, 84 for present_weather code table. |
| Dale Boudreau | August 31, 2012 | 3.0 | Final Version |
| Dale Boudreau | October 25, 2012 | 3.2 | Updated description for codes 46, 47 in table total_cloud_amount |
| Dale Boudreau | December 21, 2012 | 4.0 | <p>Multiple changes made for the DMS 2.3.12.1 release deployed on Data Depot January 15, 2013. Changes are as follows (see Release Notes for more detail):</p> <p><u>WinIDE</u></p> <ul style="list-style-type: none"> tot_cld_amt – changed units from 1/10 to % tot_cld_opcty – changed units from 1/10 to % <p><u>CA</u></p> <p>Added the following elements:</p> <ul style="list-style-type: none"> avg_cum_pcpn_gag_wt_fltrd_55-60 snow_dpth_# logr_panl_temp max_batry_volt_pst1hr min_batry_volt_pst1hr hdr_fwd_pwr hdr_refltd_pwr hdr_suply_volt hdr_oscil_drft |
| Dale Boudreau | February 14, 2013 | 5.0 | <p>Multiple changes made for the DMS 2.4.0 release deployed on Data Depot early March, 2013. Changes are as follows (see Release Notes for more detail):</p> <p><u>RA</u></p> <p>Element cld_amt_code_# wasn’t being reported for clear sky because of a change to the decoded code value from ‘CLR BLO 100’ to ‘CLR BLO’. The code substitution XML was updated to accommodate this code change and resolve this issue.</p> <p>Added the following elements:</p> <ul style="list-style-type: none"> max_air_temp_pst6hrs min_air_temp_pst6hrs max_air_temp_pst24hrs min_air_temp_pst24hrs <p><u>CA</u></p> <p>Added the following elements:</p> <ul style="list-style-type: none"> pcpn_amt_pst3hrs pcpn_amt_pst6hrs pcpn_amt_pst24hrs max_air_temp_pst6hrs min_air_temp_pst6hrs max_air_temp_pst24hrs min_air_temp_pst24hrs <p>‘air_temp_#’ added User Guide table 5.7 as well as an explanation of how it may appear</p> <p>‘snw_dpth_#’ added User Guide table 5.7 as well as an explanation of how it may appear</p> <p><u>NC-AWOS</u></p> <p>Added element cld_amt_code_#</p> |

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| | | | <p>Fixed label name for the following elements by appending an 's' at the end (i.e. hr to hrs):</p> <ul style="list-style-type: none"> pcpn_amt_pst3hr pcpn_amt_pst6hr pcpn_amt_pst24hr max_air_temp_pst6hr min_air_temp_pst6hr max_air_temp_pst24hr min_air_temp_pst24hr <p>Changed 'wmo_id' to 'wmo_synop_id', and changed 'max_10m_wnd_gst_spd_mt50-60' to 'max_wnd_gst_spd_10m_mt50-60'</p> <p><u>NC-HWOS</u></p> <p>Added elements:</p> <ul style="list-style-type: none"> cor pcpn_amt_pst6hrs <p><u>WinIDE</u></p> <p>Changed 'wmo_id' to 'wmo_synop_id'</p> |
| Dale Boudreau | February 28, 2013 | 5.1 | Modified code descriptions for obscuring_phenomena (table 6.5.2) codes 28 and 34 to deal with specific meanings for NC-HWOS. |
| Dale Boudreau | March 18, 2013 | 5.2 | DMS Release 2.4.1: Added the new element max_vis_pst1hr to CA dataset. More modifications to code descriptions for obscuring_phenomena (table 6.5.2) codes 5, 15, 29, and 46 to deal with specific meanings for NC-HWOS. |
| Dale Boudreau | May 7, 2013 | 5.3 | DMS Release 2.4.2: Added cld_amt_code_# to the NC-AWOS table (Sect. 5.6) |
| Dale Boudreau | July 15, 2013 | 6.0 | <p>DMS Release 2.4.2: Added NC-AWOS to "station_type" code table (6.5.8) as code 12, and added codes 17, 18. Removed "product_status" code table from the appendix as it was not referenced by any SWOB elements in any of the networks. New codes (86-98) added to bottom of "report_type" code table (6.5.6). Updated code descriptions in tables 6.5.7, 6.5.8, and 6.5.10. Element additions/modifications to the various networks:</p> <p><u>WinIDE</u></p> <p>Added the following element:</p> <ul style="list-style-type: none"> clg_hgt <p><u>NC-HWOS</u></p> <p>Added 3 additional identification elements:</p> <ul style="list-style-type: none"> clim_id msc_id rtp_typ <p>Learned that the following elements have an incorrect label since they should be for a 24 hour period. Therefore changed the labels of the following elements to reflect that this is a 24 hour peak wind speed, not a 1-hour peak as the SWOB label originally indicated:</p> <p>Changed</p> <ul style="list-style-type: none"> max_pk_wnd_spd_10m_pst1hr to max_pk_wnd_spd_10m_pst24hrs wnd_dir_10m_pst1hr_pk_spd to |

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| | | | <p>wnd_dir_10m_pst24hrs_pk_spd</p> <p><u>NC-AWOS</u></p> <p>Added the following identification element:</p> <ul style="list-style-type: none"> • rtp_typ <p><u>CA</u></p> <p>Removed duplicated element rows from Table 5.7. Added the following element:</p> <ul style="list-style-type: none"> • avg_wnd_spd_pcpn_gag_mt58-60 |
| Dale Boudreau | August 13, 2014 | 6.1 | <p><u>CA</u></p> <p>Added additional elements:</p> <ul style="list-style-type: none"> • avg_globl_solr_radn_pst1hr • tot_globl_solr_radn_pst1hr • avg_wnd_spd_pcpn_gag_mt50-60 • data_avail (future release) <p>Removed the following element:</p> <ul style="list-style-type: none"> • stn_id (last 4 digits of wmo_synop_id) • avg_wnd_spd_pcpn_gag_mt58-60 <p><u>NC-AWOS</u></p> <p>Added element stn_elev</p> <p>Removed the following elements (always missing):</p> <ul style="list-style-type: none"> • pcpn_amt_pst3hrs • pcpn_amt_pst24hrs <p><u>GENERAL</u></p> <ul style="list-style-type: none"> • Removed duplicate element rows from Table 5.7 • Added code table for wind_gust_squall_indicator • Changed descriptions for codes 13, 10 in station_type code table |
| Tahreem Ali / Dale Boudreau | March 24, 2014 | 7.0 | <p><u>Added the following new datasets:</u></p> <ul style="list-style-type: none"> • PanAM – MSC & Partner (CA messages) • PanAM – MSC & Partner (Compact messages) • PanAM – MSC & Partner (ATMOS messages) <p><u>Updated the following code tables:</u></p> <ul style="list-style-type: none"> • station_type • report_type • present_weather <p><u>Added the following code table:</u></p> <ul style="list-style-type: none"> • buoy_type <p><u>Reflected data changes:</u></p> <ul style="list-style-type: none"> • removed T-12 from SWOBs • removed pcpn_amt_pst3hrs and pcpn_amt_pst24hrs from NC-AWOS SWOBs (not observed) • Changed precision of Pressure elements to 1 decimal place • Changed precision of snow depth elements to 0 decimal places • Changed precision of all temperature elements to 1 decimal place • Changed precision of relative humidity to 0 decimal places • Changed precision of all precipitation/rainfall elements to 1 decimal place <p><u>Many editorial changes:</u></p> <ul style="list-style-type: none"> • Many minor editorial changes • Added text to sections 2.1, 2.3, 4.4, 5.1, 5.2.1, |

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| | | | <ul style="list-style-type: none"> Added new sections: 5.2.3, 5.2.4, Modified Qa flag descriptions in section 4.5 Added new data set descriptions and element tables (sections 5.9 – 5.22 Added additional glossary items Added additional short label descriptions Added additional units and conversions |
| Dale Boudreau | September 15, 2015 | 7.1 | Added new units to section 6.3 |
| Tahreem Ali | August 11, 2016 | 7.1 | <p><u>Added the following new datasets:</u></p> <ul style="list-style-type: none"> DND AWOS DND HWOS <p><u>Updated short labels for the following datasets:</u></p> <ul style="list-style-type: none"> CA <p>Removed PanAm datasets except for CA-Compact</p> <p>Updated taxonomy sections to account for new datasets (DND)</p> <p>Updated Qa section to remove the qa summary = 20 rule</p> <p>Updated CA table to account for new labels (pstXmts)</p> <p>Added section on multiple sensors (Multiplicities)</p> |
| Tahreem Ali | July 27, 2018 | 8.0 | <p>Updated all section with Generic SWOB taxonomies, output, rules</p> <p>Updated Sample SWOB section with new example</p> <p>Added generic swob labels to remaining datasets (NavCan, RA, WinIDE, CA Minutely)</p> |
| Tahreem Ali | November 6, 2018 | 8.1 | <p>Update document to include new dataset: OPP Marine Buoy</p> <p>Added section on data_flag</p> <p>Updated code tables: total_cloud_amount, report_type, buoy_type</p> <p>Updated units: 0.01in</p> <p>Updated WinIDE dataset (Section 5.3) with new elements:</p> <p>max_pk_wnd_spd_10m_pst24hrs,</p> <p>wnd_dir_10m_pst24hrs_pk_spd,</p> <p>max_pk_wnd_tm_pst24hrs, snw_dpth, pcpn_amt_pst6hrs,</p> <p>pcpn_amt_pst24hrs, avg_wnd_dir_10m_pst10mts,</p> <p>avg_wnd_spd_10m_pst10mts</p> |
| Tahreem Ali | February 8, 2019 | 8.2 | <p>Added BC datasets:</p> <ul style="list-style-type: none"> BC Forestry BC Tran BC SnowWx BC AQMet <p>Added code table:</p> <ul style="list-style-type: none"> precipitation_measurement_method |
| Justine Pang / Dale Boudreau | October 9, 2019 | 8.3 | <p>Added the following new datasets:</p> <ul style="list-style-type: none"> YTG <p>Updated OPP Buoy dataset with new elements</p> <ul style="list-style-type: none"> wmo_identifier_extended sensor_table_number <p>Added new glossary term – CMML</p> <p>Updated code tables:</p> <ul style="list-style-type: none"> data_flags obscuring_phenomena present_weather |

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| | | | <ul style="list-style-type: none"> report_type |
| Justine Pang | March 4, 2020 | 8.4 | Added new dataset: NT Forestry Added new code value “ODAS Viking” to buoy_type code table |
| Justine Pang | June 1, 2021 | 8.5 | Updated Section 4.2 and 4.6 Added the following elements: <ul style="list-style-type: none"> NC HWOS – max_pk_wnd_tm_pst24hrs, max_pk_wnd_typ_pst24hrs NC AWOS – max_pk_wnd_tm_pst24hrs, max_pk_wnd_typ_pst24hrs BC FLNR WMB – dwpt_temp BC Env SnowWx – batry_crnt, solr_panl_crnt BC Env AQMet - wnd_snsr_vert_disp BC Tran – wnd_snsr_vert_disp YTG – dwpt_temp, rnfl_amt_pst30mts, cum_pcpn_amt, snw_dpth_qlty, snsr_stat NT Forestry – rnfl_amt_pst3hrs, rnfl_amt_pst6hrs, rnfl_amt_pst12hrs, rnfl_amt_pst24hrs, pres_tend_amt_pst3hrs, pres_tend_char_pst3hrs, avg_mslp_pst1hr Removed the following elements: <ul style="list-style-type: none"> NT Forestry – snw_dpth, and ALL avg_subsfrc_temp elements Added the following new datasets: <ul style="list-style-type: none"> WBS Moored Buoy CCG Lighthouse NT Water DFO ODAS Buoy SK Forestry Added the following units: <ul style="list-style-type: none"> ‰ μmol/m²s kg/m³ Added the following code tables: <ul style="list-style-type: none"> direction state_of_sea swell_height transient_phenomenon Updated the following code tables: <ul style="list-style-type: none"> data_flags precipitation_measurement_method tendency_characteristic total_cloud_amount |
| Justine Pang | October 11, 2021 | 8.6 | Updated Section 6.19 with new abbreviations Added the following new datasets: <ul style="list-style-type: none"> YT-DE-WRB NL-DECC-WRMD |
| Justine Pang | March 11, 2022 | 8.7 | Added “cum_pcpn_gag_wt” to BC Forestry Updated unit from mm to kg/m ² for “avg_cum_pcpn_gag_wt_pst1min” in BC AQMet Updated Section 5.19 with WM500 Added the following new datasets: <ul style="list-style-type: none"> ON-TRCA |

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| | | | <ul style="list-style-type: none"> • ONGRCA • ON-MNRF • MTO • PoM • ON Forestry • YT Forestry • YT Avalanche <p>Updated Section 6.19 with new abbreviations and removed non-abbreviations Updated the “data_flags” code table Added Section 6.6 Reference Tables</p> |
| Justine Pang | June 22, 2022 | 8.8 | Removed “Transport Canada” from heading in Section 5.29 |
| Justine Pang | November 30, 2022 | 8.9 | <p>Removed YT_Gov from Section 5 (removed from feed on March 31st 2022)</p> <p>Added the following new datasets:</p> <ul style="list-style-type: none"> • NB Forestry • ON TRCA (Updated version of existing dataset) • BC RioTinto • BC CRD • PC Forestry <p>Updated Section 6.19 with new abbreviations</p> |
| Justine Pang | June 5, 2023 | 8.10 | Added new dataset – NS Forestry |

1.2 Filename & Location

Approved (public) Version:

https://dd.weather.gc.ca/observations/doc/SWOB-ML_Product_User_Guide_v8.9_e.pdf

1.3 Referenced Documents

| Document | Author | Version |
|--|---|---------|
| DMF External Met-ML Specification http://ecollab.ncr.int.ec.gc.ca/org/1275692/wem/MS_lib/DMFExternalMet-MLspecification.doc | Dale Boudreau, Thinesh Sornalingam, Abdulaziz Raouf | 1.1 |

2. Introduction

2.1 Overview

The creation of a product for surface weather observations has been undertaken by the Data Management Initiative (DMI) project to provide the Metrological Service of Canada (MSC) and external clients with a concise, user-friendly, easy to read product containing typical hourly surface weather data from MSC and partner atmospheric monitoring networks.

These products will be generated by applications within the Data Management System (DMS). The DMS is collection of a real-time data acquisition, decoding, standardization, quality assessment (Qa) and product generation components for observation, forecast, and warning data. It is to become MSC's primary disseminator of meteorological data to internal and external clients.

There are multiple phases or processing stages within DMS that incoming raw data passes through. Each phase has an associated XML output. In the raw phase, the incoming messages are in their original form (e.g. ASCII, BUFR, etc.). Then they are converted into a “parsed” product (typically an XML). In the parsed phase, the data has not yet been standardized or fully “decoded”. The parsed phase prepares the data to be decoded. The parsed phase is optional in the sense that not all data must pass through it. In some cases, the data proceeds straight to the decode phase from the raw phase. In the decode phase, the data is standardized (i.e. mapped to a standard classification, element definition, and name). The data emerges as a decoded XML product following the completion of its passage through the decode phase. The decoded XML is a standards-based format, which is then put through any number of enhanced, quality assessment and/or product generation (PG) phases to add further value and meet client requirements. The Surface Weather Observation XML product (SWOB-XML) is the result of the PG phase. The SWOB-XML is in a basic XML format patterned after the DMS internal Met-ML format. The SWOB-XML will be referred to by the condensed acronym ‘SWOB’ hereafter in this document. The diagram at the end of section 2.1 captures this flow for selected networks.

As opposed to the more comprehensive DMS decoded Met-ML products, the SWOB is a simplified XML product that focuses on core elemental data without the clutter and complexity of auxiliary content such as non-critical metadata, and detailed Qa results. To the extent possible, this information has been captured in a short element label and an optional qualifier to indicate a summary of any Qa.

Although the SWOB XML is intended for machine-to machine data transmission, the format and clarity of this self-descriptive format is easily human-readable without any specific training or knowledge of markup languages. However, for clients needing to interact with and display data over long intervals or comparing observations from multiple stations geospatially, the use tools such as XML parsers, graphical displays and GIS is advisable.

There are many different streams of the SWOB product, each containing data from the following networks (a short reference name is to the right of the arrow):

1. Legacy MSC & Partner Manned aviation weather stations using the WinIDE or MIDS interface → **WinIDE**
2. DND HWOS → **DND HWOS**
3. Legacy MSC & Partner AWOS aviation weather stations → **RA**
4. DND AWOS → **DND AWOS**
5. Nav Canada HWOS aviation weather stations → **NC-HWOS**

6. Nav Canada AWOS aviation weather stations → **NC-AWOS**
7. MSC & Partner public surface weather stations using Campbell Scientific data loggers → **CA**
 - 7.1. Minutely data sets supporting the **PanAm Games**:
 - MSC Compact stations → **COMPACT-minutely**
8. OPP Moored buoy weather stations → **OPP**
9. BC Ministry of Transportation weather stations → **BC-TRAN**
10. British Columbia Wildfire Management Branch (i.e. BC Forestry) weather stations → **BC-FLNR-WMB**
11. BC Ministry of Environment Air Quality Meteorological weather stations → **BC-ENV-AQMet**
12. BC Ministry of Environment Snow weather stations → **BC-ENV-SnowWx**
13. NT Department of Environment and Natural Resources → **NT Forestry**
14. NT Water Resources Division → **NT Water**
15. Meteorological Service of Canada Moored Buoy → **MSC Moored Buoy**
16. Canadian Coast Guard Lighthouses → **CCG Lighthouses**
17. DFO Ocean Data Acquisition System Buoy → **DFO ODAS Buoy**
18. Saskatchewan Wildfire Management Branch Public Safety Agency → **SK Forestry**
19. YT Department of Environment Water Resources Branch → **YT-DE-WRB**
20. NL Department of Environment and Climate Change Water Resources Management Division → **NL-DECC-WRMD**
21. Toronto and Region Conservation Authority → **ON-TRCA**
22. Grand River Conservation Authority → **ON-GRCA**
23. Ministry of Natural Resources and Forestry → **ON-MNRF**
24. Ministry of Transportation Ontario → **MTO**
25. Transport Canada Port of Montreal → **PoM**
26. ON Ministry of Northern Development, Mines, Natural Resources and Forestry, Aviation, Forest Fire and Emergency Services Branch → **ON Forestry**
27. YT Wildland Fire Management → **YT Forestry**
28. Avalanche Canada and Yukon Avalanche Association → **YT Avalanche**
29. Government of New Brunswick: Department of Natural Resources and Energy Development → **NB Forestry**
30. BC Rio Tinto Inc. → **BC Rio Tinto**
31. BC Capital Regional District → **BC-CRD**
32. Parks Canada Natural Resource Management Branch → **PC Forestry**
33. Nova Scotia Department of Lands and Forestry → **NS Forestry**

Each dataset product can be uniquely identified via its URI (will be discussed in more detail in Section 4.4).

During the production of a SWOB, the following tasks are carried out:

- Incoming DMS element packages are assigned an abbreviated label
- Unit conversion from incoming units to standard units, and if necessary, rounded to a given precision to trim insignificant digits resulting from some unit conversions.
- If the incoming element is a numeric code or a text value from a list of controlled vocabulary (so in effect a code), then code substitution is performed to map to a DMS standard code.

- An optional quality assessment (Qa) summary flag (using incoming ‘native’ and DMS quality assessments whenever available) may be attached to applicable elements.

2.2 Purpose and Scope

One of the main purposes of the SWOB-XML is to offer a replacement for much of the content traditionally found in the legacy SA (surface analysis) product still being used within MSC, although officially it was to have been retired years ago. Although the SWOB will not capture all of the SA’s content, it will include the most sought-after hourly surface weather observation elements and any elements pertaining to longer time frames. Some of the more subtle and obscure elements contained in the SA will be excluded from the initial offering of the SWOB. Clients requiring specific aviation, synoptic, or marine data may be better served acquiring the METAR or SYNOP products. Meanwhile, additional elements not present in SA will also be available in the SWOB.

As mentioned above, there are many streams of the SWOB product, each pertaining to a specific network. Each product will be accessible via its own URI within the DMS, or possibly a file system containing the XML files referenced using a filename (e.g. CMC’s DataDepot).

The observation elements included in the majority of SWOBs are from these basic observation groups, although some data sets have other groups such as radiation, wave, etc.:

- present weather
- sky condition
- visibility
- pressure
- wind
- temperature
- humidity
- precipitation

The format of this product is XML. It will be generated operationally by MSC's Data Management System (DMS) at CMC in Montreal. It will be produced in real-time from the incoming raw data of each dataset. It will be encoded in a standards based XML, which conforms to global meteorological observation conventions (discussed in detail in Section 4).

In addition to the elemental data from the groups indicated above, the SWOB may also contain optional quality assessment (Qa) information in the form of a summary quality flag attached to each element, whenever available. This flag's value is computed by considering any incoming Qa performed on the element at the source (so-called “Native QC”), any Qa conducted in-house by the DMS, or a combination of the two. The absence of a Qa summary flag on an element in the SWOB indicates the quality is unknown.

The SWOB is a very condensed and convenient product of hourly observational data, as opposed to the fuller and more comprehensive decoded XMLs being generated by DMS for the listed datasets.

Those clients requiring full element definitions, full quality assessments, etc., should gain access to the DMS decoded, or decoded_enhanced, products of each dataset.

2.3 Intended Audience

Any clients interested in hourly surface weather data will find the SWOB product attractive due to its content, simplicity and compactness. Most clients currently using the legacy SA format should also find this product a suitable replacement given it has the majority of the elements in a clear format and may have additional content which could never be encoded using the SA format. Clients who would like quick and easy access to MSC data from the DMS, will also generally benefit from the SWOB-XML product, especially given that data viewing and access tools are under development in the DMS.

This version of the User Guide is intended for **internal users** within Environment and Climate Change Canada, as some data sets described herein are not available on the publicly accessible CMC DD (DataDepot) site, but rather only on the DDi (internal). The non-public SWOBs are either third party data sets that have as part of their data sharing agreements restrictions on data usage or distribution, or are Beta data sets that have not completed user acceptance testing.

3. Data Standardization

3.1 *Standardization of incoming data by the DMS*

The DMS decodes and processes data from many networks. The same element may have a variety of different names across the input data sets. For example, air temperature may be called dry-bulb temperature, temperature, temp, ambient temperature, etc. The DMS standardizes elements names so they may be more easily inter-compared, quality assessed, and extracted. Furthermore, the elements may have optional qualifiers assigned to them to convey important metadata. Below is an example of how a particular wind speed from MSC networks is elementalized by the DMS and stored in XML format:

```
- <element group="wind" name="wind_speed" orig-name="011012" uom="m/s" value="0.0">
  <qualifier group="element" name="statistical_significance" uom="unitless" value="average" />
  <qualifier group="element" name="time_displacement" uom="min" value="-2" />
  <qualifier group="element" name="time_duration" uom="min" value="2" />
  <qualifier group="element" name="vertical_displacement" uom="m" value="10" />
</element>
```

The above “standard element package” would be applied consistently across the networks and look as the example above for cases where the incoming element is an average wind speed over the last 2 minutes of the hour and a height of 10 metres.

To avoid conversion and rounding errors, all incoming codes and units are left as-is. Such operations are typically reserved for product generators, datamarts or display tools, just as the data leaves the DMS for client use.

3.2 *Standardization for the SWOB*

The SWOB product generator needs to ingest data from many networks to make one product where the element names, units and code tables are consistent. To make the SWOB as concise as possible and remove any remaining element description variations in the DMS decoded output, a “short label” was devised to encapsulate all the critical element-defining metadata into one phrase. Furthermore, all the various unit and code variations for identical elements across the networks were handled by converting to DMS “standard units” and “standard codes”.

3.2.1 Element Short Labels:

Critical element-defining metadata such as data type, element name, statistical significance, time period displacement, time period duration, height/depth, index, etc., have been used to devise a “short label” for each DMS element package. For example, the element package shown in Section 3.1 would have the short label of “avg_wnd_spd_10m_pst2mts”. For the element name portion of the short label, the name as it appears in the original DMS decoded element has been abbreviated using the abbreviation glossary in Appendix 6.2. The length of these labels has been kept to a minimum and special characters and spaces have been avoided so that the labels may also be used as column names in database tables and meet the most stringent of requirements.

3.2.2 Units:

All element packages have a standard element assigned by the DMS based on the data class (e.g. velocity, temperature, azimuth, pressure, etc.), although some variations exist for certain elements within a class. For example, most pressure-related elements will have a DMS standard unit of hPa, but in the case of altimeter, the standard unit is inHg since it is used by a specific client community and in practically all cases measured and used in that unit. Examples of typical standard units for some classes are:

- precipitation amount = mm
- wind speed = km/h
- pressure = hPa
- visibility = km
- height = m
- temperature = °C

The conversion to DMS standard units is only done at the last possible moment, typically when data leaves the DMS via product generators, like the one that creates the SWOB, or during the population of custom datamarts and display tools where client requirements need to be satisfied. The DMS standard units will meet the majority of client needs, but inevitably some clients will have different preferences and will need to do some conversions. To assist in this, Appendix 6.4 has a list of unit conversions so clients can see what was used to convert incoming units to DMS standard units for a given element, or to apply client-side conversions. The data set tables in Section 5 show the incoming uom (unit of measure) and the standard units they were converted to. As well, the rounding precision is given where the value represents the number of digits after the decimal (e.g. 2 would represent 0.01). A value of 0 represents integer values. The intent is to remove insignificant digits as a result of a unit conversion. To avoid giving the appearance of extra precision that was not intended, the following rules were applied:

- In the element mappings the following convention is used to represent precision:
 - 0 = whole number
 - 1 = one decimal digit = 0.1
 - 2 = two decimal digits = 0.01
 - 3 = three decimal digit = 0.001
 - ...
- Mathematical rounding precision only applies to numerical values and for elements a precision is indicated in the Precision column (see Section 5). For instance if the decoded value = 5.67 and the Rounding Precision is 1, then the SWOB value = 5.7. If on the other hand the decoded value has a lower precision than what is specified for that element in the mappings, then preserve the decoded value as-is. For example, if a decoded value or unit conversion = 5, Precision = 1 (i.e. 0.1), then SWOB value = 5.

The following page has some examples of rounding to a specified precision:

| Decoded Value | Rounding Precision | External Element Value |
|---------------|---------------------------------|---|
| 12.3 | 0 (to the nearest whole number) | 12 |
| 23.3 | 2 (two decimal digits) | 23.3 (decoded value precision is less than requested precision, so preserve decoded value as-is) |
| 45.1234666666 | 6 (six decimal digits) | 45.123467 |
| 23.549 | 1 (one decimal digit) | 23.5 (given the requested precision is 1 decimal digit, one needs to look at the digit immediately following it for rounding (4). As a general rule: if precision = x, then always look at $x * 10^{-1}$ to carry out rounding) |
| 17.6 | 0 | 18 |

3.2.3 Codes:

As with units, the incoming code values are preserved as-is after DMS decoding, with the code table source and type (i.e. name) cited. Prior to the creation of the SWOB, incoming code tables are left in their original form. The source of these tables can be any of the following:

| Incoming code-src | Description | Documentation Source | Sample code-source and code-type |
|-------------------|--|--|---|
| wmo_buf | A WMO code table for data encoded in BUFR format | WMO Pub. No. 306 -- Manual on Codes Part B – Binary Codes: http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_v12/Volumel.2.html | wmo_buf 020003 |
| local_buf | A local Canadian code table for MSC data encoded in BUFR format. Defined by CMC | CMC: ftp://depot.cmc.ec.gc.ca/ftp/cmci/bufr/english/tabloc_bufr_e | local_buf 020197 |
| wmo_tac | A WMO code table for data encoded in Traditional Alphanumeric Code forms (TAC) such as SYNOP | WMO Pub. No. 306 -- Manual on Codes Part A – Alphanumeric Codes http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_v11/Volumel.1.html | wmo_tac 000500 |
| local_tac | A local code table defined by the DMS for incoming data encoded in Traditional Alphanumeric Code forms (TAC) | DMS code tables and encode/decode specification documents | local_tac 008197 |
| Various sources | A local code table defined by the DMS for incoming data encoded in ASCII formats. The code source may be the name of the network, product, message, etc. | DMS code tables and encode/decode specification documents | ra present_weather rwin essPrecipSituation metar visibility |

However, a “standard” code table is also associated with each of these incoming code tables for a given element. The master list of code tables that the DMS maintains has cross referenced similar code tables for a given entity to a DMS standard table, which is in effect a superset of all the similar code tables for that entity. This allows for products or clients to use one standard code value for an element to map to their preferred codes, expressions or interpretation rather than having to map too many different tables for a given element across multiple networks. For example, present weather is reported by many networks, but most use different code tables or even text strings (note, in the DMS text strings that are controlled vocabulary are also treated as if they were codes).

Example 1. Present weather arriving to the DMS in different code tables for each network is mapped to a code value in a single DMS standard code table. Below are *some* examples:

| Network | Observation | Incoming code-src | Incoming code-type | Incoming value | SWOB code-src | SWOB code-type | Std code value |
|---------|--|-------------------|--------------------|----------------|---------------|-----------------|----------------|
| WinIDE | Manned Observation: Light rain (not freezing, continuous) | local_buf | 020210 | 11 | std_code_src | present_weather | 65 |
| NC-HWOS | Manned Observation: Light rain (not freezing, continuous) | wmo_buf | 020019 | -RA | std_code_src | present_weather | 65 |
| RA | Automated Station Observation: Light rain | ra | present_weather | R- | std_code_src | present_weather | 364 |
| RWIN | Automated Station Observation: Light rain | rwin | WMO4680 | 61 | std_code_src | present_weather | 364 |

Example 2. Cloud type and obscuring phenomena arriving to the DMS in a different code tables for each network is mapped to a code value in a single DMS standard code table. Below are *some* examples:

| Network | Observation | Incoming code-src | Incoming code-type | Incoming value | SWOB code-src | SWOB code-type | Std code value |
|-------------------------|-------------|-------------------|--------------------|----------------|---------------|---------------------|----------------|
| WinIDE | AltoCumulus | local_buf | 020197 | 0 | std_code_src | obscuring_phenomena | 0 |
| NC-HWOS | AltoCumulus | wmo_buf | 020012 | 3 | std_code_src | obscuring_phenomena | 0 |
| ASCII SYNOP FM-12 | AltoCumulus | wmo_tac | 000500 | 3 | std_code_src | obscuring_phenomena | 0 |

To see the meaning of the standard code table values for coded SWOB elements, please refer to Appendix 6.5. With this information clients can map the SWOB standard code values to their preferred expression or code using a single mapping table, rather than one for each network.

4. SWOB-XML Format and Structure

4.1 Overview

As with all DMS decoded XML products, the SWOB conforms to global standards such as OGC's Observation and Measurement schema and GML. Being compliant with such standards enhances the interoperability of the format and also offers a common look and feel among similar products.

The two standards employed in the SWOB are the following:

Open Geospatial Consortium's Observations and Measurements Encoding Standard (O&M) defines an abstract model and an XML schema encoding for observations and it provides support for common sampling strategies. O&M also provides a general framework for systems that deal in technical measurements in science and engineering. This is one of the OGC Sensor Web Enablement (SWE) suite of standards.

Additional information of O&M can be obtained from here:

<http://www.opengeospatial.org/standards/om>

Open Geospatial Consortium's Geography Markup Language Encoding Standard (GML) The Geography Markup Language (GML) is an XML grammar for expressing geographical features. GML serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet. As with most XML based grammars, there are two parts to the grammar – the schema that describes the document and the instance document that contains the actual data.

A GML document is described using a GML Schema. This allows users and developers to describe generic geographic data sets that contain points, lines and polygons.

Additional information of GML can be obtained from here:

<http://www.opengeospatial.org/standards/gml>

4.2 Structural Organization of SWOB

```

<om:ObservationCollection>
  <om:member>
    <om:Observation>
      <om:metadata>
        <set>

```

```

    <general>
      <author/>
      <dataset/>
      <phase/>
      <id/>
      <parent />
    </general>

```

A

```

    <identification-elements>
      <element name=" " uom=" " value=" "/>*
      <element name=" " uom="code" code-src=" " code-type=" " value=" "/>*
    </identification-elements>

```

B

```

    </set>
  </om:metadata>

```

```

    <om:samplingTime>
      </gml:TimeInstant>
    </om:samplingTime>
    <om:resultTime>
      </gml:TimeInstant>
    </om:resultTime>
    <om:procedure>
    <om:observedProperty>
    <om:featureOfInterest>
      </gml:FeatureCollection>
    </om:featureOfInterest>

```

C

```

    <om:result>
      <elements>
        <orig-header/>
        <orig-msg/>
        <element name=" " uom=" " value=" "/>*
        <element name=" " uom=" " value=" ">
          <qualifier name="qa_summary" uom="unitless" value=" "/>
        </element>*
        <element name=" " uom=" " value=" ">
          <qualifier name="data_flag" value=" " uom="code" code-
            type="data_flags" code-src="std_code_src"/>
        </element>*
        <element name=" " uom=" " value=" ">
          <qualifier name="qa_summary" uom="unitless" value=" "/>
          <qualifier name="data_flag" value=" " uom="code" code-
            type="data_flags" code-src="std_code_src"/>
        </element>*
        <element name=" " uom="code" code-src=" " code-type=" " value=" "/>*
        <element name=" " uom="code" code-src=" " code-type=" " value=" "/>
          <qualifier name="qa_summary" uom="unitless" value=" "/>
        </element>*
      </elements>
    </om:result>

```

D

```

        <element name=" " uom="code" code-src=" " code-type=" " value=" "/>
            <qualifier name="data_flag" value=" " uom="code" code-
            type="data_flags" code-src="std_code_src"/>
        </element>*
        <element name=" " uom="code" code-src=" " code-type=" " value=" "/>
            <qualifier name="qa_summary" uom="unitless" value=" "/>
            <qualifier name="data_flag" value=" " uom="code" code-
            type="data_flags" code-src="std_code_src"/>
        </element>*
    </elements>
</om:result>
</om:Observation>
</om:member>
</om:ObservationCollection>

```

***Note:** Zero to many lines in this format can be present. The data flag qualifier is also optional, but if present only one data flag will be assigned to each element (with one or more values comma separated)

Section A:

This section provides metadata around the DMS component that produces this XML.

- <author> is the component's name
- <dataset> contains the full taxonomy of this dataset (discussed below in detail)
- <phase> the DMS phase at which point this XML was generated
- <id> is the full URI (uniform resource indicator) of this instance of the XML
- <parent> is the full URI of the input file that led to the generation of this XML instance. In the case of a product generator, which produces the SWOB, the input is either the decoded or decoded_enhanced XML.

Section B:

This section of the SWOB contains metadata elements about the observation. For instance, one could find the time of observation, the reporting station identifier (e.g. MSC ID, ICAO ID, WMO Synoptic ID, etc.), the station's latitude, longitude and elevation, correction level of the observation, etc. The elements in this section are of the form <element name=" " uom=" " value=""/>, where

- *name* is an abbreviated label (less than 30 characters) assigned to each element definition
- *uom* is the unit of measure
- *value* is the value of the element.

In the case when *uom*="code", then two additional attributes will be included, these are:

- *code-src* is the authoritative source of which this code table originates
- *code-type* is the type or name of a given code table available for a given source

The resulting element would look like this:

<element name=" " uom="code" code-src=" " code-type=" " value=""/>. Such elements contain coded values.

There can be any number of identification elements for a given observation, depending on the dataset.

Section C:

This section contains additional metadata about the observation.

- <om:samplingTime> is the full date time of this observation encoded within a GML element
- <om:resultTime> is the full date-time when the DMS product generator produced this instance of the SWOB encoded within a GML element
- <om:featureOfInterest> is the latitude and longitude of the station that reported this observation encoded within a GML element.

Section D:

This section of the SWOB is the body of the observation, where one would expect to find the observational elements. Fundamentally an element is a single unit of observation. For instance, air temperature, relative humidity, wind speed, wind direction, visibility, etc. are all examples of a singular observed phenomenon, which is encoded as an element in the SWOB. Elements in this section are of the form:

<element name=" " uom=" " value=" "/> where

- *name* is an abbreviated label (less than 30 characters) assigned to each element definition
- *uom* is the unit of measure
- *value* is the value of the element

In the case when *uom*="code", then two additional attributes will be included, these are:

- *code-src* is the authoritative source of which this code table originates
- *code-type* is the type or name of a given code table available for a given source

The resulting element would look like this:

<element name=" " uom="code" code-src=" " code-type="" value=" "/>. Such elements contain coded integer or text values from a list of controlled vocabulary (so in effect a code). The incoming element that is initially decoded, comes in with a native code source and code type (an example for a present weather code source and type may be: wmo_buf, 020003, respectively). During the production of the SWOB, a “standard code value” is substituted for the incoming codes. The exact code substitutions used for each dataset of the SWOB product will be discussed in Section 5 of this document.

For elements which are reported in the raw observation that have an empty or illegal value, the value/code will be designated as MSNG to denote “missing”.

If *Qa* information is available for the element, then a qualifier will be tagged onto the element to provide an over-all summary of the quality assessments. See section 4.5 for details on the creation of the *Qa* qualifier and the meaning of the code value (i.e. *Qa* flags)

If supplementary information is available for the element, a “data_flag” may be tagged onto the element to provide additional metadata. See section 4.6 for details on data flags.

Below is a list of examples showing various cases of elements with and without the *Qa* and data flag qualifiers, as well as standalone numeric elements and standalone coded elements:

Case 1.1: Standalone Numeric Elements with Units

<element name=" " uom="" value="">

Case 1.2: Element with Units (Qa_summary)

```
<element name=" " uom="" value="">
  <qualifier name="qa_summary" uom="unitless" value=""/>
</element>
```

Case 1.3: Element with Units (data_flag)

```
<element name=" " uom="" value="">
  <qualifier name="data_flag" value=" " uom="code" code-type="data_flags"
    code-src="std_code_src"/>
</element>
```

Case 1.4: Element with Units (data_flag and Qa_summary)

```
<element name=" " uom="" value="">
  <qualifier name="qa_summary" uom="unitless" value=""/>
  <qualifier name="data_flag" value=" " uom="code" code-type="data_flags"
    code-src="std_code_src"/>
</element>
```

Case 2.1: Standalone Coded Element with Code Table Unit

```
<element name=" " uom="code" code-src="" code-type="" value=""/>
```

Case 2.2: Element with Code Table Unit (Qa_summary)

```
<element name=" " uom="code" code-src="" code-type="" value=""/>
  <qualifier name="qa_summary" uom="unitless" value=""/>
</element>
```

Case 2.3: Element with Code Table Unit (data_flag)

```
<element name=" " uom="code" code-src="" code-type="" value=""/>
  <qualifier name="data_flag" value=" " uom="code" code-type="data_flags"
    code-src="std_code_src"/>
</element>
```

Case 2.4: Element with Code Table Unit (data_flag and Qa_summary)

```
<element name=" " uom="code" code-src="" code-type="" value=""/>
  <qualifier name="qa_summary" uom="unitless" value=""/>
  <qualifier name="data_flag" value=" " uom="code" code-type="data_flags"
    code-src="std_code_src"/>
</element>
```

4.3 Sample SWOB

Here is a full sample output of a SWOB instance for the RA (MSC AWOS) dataset:

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<om:ObservationCollection xmlns:om="http://www.opengis.net/om/1.0"
  xmlns="http://dms.ec.gc.ca/schema/point-observation/2.0"
  xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <om:member>
    <om:Observation>
      <om:metadata>
        <set>
          <general>
            <author name="MSC-DMS-PG-SWOB" version="1.0" />
            <dataset name="msc/observation/atmospheric/surface_weather/ra-1.1-ascii" />
            <phase name="product_generic_swob-xml-2.0" />
            <id xlink:href="/data/msc/observation/atmospheric/surface_weather/ra-1.1-ascii/product_generic_swob-xml-2.0/201207181400/7018573/yoy/orig/data_60" />
            <parent xlink:href="/data/msc/observation/atmospheric/surface_weather/ra-1.1-ascii/decoded_enhanced-xml-2.0/201207181400/7018573/yoy/orig/data_60" />
          </general>
          <identification-elements>
            <element name="tc_id" uom="unitless" value="YOY" />
            <element name="stn_nam" uom="unitless" value="VAL CARTIER" />
            <element name="msc_id" uom="unitless" value="7018573" />
            <element name="clim_id" uom="unitless" value="7018573" />
            <element name="wmo_synop_id" uom="unitless" value="71716" />
            <element code-src="std_code_src" code-type="report_type" name="rpt_typ" uom="code" value="0" />
            <element name="date_tm" uom="datetime" value="2012-07-18T14:00:00.000Z" />
            <element code-src="std_code_src" code-type="station_type" name="stn_typ" uom="code" value="4" />
            <element name="lat" uom="°" value="46.9" />
            <element name="long" uom="°" value="71.5" />
            <element name="stn_elev" uom="m" value="167.6" />
          </identification-elements>
        </set>
      </om:metadata>
      <om:samplingTime>
        <gml:TimeInstant>
          <gml:timePosition>2012-07-18T14:00:00.000Z</gml:timePosition>
        </gml:TimeInstant>
      </om:samplingTime>
      <om:resultTime>
        <gml:TimeInstant>
          <gml:timePosition>2012-07-18T14:01:04.657Z</gml:timePosition>
        </gml:TimeInstant>
      </om:resultTime>
      <om:procedure xlink:href="/data/msc/metadata/station/surface_weather/metadata_instance-2.0-xml/product-jicc_xml-2.0/201207181143/yoy" />
      <om:observedProperty gml:remoteSchema="/schema/point-observation/2.0.xsd" />
      <om:featureOfInterest>
        <gml:FeatureCollection>
          <gml:location>
            <gml:Point>
```

```

        <gml:pos>46.9 71.5</gml:pos>
      </gml:Point>
    </gml:location>
  </gml:FeatureCollection>
</om:featureOfInterest>
<om:result>
  <elements>
    <element code-src="std_code_src" code-type="total_cloud_amount"
      name="cld_amt_code_1" uom="code" value="2">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="cld_bas_hgt_1" uom="m" value="1500">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element code-src="std_code_src" code-type="total_cloud_amount"
      name="cld_amt_code_2" uom="code" value="2">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="cld_bas_hgt_2" uom="m" value="1800">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="vis" uom="km" value="14.484">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element code-src="std_code_src" code-type="present_weather" name="prsnt_wx"
      uom="code" value="409">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="altmetr_setng" uom="inHg" value="29.77">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="air_temp" uom="°C" value="21.2">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="dwpt_temp" uom="°C" value="11.3">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="avg_wnd_dir_10m_pst2mts" uom="°" value="281">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="avg_wnd_spd_10m_pst2mts" uom="km/h" value="13">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="max_wnd_gst_spd_10m_pst10mts" uom="km/h" value="31.5">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="sum_cld_cvr_1" uom="%" value="0">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="sum_cld_cvr_2" uom="%" value="0">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="min_vis_pst10mts" uom="km" value="14.484">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
    <element name="max_vis_pst10mts" uom="km" value="14.484">
      <qualifier name="qa_summary" uom="unitless" value="100" />
    </element>
  </elements>
</om:result>

```

```

<element name="stn_pres" uom="hPa" value="988.3">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="min_air_temp_pst1hr" uom="°C" value="20.5">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="max_air_temp_pst1hr" uom="°C" value="21.9">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="avg_wnd_dir_10m_pst10mts" uom="°" value="270">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="avg_wnd_spd_10m_pst10mts" uom="km/h" value="16.7">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="wnd_dir_10m_pst1hr_pk_spd" uom="°" value="270">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="max_pk_wnd_spd_10m_pst1hr" uom="km/h" value="31.5">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="pcpn_gag_wt_fltrd" uom="kg/m²" value="410.5">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="pcpn_amt_pst1hr" uom="mm" value="0.0">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="rel_hum" uom="%" value="53" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element code-src="std_code_src" code-type="tendency_characteristic"
  name="pres_tend_char_pst3hrs" uom="code" value="1" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="pres_tend_amt_pst1hr" uom="hPa" value="0.2" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="pres_tend_amt_pst3hrs" uom="hPa" value="1.5" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="pcpn_amt_pst3hrs" uom="mm" value="0.5" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="pcpn_amt_pst6hrs" uom="mm" value="0.5" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="pcpn_amt_pst24hrs" uom="mm" value="8.5" />
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
    uom="code" value="1" />
</element>
<element name="max_air_temp_pst24hrs" " uom="°C" value="31.4/>

```

```
        <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
          uom="code" value="1" />
      </element>
      <element name="max_air_temp_pst6hrs" " uom="°C" value="31.1"/>
        <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
          uom="code" value="1" />
      </element>
      <element name="min_air_temp_pst6hrs" " uom="°C" value="21.2"/>
        <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
          uom="code" value="1" />
      </element>
      <element name="min_air_temp_pst24hrs" " uom="°C" value="17.6" />
        <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
          uom="code" value="1" />
      </element>
      <element name="mslp" uom="hPa" value="1008.2" />
        <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag"
          uom="code" value="1" />
      </element>
    </elements>
  </om:result>
</om:Observation>
</om:member>
</om:ObservationCollection>
```

4.4 Taxonomy and URI

Each dataset is classified using taxonomy. Each instance of a SWOB is uniquely identified via its URI. One can access each dataset's SWOB instances using the assigned URI in the DMS notification web application (permissions dependent).

Taxonomies are of the form:

/organization/category/type/network/dataset-version-format/phase-format-version/ (<parameters>*)

Please refer to the Taxonomy Documentation referenced in Section 1.3 for more information about the taxonomy structure and meaning of the various tokens.

The chart below indicates the taxonomy for each dataset:

| Incoming Dataset | SWOB Taxonomy |
|---|--|
| Legacy MSC & Partner Manned aviation weather stations using the WinIDE or MIDS interface (BUFR messages under header 'ISAx41') | /msc/observation/atmospheric/surface_weather/winide_fm12-1.0-xml/product_generic_swob-xml-2.0 |
| Legacy MSC & Partner AWOS aviation weather stations (' RA ' ASCII messages) | /msc/observation/atmospheric/surface_weather/ra-1.1-ascii/product_generic_swob-xml-2.0 |
| DND AWOS (BUFR messages under header 'ISAx64') | /dnd/observation/atmospheric/surface_weather/awos-1.0-binary/product_generic_swob-xml-2.0 |
| DND HWOS (BUFR messages under header 'ISAx67') | /dnd/observation/atmospheric/surface_weather/hwos-1.1-binary/product_generic_swob-xml-2.0 |
| Nav Canada HWOS aviation weather stations (BUFR messages under header 'ISAx62') | /nav_canada/observation/atmospheric/surface_weather/hwos-1.1-binary/product_generic_swob-xml-2.0 |
| Nav Canada AWOS aviation weather stations (BUFR messages under header 'ISAx61') | /nav_canada/observation/atmospheric/surface_weather/awos-2.1-binary/product_generic_swob-xml-2.0 |
| MSC & Partner public surface weather network stations using Campbell Scientific data loggers (' CA ' ASCII messages) | /msc/observation/atmospheric/surface_weather/ca-1.1-ascii/product_generic_swob-xml-2.0 |
| MSC weather stations using Campbell Scientific data loggers transmitting <u>minutely</u> in support of the 2015 PanAm Games (' COMPACT-minutely ' CA ASCII messages sent to the DMS) | /msc/observation/atmospheric/surface_weather/ca-1.2-ascii/product_generic_swob-xml-2.0 |
| OPP Moored Buoy weather network stations (' OPP ') | /msc/observation/atmospheric/marine/moored_buoy-1.2-ascii/product_generic_swob-xml-2.0 |
| BC Ministry of Transportation (' BC-TRAN ') | /partners/observation/atmospheric/surface_weather/bc_tran-1.0-csv/product_generic_swob-xml-2.0 |

| | |
|--|---|
| British Columbia Ministry of Forests, Lands and Natural Resources; Wildfire Management Branch (BC-FLNR-WMB) | /partners/observation/atmospheric/surface_weather/bc_forestry-1.1-ascii/product_generic_swob-xml-2.0 |
| BC Ministry of Environment Air Quality Meteorological weather network stations (BC-ENV-AQMet) | /partners/observation/atmospheric/surface_weather/bc_env_aqmet-1.0-csv/product_generic_swob-xml-2.0 |
| BC Ministry of Environment Snow weather network stations (BC-ENV-SnowWx) | /partners/observation/atmospheric/surface_weather/bc_env_snowwx-1.0-ascii/product_generic_swob-xml-2.0 |
| NT Department of Environment and Natural Resources (NT Forestry) | /partners/observation/atmospheric/surface_weather/nt_forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| NT Water Resources Division (NT Water) | /gov_nt/observation/atmospheric/surface_weather/water-1.0-ascii/product_generic_swob-xml-2.0 |
| Weather Buoy System Moored Buoy (WBS Moored Buoy) | /msc/observation/atmospheric/marine/moored_buoy-1.3-ascii/product_generic_swob-xml-2.0 |
| Canadian Coast Guard Lighthouses (CCG Lighthouses) | /partners/observation/atmospheric/surface_weather/ccg_lighthouse-1.0-ascii/product_generic_swob-xml-2.0 |
| DFO Ocean Data Acquisition System Buoy (DFO ODAS Buoy) | /dfo/observation/atmospheric/marine/moored_buoy-1.0-ascii/product_generic_swob-xml-2.0 |
| SK Wildfire Management Branch Public Safety Agency (SK Forestry) | /gov_sk/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| YT Department of Environment Water Resources Branch (YT-DE-WRB) | /gov_yt/observation/atmospheric/surface_weather/water-1.0-ascii/product_generic_swob-xml-2.0 |
| NL Department of Environment and Climate Change Water Resources Management Division (NL-DECC-WRMD) | /gov_nl/observation/atmospheric/surface_weather/water-1.0-ascii/product_generic_swob-xml-2.0 |
| Toronto and Region Conservation Authority (Ontario) – ON-TRCA | /gov_on/observation/atmospheric/surface_weather/trca-1.0-json/product_generic_swob-xml-2.0 |
| Grand River Conservation Authority (Ontario) – ON-GRCA | /partners/observation/atmospheric/surface_weather/on_grca-1.0-ascii/product_swob-xml- |
| Ontario Ministry of Natural Resources and Forestry – ON-MNRF | /partners/observation/atmospheric/surface_weather/on_mnr-1.0-ascii/product_swob-xml-2.0 |
| Ministry of Transportation Ontario (MTO) | /partners/observation/atmospheric/road_weather/on_mto-1.0-xml/product_generic_swob-xml-2.0 |
| Transport Canada Port of Montreal (PoM) | /tc/observation/atmospheric/surface_weather/port_of_montreal-1.0-ascii/product_generic_swob-xml-2.0 |

| | |
|--|--|
| ON Ministry of Northern Development, Mines, Natural Resources and Forestry, Aviation, Forest Fire and Emergency Services Branch (ON Forestry) | /gov_on/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| YT Wildland Fire Management (YT Forestry) | /gov_yt/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| Avalanche Canada and Yukon Avalanche Association (YT Avalanche) | /volunteer/observation/atmospheric/surface_weather/yt_avalanche-1.0-ascii/product_generic_swob-xml-2.0 |
| Government of New Brunswick: Department of Natural Resources and Energy Development (NB Forestry) | /gov_nb/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| BC Rio Tinto Inc. (BC Rio Tinto) | /riotinto/observation/atmospheric/surface_weather/bc_riotinto-1.0-ascii/product_generic_swob-xml-2.0 |
| BC Capital Regional District (BC-CRD) | /gov_bc/observation/atmospheric/surface_weather/crd-1.0-json/product_generic_swob-xml-2.0 |
| Parks Canada Natural Resource Management Branch (PC Forestry) | /pc/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |
| Nova Scotia Department of Lands and Forestry (NS Forestry) | /gov_ns/observation/atmospheric/surface_weather/forestry-1.0-ascii/product_generic_swob-xml-2.0 |

To each of the taxonomies listed above, the following parameters may be appended:

/<datetime>/<MSC Id>/<secondary station identifier>/<revision level>/<content frequency>

- <datetime> is the full date-time string when the observation was reported by the station in the format YYYYMMDDHHMM
- <MSC Id> is the official MSC station identifier (for MSC stations this is the climate identifier used by the National Climate Archive to guarantee uniqueness). For Partner networks, the MSC identifier may be a copy of the secondary identifier unless a Climate identifier can be assigned.
- <secondary station identifier> is an additional station identifier attached to the URI. It varies depending on the dataset and is typically the identifier most commonly used by a particular network's operators. For example:
 - NC-AWOS, DND-AWOS: ICAO station identifier
 - NC-HWOS, DND-HWOS: ICAO station identifier
 - CA: TC identifier
 - RA: TC identifier
 - WinIDE: TC identifier

- <revision level> is the correction/revision level of the observation. If the observation is the original message “orig” will be used. If there are corrections or revisions, an indicator will be used (e.g. CCA, CCB, CCC, etc.).
- <content frequency> is used for networks that issue multiple observations for a given time with different data content. The frequency of a particular observation is also indicated (in minutes). The value of this parameter is in the format content_frequency, where the content types are data, diag (diagnostic data) and supp (supplementary program data), and the message frequency is in minutes (e.g. **data_60** would be an observation containing hourly data intended for official products; **supp_1** would be an observation from a supplementary program such as solar radiation transmitted every minute).

The chart below indicates the URI for selected dataset examples:

| Dataset | URI | Example |
|---|--|--|
| MSC & Partner Manned (WinIDE/MIDS - ISAx41 BUFR) | /msc/observation/atmospheric/surface_weather/winide_fm12-1.0-xml/product_generic_swob-xml-2.0/<date time>/<msc identifier>/<tc identifier>/<revision level>/<content frequency> | data/msc/observation/atmospheric/surface_weather/winide_fm12-1.0-xml/product_generic_swob-xml-2.0/201808081600/7060400/cybg/orig/data_60 |
| MSC & Partner AWOS (RA messages) | msc/observation/atmospheric/surface_weather/ra-1.1-ascii/product_generic_swob-xml-2.0/<date time>/<msc identifier>/<tc identifier>/<revision level>/<content frequency> | /msc/observation/atmospheric/surface_weather/ra-1.1-ascii/product_generic_swob-xml-2.0/201808080000/8101794/ycx/orig/data_60 |
| Nav Canada HWOS (ISAx62 BUFR) | /nav_canada/observation/atmospheric/surface_weather/hwos-1.1-binary/product_generic_swob-xml-2.0/<date time>/<msc identifier>/<tc identifier>/<revision level>/<content frequency> | /nav_canada/observation/atmospheric/surface_weather/hwos-1.1-binary/product_generic_swob-xml-2.0/201808081600/7047911/cyzv/orig/data_60 |
| Nav Canada AWOS (ISAx61 BUFR) | /nav_canada/observation/atmospheric/surface_weather/awos-2.1-binary/product_generic_swob-xml-2.0/<date time>/<msc identifier>/<tc identifier>/<revision level>/<content frequency> | /data/nav_canada/observation/atmospheric/surface_weather/awos-2.1-binary/product_generic_swob-xml-2.0/201808081600/2402360/cwgz/orig/data_60 |
| MSC & Partner surface weather network (Campbell Sci. CA messages) | /msc/observation/atmospheric/surface_weather/ca-1.1-ascii/product_generic_swob-xml-2.0/<date time>/<msc identifier>/<tc identifier>/<revision level>/<content frequency> | /msc/observation/atmospheric/surface_weather/ca-1.1-ascii/product_generic_swob-xml-2.0/201808071600/3012192/pea/orig/data_60 |

4.5 Quality Assessment Flag

The SWOB will contain a quality assessment (Qa) summary flag as a qualifier attached to an element whenever possible. In the SWOB it will appear as such:

```
<element name=" " uom="" value="">
  <qualifier name="qa_summary" uom="unitless" value=""/>
</element>
or
```

```
<element name=" " uom="code" code-src="" code-type="" value=""/>
  <qualifier name="qa_summary" uom="unitless" value=""/>
</element>
```

The possibility of this flag being attached to an element is dependent on the following scenarios:

1. There will be no qa_summary flag if there are no incoming “Native QC” flags on the element **and** there was no in-house DMS quality assessment done on the element.
2. There will be no qa_summary flag if the incoming “Native QC” attached to the element has no flags raised **and** there is no in-house DMS quality assessment done on the element
3. A qa_summary flag will be generated and attached to the element, if it arrived from the source with one or more Native QC flags indicating a problem **and/or** if a quality assessment was carried out by DMS on the element.

In scenario 2, an algorithm will be used to arrive at a single qa_summary value considering the availability of both the native and DMS quality assessments on the element.

Below is the algorithm used to generate the value for the qa_summary qualifier:

Prior to executing the algorithm, all incoming Native QC values are converted to DMS standard Qa flag values (so that they can be easily compared to the DMS Qa flag value) using the following scheme:

- 10 = Suppressed
- 1 = Missing
- 0 = Error
- 10 = Doubtful
- 15 = Suspect/Warning
- 20 = Inconsistent
- 100 = Acceptable/Passed

Qa Flag Definitions:

Suppressed – the data provider has indicated that the data value is not to be used or published due to instrumentation or environmental issues which have compromised the data.

Missing – the “value” of an element is null, blank/space, “MSNG” (from the decoder), a code representing missing, or could not be derived.

Error – The value is physically impossible, beyond the capability of the sensor to detect, or identified as incorrect.

Doubtful – The value is physically possible but is statistically improbable: at or exceeding expected extreme values.

Suspect/Warning – the data provider has indicated that the data may be unreliable or is outside of nominal limits.

Inconsistent – The value is inconsistent when it departs significantly from an expected physical relationship with an independently measured, associated variable. It is not possible to determine if either the value or the associated variable is in error.

Acceptable/Passed – The value passed all applicable quality assessment test(s) or has been verified as acceptable.

The final qa_summary flag values are generated as follows:

- The final qa_summary flag in the SWOB is the lowest value between the converted Native QC flag (if exists) and the real-time DMS Qa flag:

e.g.

If Native QC flag variable = 0 and DMS Qa flag=10, then SWOB qa_summary = 0

If Native QC flag variable = -10 and DMS Qa flag=0, then SWOB qa_summary = -10

If Native QC flag variable = 10 and DMS Qa flag=100, then SWOB qa_summary = 10

If Native QC flag variable = 100 and DMS Qa flag=100, then SWOB qa_summary = 100

If Native QC flag variable = 100 and DMS Qa flag = 0, then SWOB qa_summary = 0

If Native QC flag variable = -10 and DMS Qa flag = 0, then SWOB qa_summary = -10

If Native QC flag variable = 15 and DMS Qa flag = 10, then SWOB qa_summary = 10

If Native QC flag variable = 100 and DMS Qa was not performed, then no qa_summary in SWOB

If no incoming Native QC flags and DMS Qa was not performed, then no qa_summary in SWOB

- If an element does not have a qa_summary qualifier, it means that there was no **direct** quality assessment performed on it within the DMS, and that if Native QC was present, no flags were raised. Note however, that although derived elements may not have a Qa flag, it is likely that some or all of the input elements had Native QC and/or DMS Qa and these flags were considered when determining whether or not to derive the element.

4.6 Data Flag

A new feature of the SWOB is a qualifier that may be present on some elements, if applicable. Currently most observed elements have a `qa_summary` qualifier on them to indicate the quality status via a code table. A new “`data_flag`” qualifier will operate the same way by providing additional metadata on some elements to convey the following information, if it applies:

| Code Value | Text Value | Description |
|------------|------------|---|
| 1 | derived | Value has been reformulated or mathematically derived with complete inputs |
| 2 | estimate | Reported value received as an estimate |
| 3 | adjusted | Reported value the result of an adjustment (e.g. precipitation under catch, wind speed extrapolated to 10m, etc.) |
| 4 | incomplete | Value has been reformulated or mathematically derived with incomplete inputs - element derivation contains at least one missing value |
| 5 | trace | Trace. Value is zero |
| 6 | multiple | More than one occurrence |
| ... | ... | Refer to Section 6.5.3 for additional codes (although they will not appear in the SWOB as of yet) |

For hourly datasets and the associated SWOBs, the most common `data_flag` used will be code 1 and 4 (derived with complete inputs, derived with incomplete inputs, respectively), and in some cases code 5 (trace) and code 2 (estimate). The majority of the other flags are rarely assigned or are typically only applicable for post-processing by other downstream product generators.

Like the `qa_summary`, the `data_flag` qualifier is a child of the parent element and is optional. Below is an example of how it will appear in the SWOB for a derived element:

```
<element name="mslp" value="1020.8" uom="hPa"/>
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag" uom="code" value="1"/>
</element>
```

To associate the code to the proper code table (see Appendix Section 6.5.3), the code source (`code-src = std_code_src`) and code type (`code-type = data_flags`) are identified. For hourly data, if a `data_flag` qualifier is specified for an element, there will almost always be a single value. In the rare event there are two data flags on an element they will appear as a comma-separated list for the value. For example, below is a case where a derived (1) element has a trace (5) value:

```
<element name="tot_precip_pst24hrs" value="0" uom="mm"/>
  <qualifier code-src="std_code_src" code-type="data_flags" name="data_flag" uom="code"
value="1,5"/>
</element>
```

4.7 Multiplicity

Some elements within the DMS are repeated due to more than one instance of occurrence or more than one observation being made. For these elements, the element name is followed by “_#”. For example, air temperature in the CA dataset can be observed up to three times if three sensors are available. In this case, three air temperature measurements are sent to the DMS which are used to achieve an “official” air temperature. A SWOB output would show the official as well as the three sensor values. For example:

```
<element name="air_temp" uom="°C" value="21.2">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="air_temp_1" uom="°C" value="21.2">
<element name="air_temp_2" uom="°C" value="21.1">
<element name="air_temp_3" uom="°C" value="21.1">
```

Some other elements that can have more than one sensor include:

- Wind – 2 sensors
- Snow – 3 sensors
- Precipitation gauge weight – up to 3 sensors

Furthermore, cloud elements in the NC AWOS/NC HWOS dataset can have multiple instances being reported, one for each cloud layer. A SWOB output for this would look like the following:

```
<element code-src="std_code_src" code-type="total_cloud_amount"
  name="cld_amt_code_1" uom="code" value="1">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="cld_bas_hgt_1" uom="m" value="900.0">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element code-src="std_code_src" code-type="total_cloud_amount"
  name="cld_amt_code_2" uom="code" value="2">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
<element name="cld_bas_hgt_2" uom="m" value="1140.0">
  <qualifier name="qa_summary" uom="unitless" value="100" />
</element>
```

Elements with more than one instance of occurrence include:

- Cloud elements (height, type, cover, amount) – up to 6 instances
- Present weather – up to 8 instances
- Recent weather – up to 3 instances

In the following sections, datasets that can contain multiplicities will have an additional column of “Maximum Multiplicity” identifying the maximum number of times that element can be repeated.

5. Datasets

5.1 Overview

This section will outline where the incoming data comes from, how it is mapped to short labels, the description of the elements, and which elements have gone through unit conversion. The sections are broken down by dataset:

1. Legacy MSC & Partner Manned aviation weather stations using the WinIDE or MIDS interface
2. DND HWOS aviation weather stations
3. Legacy MSC & Partner AWOS aviation weather stations
4. DND AWOS aviation weather stations
5. Nav Canada HWOS aviation weather stations
6. Nav Canada AWOS aviation weather stations
7. MSC & Partner public surface weather network stations using Campbell Scientific data loggers which transmit official hourly observations

MSC & Partner networks that supported the 2015 PanAm Games:

8. Minutely MSC & Partner surface weather network – COMPACT
9. OPP marine weather stations
10. BC Tran weather stations
11. BC Forestry weather stations
12. BC Environment AQ Met weather stations
13. BC Environment Snow Wx weather stations
14. NT Department of Environment and Natural Resources
15. NT Water Resources Division
16. Meteorological Service of Canada Moored Buoy
17. Canadian Coast Guard Lighthouses
18. DFO Ocean Data Acquisition System Buoy
19. SK Wildfire Management Branch Public Safety Agency
20. YT Department of Environment Water Resources Branch
21. NL Department of Environment and Climate Change Water Resources Management Division
22. Toronto and Region Conservation Authority
23. Grand River Conservation Authority
24. Ministry of Natural Resources and Forestry
25. Ministry of Transportation Ontario

26. Transport Canada Port of Montreal
27. ON Ministry of Northern Development, Mines, Natural Resources and Forestry, Aviation, Forest Fire and Emergency Services Branch
28. YT Wildland Fire Management
29. Avalanche Canada and Yukon Avalanche Association
30. Government of New Brunswick: Department of Natural Resources and Energy Development
31. BC Rio Tinto Inc.
32. BC Capital Regional District
33. Parks Canada Natural Resource Management Branch
34. Nova Scotia Department of Lands and Forestry

The tables in the sub-sections below provide a superset of the weather elements that could potentially be in a given SWOB. They describe the meaning of the short label and identify the incoming units and codes. As well, the standard units and code tables required for the SWOB are indicated, along with the precision values are rounded to in the event of a unit conversion. The value in the Precision column represents the number of digits after the decimal (e.g. 2 would represent 0.01). A value of 0 represents integer values. Descriptions of the unit of measure's (uom) expression and meaning can be found in Appendix 6.3, while Appendix 6.4 provides unit conversions. Descriptions of the meaning of codes in the standard code tables can be found in Appendix 6.5.

5.2 *Data Element Terminology*

5.2.1 Wind

The various types of wind measurements can cause confusion given the large number of variations. In particular, the use of the terms 'wind **gust** speed', '**maximum** wind speed', and '**peak** wind speed' need to be defined as these terms are sometimes used interchangeably yet the data are processed quite differently.

- **Maximum Wind Speed** (e.g. max_wnd_spd_10m_pst10mts): This is the highest instantaneous wind speed no matter what the value (e.g. could be 0) over the interval indicated (e.g. could be over the past hour, or minutes 50 to 60 as in this example);
- **Maximum Wind Gust Speed** (or just wind gust; e.g. max_wnd_gst_spd_10m_pst10mts): This element is derived from the 10 minute maximum wind speed element described above. The rules follow the ManObs definition and it is only reportable if the max wind speed over the last 10 minutes of the hour is ≥ 15 knots AND the max speed exceeds the 2-minute mean wind speed by ≥ 5 knots (note the 10-minute mean is used for climate stations such as the CA data set).
- **Peak Wind Speed** (e.g. max_pk_wnd_spd_10m_pst1hr): This element is derived from the maximum wind speed over the past hour. The rules follow the ManObs definition and it is only reportable if the max wind speed over the past hour is ≥ 17 knots. Depending on the network, the time of the peak and the wind direction at the time of the peak may also be reported. The peak direction element would be wnd_dir_10m_pst1hr_pk_spd.

Given how critical the height of the anemometer is to the measurement and use of wind speed data, the height of the instrument is typically included in the SWOB short label (e.g. avg_wnd_spd_10m_pst10mts). For the operational MSC surface weather networks, as well as partner data (e.g. Nav Canada, DND), the standardized anemometer heights are generally 10 m as per WMO and ICAO guidelines. However, in the case of the MSC “Compact” stations supporting the 2015 PanAm Games Mesonet, the height of the anemometer can vary from station-to-station. The nominal height of the anemometer for a Compact station situated on the ground is approximately 2.5 m above the pedestal base, however, some stations are located on rooftops or other structures, so the wind speed height can vary significantly. To keep the SWOB short label consistent for wind elements across all the networks the label was not modified on a station-to-station basis to account for anemometer heights that depart from the standard. Clients needing information specific to the Compact stations will need to access the station information metadata maintained by the Data Management System.

5.2.2 Cloud Amount/Cover

Sky condition, in terms of cloud amount and cloud cover, is complicated by the fact it's handled differently across the networks that observe it. Human observations are capable of reporting a total cloud amount because the human can assess the whole celestial dome, whereas the instrumentation currently deployed at automatic stations cannot. As for cloud amount/cover reported for individual cloud layers, the observation from a manual station is non-cumulative and pertains to each layer, while the measurement from an automatic station is a summation so each layer incorporates the amount of the layer below. Finally, there are variations in the way cloud amount (also known as cloud cover) is reported across the networks. Some networks send codes that represent the sky condition as strings such as SCT (scattered), BKN (broken), OVC (overcast), etc. Other networks observe in eighths (octas) or tenths. For this reason it may be difficult to translate the standard code from all networks to a single scheme without compromises being made.

| <u>Sky Coverage</u> | <u>Legacy MSC AWOS</u> | <u>MSC Manned (WinIDE/MIDS)</u> | <u>NC-AWOS</u> | <u>NC-HWOS</u> | <u>METAR Product</u> |
|--|---|---|--|--|---|
| String based on cloud layer opacity or coverage/amount | Sky Coverage derived from summation cloud cover (amount) as estimated by a ceilometer | Sky Coverage derived from observing cloud layer opacity in tenths | Sky Coverage derived from summation cloud amount as estimated by a ceilometer. | Sky Coverage derived from cloud layer amounts in Octas | Sky Coverage derived from the various observing systems based on observing Cloud layer amounts in Octas (NC-AWOS, NC-HWOS) or mapped from tenths (WinIDE) |
| CLR/SKC (clear-no cloud or obscuring phenomena) | 0% (results in the code of 'CLR BLO 100' meaning clear below 10,000 ft.) | 0/10 th (CLR) | 0/8 th (SKC) | 0/8 th (SKC) | 0/8 th (SKC) |
| FEW | n/a | 1/10 – 3/10 th | 1/8 – 2/8 th | 1/8 – 2/8 th | 1/8 – 2/8 th |
| SCT (scattered) | ≤ 49% | 4/10 – 5/10 th | 3/8 – 4/8 th | 3/8 – 4/8 th | 3/8 – 4/8 th |
| BKN (broken) | 50 – 89% | 6/10 – 9/10 th | 5/8 – 7/8 th | 5/8 – 7/8 th | 5/8 – 7/8 th |
| OVC (overcast) | ≥ 90% | 10/10 th | 8/8 th | 8/8 th | 8/8 th |
| -X (partially obscured by surface-based layer) | < 90% (80% in multi-parameter) Note: will not come out on any METAR because you can see through it | 1/10 th – <10/10 th surface-based layer | n/a | n/a | n/a |
| X (totally obscured) | ≥ 90%, otherwise 100% | 10/10 th surface- | n/a | n/a | n/a |

| | | | | | |
|-------------------------|--|-------------|--|--|--|
| by surface based layer) | | based layer | | | |
|-------------------------|--|-------------|--|--|--|

5.2.3 Precipitation and Rainfall

Within the DMS there is a clear distinction between “precipitation”, which implies a measurement of all forms of liquid and frozen precipitation, and “rainfall”, which is just the liquid state. The designation of a measurement as either precipitation or rainfall is determined by the instrument is use. For MSC data, official precipitation elements will come from an all-weather sensor capable of operating year round. Examples of such instrumentation are weighing-type gauges (e.g. GEONOR and PLUVIO), Piezo electric strike plates, and Doppler sensors. For rainfall and rate of rainfall measurements, the most commonly used sensor is a tipping bucket rain gauge (TBRG) like the TB3 used by the MSC. For MSC data, an exception to the precipitation rule is granted when a station only has a TBRG. In such cases the rainfall measurement may be used in derived precipitation elements as long as certain criteria are met (e.g. dew point temperature is $> +1^{\circ}\text{C}$, or the air temp is $> 4.5^{\circ}\text{C}$).

For third party, where we have less detail on instrumentation, it may not be possible to distinguish between precipitation and rainfall or validate that what they call “precipitation” is indeed from an all-weather instrument. Also for the case of the Nav Canada and some stations in other third party datasets (e.g. GRCA, TRCA) we know that a heated TBRG may be employed to report precipitation, which can compromise the accuracy of measuring both liquid and frozen precipitation.

5.2.4 Station elevation

Station elevation is a critical parameter used for the computation of mean sea level pressure (MSLP). For networks that have the barometer relatively close to the ground, an initial station pressure correction may not be done for the difference in height between the level of the barometer and the ground surface (where the elevation is normally referenced) before the final reduction to sea level for the computation of MSLP. The automated Public Surface Weather network (i.e. Campbell stations issuing CA messages) and legacy AWOS sites (RA messages) are examples of such networks. For these networks the station elevation is actually referenced from the height of the barometer to compensate for not doing a pressure correction down to ground surface. At these stations the barometer is approximately 1.5 m to 2.5 m above the ground surface.

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5.3 Legacy MSC & Partner Manned (WinIDE/MIDS)

The WinIDE and MIDS legacy applications are interfaces that DND and Nav Canada weather observers use to enter their weather observations. The observing program is in support of aviation and most stations are located at airports. Observers are expected to input observed conditions in

accordance with the Manual of Surface Observations (MANOBS). The output is a BUFR (Binary Universal Form of Representation) message, which is not human readable. These stations are in the process of being converted to NC-HWOS stations. All the incoming elements, units and values that come from within the actual BUFR are mapped to their desired elements, units, values and qualifiers by the DMS and stored in XML format. These elements are then mapped to the short labels shown in the table below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|--|--|----------------|----------------------|---|-----------|--------------------------|
| tc_id | TC identifier | unitless | | | | |
| long | longitude | ° | | | 6 | |
| lat | latitude | ° | | | 6 | |
| stn_elev | station height | m | | | 3 | |
| stn_typ | station type | code | std_code_src | station_type | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| clim_id | climate identifier | unitless | | | | |
| date_tm | date and time | datetime | | | | |
| wmo_synop_id | WMO synoptic identifier | unitless | | | | |
| icao_stn_id | ICAO station identifier | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| cor | correction | unitless | | | | |
| tot_cld_opcty | total cloud opacity | % | | | 0 | |
| tot_cld_amt | total cloud amount | % | | | 0 | |
| cld_bas_hgt_# | cloud height for individual layers indexed by layer | m | | | 0 | 8 |
| cld_amt_code_# Previously: cld_cvr_# | cloud cover/amount (non-cumulative) indexed by layer | code | std_code_src | total_cloud_amount Previously: sky_condition | | 8 |
| cld_typ_# | cloud type obscuring phenomena indexed by layer | code | std_code_src | obscuring_phenomena | | 8 |
| cld_opcty_# | cloud opacity indexed by layer | % | | | 0 | 8 |
| clg_typ | ceiling type | code | std_code_src | ceiling_type | | |
| clg_hgt | ceiling height | m | | | 0 | |
| vis | horizontal visibility | km | | | 3 | |
| prsnt_wx_# | present weather indexed | code | std_code_src | present_weather | | 8 |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | mean sea level pressure | hPa | | | 1 | |
| air_temp | air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature | °C | | | 1 | |
| avg_wnd_dir_10m_pst2mts Previously: avg_wnd_dir_10m_mt58-60 | past 2-min vectoral average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst2mts Previously: avg_wnd_spd_10m_mt58-60 | past 2-min average 10m wind speed | km/h | | | 1 | |

| | | | | | | |
|---|--|----------|--------------|------------------------------------|---|--|
| wnd_gst_char_10m_pst10mts Previously: wnd_gst_char_10m_mt50-60 | past 10-min wind gust character | code | std_code_src | wind_gust_s quall_indicat or | | |
| max_wnd_gst_spd_10m_pst10mts Previously: max_wnd_gst_spd_10m_mt50-60 | past 10-min maximum 10m wind gust speed | km/h | | | 1 | |
| altmetr_setng | altimeter setting | inHg | | | 2 | |
| pres_tend_char_pst3hrs | past 3-hour trend pressure tendency characteristic | code | std_code_src | tendency_ch aracteristic | | |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure change amt | hPa | | | 1 | |
| rel_hum | relative humidity | % | | | 0 | |
| rmk | remark | unitless | | | | |
| pcpn_amt_pst6hrs | past 6-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | past 24-hour precipitation amount | mm | | | 1 | |
| snw_dpth | snow depth | cm | | | 0 | |
| avg_wnd_spd_10m_pst10mts | past 10-min average 10m wind speed | km/h | | | 1 | |
| snwfl_amt_pst24hrs | past 24h snowfall amount | cm | | | 0 | |
| avg_wnd_dir_10m_pst10mts | past 10-min vectoral average 10m wind direction | ° | | | 0 | |
| max_pk_wnd_spd_10m_pst24hrs | past 24-hour peak wind speed | km/h | | | 1 | |
| wnd_dir_10m_pst24hrs_pk_spd | past 24-hour peak wind direction | ° | | | 0 | |
| max_pk_wnd_tm_pst24hrs | past 24-hour peak wind time | datetime | | | | |

5.4 DND HWOS

DND HWOS is the name given to the DND staffed observations that are sent to MSC using a BUFR (Binary Universal Form of Representation) message. The BUFR message contains multiple fields that are not observed or reported by DND, and thus are either not included in the SWOB output or will always have a value of MSNG. The observers are expected to observe and input weather conditions in accordance with the Manual of Surface Observations (MANOBS). Observations are scheduled to be reported on an hourly basis at the top of the hour, along with ‘Special’ reports when warranted.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|-----------------|-------------------------------|----------------|----------------------|--------------------|-----------|--------------------------|
| wmo_synop_id | WMO Identifier | unitless | | | | |
| data_pvdr | data provider | unitless | | | | |
| data_attrib_not | data attribution notice | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| date_tm | official report date and time | datetime | | | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| icao_stn_id | ICAO station identifier | unitless | | | | |
| clim_id | climate identifier | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| stn_typ | station type | code | std_code_src | station_type | | |

| | | | | | | |
|-------------------------------|--|----------|--------------|--------------------------|---|---|
| cor | correction level | unitless | | | | |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | Mean sea level pressure | hPa | | | 1 | |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure tendency amount | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour trend of pressure tendency characteristic | code | std_code_src | tendency_ch aracteristic | | |
| altmetr_setng | altimeter settings | inHg | | | 2 | |
| air_temp | air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature | °C | | | 1 | |
| rel_hum | relative humidity | % | | | 0 | |
| vis | prevailing horizontal visibility | km | | | 3 | |
| vert_vis | vertical visibility (in meters) | m | | | 3 | |
| prsnt_wx_# | present weather | code | std_code_src | present_wea ther | | 5 |
| recnt_wx_# | recent weather | code | std_code_src | present_wea ther | | 3 |
| cld_amt_code_# | non-cumulative cloud amount coded (oktas) indexed by layer | code | std_code_src | total_cloud_ amount | | 5 |
| cld_bas_hgt_# | cloud base height | m | | | 0 | 5 |
| cld_typ_# | cloud type | code | std_code_src | obscuring_p henomena | | 5 |
| avg_wnd_dir_10m_pst2mts | past 2-minute average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst2mts | past 2-minute average 10m wind speed | km/h | | | 1 | |
| max_wnd_gst_spd_10m_pst 10mts | past 10-minute max 10 m wind gust speed | km/h | | | 1 | |
| rmk | remark | unitless | | | | |

Typically observed elements that are not reported by this dataset:

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|------------------------------|---|----------------|----------------------|--------------------|-----------|--------------------------|
| max_air_temp_pst1hr | past 1-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst1hr | past 1-hour minimum air temperature | °C | | | 1 | |
| max_air_temp_pst6hrs | past 6-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6-hour minimum air temperature | °C | | | 1 | |
| max_air_temp_pst24hrs | past 24-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24-hour minimum air temperature | °C | | | 1 | |
| max_vis | maximum horizontal visibility | km | | | 3 | |
| min_vis | minimum horizontal visibility | km | | | 3 | |
| tot_cld_amt | total cloud amount | % | | | 0 | |
| avg_wnd_dir_10m_pst10 mts | past 10-minute average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst10 mts | past 10-minute average 10m wind speed | km/h | | | 1 | |
| wnd_dir_10m_pst24hrs_p k_spd | wind direction associated with the past 24-hour peak wind speed at 10 m | ° | | | 0 | |
| max_pk_wnd_spd_10m_p st24hrs | past 24-hour maximum peak 2-minute mean 10m wind speed | km/h | | | 1 | |
| rnfl_snc_last_syno_hr | rainfall since last synoptic hour (TBRG) | mm | | | 1 | |

| | | | | | | |
|-------------------|---|----|--|--|---|--|
| pcpn_amt_pst6hrs | past 6-hour accumulated precipitation gauge amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | past 24-hour accumulated precipitation gauge amount | mm | | | 1 | |
| snw_dpth | snow depth | cm | | | 0 | |

5.5 MSC & Partner AWOS (RA messages)

RA is the bulletin header for MSC AWOS aviation weather observation reports. AWOS stations are connected via modem and voice-grade circuits to a regional host computer. These AWOS stations respond to a poll from the host and transmit their data. In response to a poll, AWOS transmits its most recent observation. These outputs are the assessment of weather conditions at a particular place and particular time. They are transmitted hourly, or whenever there is significant weather change, in which case a “Special” report (SP) is issued.

Sample Incoming Message:

```
RACN00 CWA0 040100
ZVV SA 031100 AUTO 41SCT/9.+/P-/M/-24.2/-28.2/29307G18/004//2/9+ 9+/9897/-
249-241/29007G030340365/Z/1245-0/
*
CL03/VC04/PB07/TC08/WC09/RE18/
*
3*83018701/4*8301/7*8301/9*9301/18*7101/
E83-03 E87-03/E83-04/E83-07/E93-09/E71-18/=
```

All the incoming elements, units and values that come from within the actual RA are mapped to their desired elements, units, values and qualifiers by the DMS and stored in XML format. These elements are then mapped to the short labels shown in the table below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|----------------|--|----------------|----------------------|--------------------|-----------|--------------------------|
| tc_id | TC identifier | unitless | | | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| date_tm | actual observation date-time | datetime | | | | |
| wmo_synop_id | WMO synop identifier | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| icao_stn_id | ICAO station identifier | unitless | | | | |
| clim_id | climate identifier | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| stn_typ | station type | code | std_code_src | station_type | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| clg_typ_# | ceiling type indexed by layer | code | std_code_src | ceiling_type | | 1 |
| cld_amt_code_# | cumulative cloud amount coded indexed by layer | code | std_code_src | total_cloud_amount | | 6 |
| cld_bas_hgt_# | cloud height indexed by layer | m | | | 0 | 6 |

| | | | | | | |
|---|--|-------|--------------|-------------------------|---|---|
| sum_cld_cvr_# | summation cloud cover indexed by layer | % | | | 0 | 6 |
| min_vis_pst10mts Previously: min_vis_mt50-60 | past 10-min minimum horizontal visibility | km | | | 3 | |
| max_vis_pst10mts Previously: max_vis_mt50-60 | past 10-min maximum horizontal visibility | km | | | 3 | |
| vis | horizontal visibility | km | | | 3 | |
| prsnt_wx_# Previously: prsnt_wx | present weather | code | std_code_src | present_weather | | 1 |
| air_temp | air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature | °C | | | 1 | |
| min_air_temp_pst1hr | past 1-hour min air temperature | °C | | | 1 | |
| max_air_temp_pst1hr | past 1-hour max air temperature | °C | | | 1 | |
| max_air_temp_pst6hrs | past 6 hours maximum air temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6 hours minimum air temperature | °C | | | 1 | |
| max_air_temp_pst24hrs | past 24 hours maximum air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24 hours minimum air temperature | °C | | | 1 | |
| avg_wnd_dir_10m_pst2mts Previously: avg_wnd_dir_10m_mt58-60 | past 2-min vectoral average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst2mts Previously: avg_wnd_spd_10m_mt58-60 | past 2-min average 10m wind speed | km/h | | | 1 | |
| max_wnd_gst_spd_10m_pst10mts Previously: max_wnd_gst_spd_10m_mt50-60 | past 10-min max 10m wind gust speed | km/h | | | 1 | |
| avg_wnd_dir_10m_pst10mts Previously: avg_wnd_dir_10m_mt50-60 | past 10-min vectoral average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst10mts Previously: avg_wnd_spd_10m_mt50-60 | past 10-min average 10m wind speed | km/h | | | 1 | |
| wnd_dir_10m_pst1hr_pk_spd | past 1-hour peak 10m wind speed direction | ° | | | 0 | |
| max_pk_wnd_spd_10m_pst1hr | past 1-hour peak 10m wind speed | km/h | | | 1 | |
| pcpn_gag_wt_fltrd | gauge weight filtered | kg/m² | | | 1 | |
| pcpn_amt_pst1hr | past 1-hour precipitation amount | mm | | | 1 | |
| altmetr_setng | altimeter setting | inHg | | | 2 | |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | mean sea level pressure | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour trend pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure tendency amount | hPa | | | 1 | |
| pres_tend_amt_pst1hr | past 1-hour differential pressure tendency amount | hPa | | | 1 | |
| rel_hum | derived relative humidity | % | | | 0 | |

| | | | | | | |
|-----------------------|---|----|--|--|---|--|
| pcpn_amt_pst3hrs | derived past 3-hour accumulated precipitation amount | mm | | | 1 | |
| pcpn_amt_pst6hrs | derived past 6-hour accumulated precipitation amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | derived past 24-hour accumulated precipitation amount | mm | | | 1 | |
| pcpn_snc_last_syno_hr | precipitation since last synoptic hour | mm | | | 1 | |

5.6 DND AWOS

The DND AWOS is a new generation Automatic Weather Observing System maintained and managed by the Department of National Defence (DND). These AWOS stations are a direct replacement of legacy MSC AWOS stations throughout the country, and are deployed in support of DND operations. Raw observations are collected by DND for processing before sending to MSC using a BUFR (Binary Universal Form of Representation) message. The BUFR message contains multiple fields that are not observed or reported by DND, and thus are either not included in the SWOB output or will always have a value of MSNG. The observations are scheduled to be taken hourly at top of the hour, and whenever there is significant weather change, in which case a 'Special' report is issued.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|------------------------|--|----------------|----------------------|-------------------------|-----------|--------------------------|
| clim_id | climate identifier | unitless | | | | |
| msc_id | msc identifier | unitless | | | | |
| wmo_synop_id | WMO synoptic identifier | unitless | | | | |
| data_pvdr | data provider | unitless | | | | |
| data_attrib_not | data attribution notice | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| stn_typ | station type | code | std_code_src | station_type | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| date_tm | date | datetime | | | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| icao_stn_id | icao station identifier | unitless | | | | |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | mean sea level pressure | hPa | | | 1 | |
| pres_tend_amt_pst3hrs | past 3-hour differential tendency amount | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour trend pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |
| altmetr_setng | altimeter setting | inHg | | | 2 | |
| air_temp | air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature | °C | | | 1 | |
| rel_hum | relative humidity | % | | | 0 | |
| max_air_temp_pst24hrs | past 24-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24-hour minimum air temperature | °C | | | 1 | |

| | | | | | | |
|------------------------------|--|------|--------------|-------------------------------|---|---|
| avg_vis_pst10mts | past 10-min average horizontal visibility | km | | | 3 | |
| max_vis_pst10mts | past 10-min maximum horizontal visibility | km | | | 3 | |
| min_vis_pst10mts | past 10-min minimum 2.83m horizontal visibility | km | | | 3 | |
| cld_bas_hgt_# | cloud height | m | | | 0 | 6 |
| cld_amt_code_# | Cumulative cloud amount coded (oktas) indexed by layer | code | std_code_src | total_cloud_amount | | 6 |
| cld_lyr_amt_rptg_mtd | cloud layer amount reporting method | code | std_code_src | cloud_amount_reporting_method | | |
| vert_vis | vertical visibility | m | | | 3 | |
| prsnt_wx_# | present weather indexed | code | std_code_src | present_weather | | 8 |
| avg_wnd_dir_10m_pst10mts | past 10-min average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst10mts | past 10-min average 10m wind speed | km/h | | | 1 | |
| avg_wnd_dir_10m_pst2mts | past 2-min average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst2mts | past 2-min average 10m wind speed | km/h | | | 1 | |
| max_wnd_gst_spd_10m_pst10mts | past 10-min maximum 10m wind gust speed | km/h | | | 1 | |
| max_pk_wnd_spd_10m_pst1hr | past 1-hour instantaneous 10m peak wind speed | km/h | | | 1 | |
| wnd_dir_10m_pst1hr_pk_spd | past 1-hour instantaneous 10m peak wind direction | ° | | | 0 | |
| wnd_dir_10m_pst1hr_max_spd | past 1-hour maximum 10m wind speed direction | ° | | | 0 | |
| max_wnd_spd_10m_pst1hr | past 1-hour maximum 10m wind speed | km/h | | | 1 | |

Typically observed elements that are not reported by this dataset:

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|----------------------|--|----------------|----------------------|--------------------|-----------|--------------------------|
| pcpn_amt_pst1hr | past 1-hour accumulated precipitation gauge amount | mm | | | 1 | |
| pcpn_amt_pst6hrs | past 6-hour accumulated precipitation gauge amount | mm | | | 2 | |
| vpr_pres | vapour pressure | hPa | | | 1 | |
| wetblb_temp | wet bulb temperature | °C | | | 1 | |
| max_air_temp_pst1hr | past 1-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst1hr | past 1-hour minimum air temperature | °C | | | 1 | |
| max_air_temp_pst6hrs | past 6-hour maximum air temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6-hour minimum air temperature | °C | | | 1 | |

5.7 Nav Canada HWOS

NC-HWOS is the common name given to observation data transmitted by NAV CANADA's (NC) new software interface for manned observations. NC-HWOS is a direct replacement of WinIDE/MIDS. The observing program is in support of aviation and most stations are located at airports. Observers are expected to input weather conditions in accordance with the Manual of

Surface Observations (MANOBS). The output is a BUFR (Binary Universal Form of Representation) message, which is not human readable. All the incoming elements, units and values that come from within the actual BUFR are mapped to their desired elements, units, values and qualifiers by the DMS and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|------------------------|---|----------------|----------------------|-------------------------|-----------|--------------------------|
| wmo_synop_id | WMO Identifier | unitless | | | | |
| data_pvdr | data provider | unitless | | | | |
| data_attrb_not | data attribution notice | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| date_tm | official report date and time | datetime | | | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| icao_stn_id | ICAO station identifier | unitless | | | | |
| clim_id | climate identifier | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| stn_typ | station type | code | std_code_src | station_type | | |
| cor | correction level | unitless | | | | |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | Mean sea level pressure | hPa | | | 1 | |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure tendency amount | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour trend of pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |
| altmetr_setng | altimeter settings | inHg | | | 2 | |
| air_temp | 2 m air temperature | °C | | | 1 | |
| dwpt_temp | 2 m dew point Temperature | °C | | | 1 | |
| rel_hum | 2 m relative humidity | % | | | 0 | |
| max_air_temp_pst1hr | past 1-hour max 2 m Air Temperature | °C | | | 1 | |
| min_air_temp_pst1hr | past 1-hour min 2 m air temperature | °C | | | 1 | |
| max_air_temp_pst6hrs | past 6-hour max 2 m Air Temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6-hour min 2 m air temperature | °C | | | 1 | |
| max_air_temp_pst24hrs | past 24-hour max 2 m air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24-hour min 2 m air temperature | °C | | | 1 | |
| vis | prevailing horizontal visibility | km | | | 3 | |
| max_vis | maximum horizontal visibility | km | | | 3 | |
| min_vis | minimum horizontal visibility | km | | | 3 | |
| vert_vis | vertical visibility (in meters) | m | | | 3 | |
| prsnt_wx_# | present weather | code | std_code_src | present_weather | | 5 |
| recnt_wx_# | recent weather | code | std_code_src | present_weather | | 3 |
| tot_cld_amt | total cloud amount | % | | | 0 | |

| | | | | | | |
|---|---|----------|--------------|-----------------------|---|---|
| cld_amt_code_# | non-cumulative cloud amount coded (oktas) indexed by layer | code | std_code_src | total_cloud_amount | | 5 |
| cld_bas_hgt_# | cloud base height | m | | | 0 | 5 |
| cld_typ_# | cloud type | code | std_code_src | obscuring_p_henomena | | 5 |
| avg_wnd_dir_10m_pst10mts Previously: avg_wnd_dir_10m_mt50-60 | 10-minute average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst10mts Previously: avg_wnd_spd_10m_mt50-60 | 10-minute average 10m wind speed | km/h | | | 1 | |
| avg_wnd_dir_10m_pst2mts Previously: avg_wnd_dir_10m_mt58-60 | 2-minute average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst2mts Previously: avg_wnd_spd_10m_mt58-60 | 2-minute average 10m wind speed | km/h | | | 1 | |
| max_wnd_gst_spd_10m_pst10mts Previously: max_wnd_gst_spd_10m_mt50-60 | 10-minute max 10 m wind gust speed | km/h | | | 1 | |
| wnd_dir_10m_pst24hrs_pk_spd | wind direction associated with the past 24-hour peak wind speed at 10 m | ° | | | 0 | |
| max_pk_wnd_spd_10m_pst24hrs | past 24-hour maximum peak 2-minute mean 10m wind speed | km/h | | | 1 | |
| max_pk_wnd_tm_pst24hrs | past 24-hour peak wind time | datetime | | | | |
| max_pk_wnd_typ_pst24hrs | past 24-hour peak wind type | code | std_code_src | transient_p_henomenon | | |
| rnfl_snc_last_syno_hr | rainfall since last synoptic hour (TBRG) | mm | | | 1 | |
| pcpn_amt_pst6hrs | past 6-hour accumulated 1.5 m precipitation gauge amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | past 24-hour accumulated 1.5 m precipitation gauge amount | mm | | | 1 | |
| snw_dpth | snow depth | cm | | | 0 | |
| rmk | remark | unitless | | | | |

5.8 Nav Canada AWOS

NC-AWOS is the common name given to observation data gathered by NAV CANADA's (NC) new automated weather observation system (AWOS). The observing program is in support of aviation and most stations are located at airports. NC-AWOS is a new generation system intended to replace the MSC's legacy AWOS. It is encoded in a defined BUFR template created by NavCan and ECCC. Although a replacement of the legacy AWOS, NC-AWOS is not a direct data replacement. There are data content gains, losses and differences in comparison to the MSC legacy AWOS system. The output is a BUFR (Binary Universal Form of Representation) message, which is not human readable. All the incoming elements, units and values that come from within the actual BUFR are mapped to their desired elements, units, values and qualifiers by the DMS and stored in XML format. These elements are then mapped to the short labels shown in the table below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (_#) |
|--------------|-------------------------|----------------|----------------------|--------------------|-----------|---------------------------|
| clim_id | climate identifier | unitless | | | | |
| msc_id | msc identifier | unitless | | | | |
| wmo_synop_id | WMO synoptic identifier | unitless | | | | |

| | | | | | | |
|---|--|----------|--------------|-------------------------|---|---|
| data_pvdr | data provider | unitless | | | | |
| data_attrib_not | data attribution notice | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| stn_typ | station type | code | std_code_src | station_type | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| date_tm | date | datetime | | | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| icao_stn_id | icao station identifier | unitless | | | | |
| stn_pres | station pressure | hPa | | | 1 | |
| mslp | mean sea level pressure | hPa | | | 1 | |
| pres_tend_amt_pst3hrs | past 3-hour differential tendency amount | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour trend pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |
| altmetr_setng | altimeter setting | inHg | | | 2 | |
| air_temp | 2m air temperature | °C | | | 1 | |
| dwpt_temp | 2m dew point temperature | °C | | | 1 | |
| rel_hum | 2m relative humidity | % | | | 0 | |
| max_air_temp_pst1hr | past 1-hour maximum 2m air temperature | °C | | | 1 | |
| min_air_temp_pst1hr | past 1-hour minimum 2m air temperature | °C | | | 1 | |
| max_air_temp_pst6hrs | past 6-hour maximum 2m air temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6-hour minimum 2m air temperature | °C | | | 1 | |
| max_air_temp_pst24hrs | past 24-hour maximum 2m air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24-hour minimum 2m air temperature | °C | | | 1 | |
| avg_vis_pst10mts Previously: vis | 10-min average horizontal visibility | km | | | 3 | |
| max_vis_pst10mts Previously: max_vis_mt50-60 | 10-min maximum horizontal visibility | km | | | 3 | |
| min_vis_pst10mts Previously: min_vis_mt50-60 | 10-min minimum horizontal visibility | km | | | 3 | |
| cld_bas_hgt_# | cloud height | m | | | 0 | 6 |
| cld_amt_code_# | Cumulative cloud amount coded (oktas) indexed by layer | code | std_code_src | total_cloud_amount | | 6 |
| vert_vis | vertical visibility | m | | | 3 | |
| prsnt_wx_# | present weather indexed | code | std_code_src | present_weather | | 8 |
| avg_wnd_dir_10m_pst10mts Previously: avg_wnd_dir_10m_mt50-60 | 10-min average 10m wind direction | ° | | | 0 | |
| avg_wnd_spd_10m_pst10mts Previously: avg_wnd_spd_10m_mt50-60 | 10-min average 10m wind speed | km/h | | | 1 | |
| avg_wnd_dir_10m_pst2mts Previously: avg_wnd_dir_10m_mt58-60 | 2-min average 10m wind direction | ° | | | 0 | |

| | | | | | | |
|---|--|----------|--------------|-----------------------|---|--|
| avg_wnd_spd_10m_pst2mts Previously avg_wnd_spd_10m_mt58-60 | 2-min average 10m wind speed | km/h | | | 1 | |
| max_wnd_gst_spd_10m_pst10mts Previously: max_wnd_gst_spd_10m_mt50-60 | 10-min maximum 10m wind gust speed | km/h | | | 1 | |
| max_pk_wnd_spd_10m_pst1hr | past 1-hour instantaneous 10m peak wind speed | km/h | | | 1 | |
| wnd_dir_10m_pst1hr_pk_spd | past 1-hour instantaneous 10m peak wind direction | ° | | | 0 | |
| wnd_dir_10m_pst1hr_max_spd | past 1-hour maximum 10m wind speed direction | ° | | | 0 | |
| max_wnd_spd_10m_pst1hr | past 1-hour maximum 10m wind speed | km/h | | | 1 | |
| max_pk_wnd_tm_pst24hrs | past 24-hour maximum peak wind time | datetime | | | | |
| max_pk_wnd_typ_pst24hrs | past 24-hour maximum peak wind type | code | std_code_src | transcient_phenomenon | | |
| pcpn_amt_pst1hr | past 1-hour accumulated 1.5 m precipitation gauge amount | mm | | | 1 | |
| pcpn_amt_pst6hrs | past 6-hour accumulated 1.5 m precipitation gauge amount | mm | | | 2 | |

5.9 MSC & Partner surface weather network (Campbell Sci. CA messages)

The primary focus of the Public Surface Weather network is to support weather forecasting and climate monitoring. Observations are reported hourly, typically from data logger output tables 11 or 160. Campbell Scientific data loggers are the data acquisition system used in this network to obtain data from sensors, as well as process, store, and transmit the data. The data loggers encode the observations and transmit via the Datalogger Retrieval System on a one-observation to one-file basis. The file is transmitted to the Canadian Meteorological Centre (CMC) under the bulletin header CA. CMC then makes the file available to the rest of ECCC. The raw files are paired with a configuration file from JICC, which has information on element position, name and unit, to decode the CVS file format.

Sample of CA bulletin:

Table 160

CACN00 CWA0 121300

XQA

160,2010,132,1300,1583,100,152,-
15.84,85.4,3.774,3.77,142.4,2.584,5.639,1203,128.9,5.375,0,4.15,4.13,135.9,5.661,4.801,4.946,-
16.38,86.6,4.524,4.465,134,9.26,-15.83,-17.14,-12.95,12.32,1079,213.1,0,0.076,0.112,0.112, 0.158,-
10.14,-10.09,162,15

The resulting decoded elements are mapped to their desired element names, units, values and qualifiers by the DMS and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|---|--|-------------------|----------------------|--------------------|-----------|--------------------------|
| wmo_synop_id | wmo identifier | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| tc_id | TC identifier | unitless | | | | |
| clim_id | climate identifier | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| stn_elev | station elevation | m | | | 3 | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| date_tm | date and time | datetime | | | | |
| data_pvdr | data provider | unitless | | | | |
| data_avail | data availability | % | | | 0 | |
| logr_panl_temp | datalogger panel temperature | °C | | | 1 | |
| max_batry_volt_pst1hr | past 1-hour maximum battery voltage | V | | | 2 | |
| min_batry_volt_pst1hr | past 1-hour minimum battery voltage | V | | | 2 | |
| hdr_fwd_pwr | HDR (High Data Rate) transmitter forward power | W | | | 2 | |
| hdr_refltd_pwr | HDR (High Data Rate) transmitter reflected power | W | | | 2 | |
| hdr_supply_volt | HDR (High Data Rate) transmitter supply voltage | V | | | 2 | |
| hdr_oscil_drft | HDR (High Data Rate) transmitter oscillator drift | Hz | | | 2 | |
| avg_uvbn_idx_pst1hr | 5-minute average UVB index in past 1-hour | unitless | | | | |
| rel_hum | relative humidity | % | | | 0 | |
| max_rel_hum_pst1hr | past 1-hour maximum relative humidity | % | | | 0 | |
| min_rel_hum_pst1hr | past 1-hour minimum relative humidity | % | | | 0 | |
| avg_rel_hum_pst1hr | past 1-hour average relative humidity | % | | | 0 | |
| rnfl_amt_pst1hr | past 1-hour rainfall amount (TBRG) | mm | | | 1 | |
| avg_cum_pcpn_gag_wt_filt_d_pst5mts Previously: avg_avg_cum_pcpn_gag_wt_filt_d_55-60 | 5-minute cumulative precipitation gauge weight (filtered) | kg/m ² | | | 1 | |
| avg_cum_pcpn_gag_wt_filt_d_pst5mts_# | 5-minute cumulative precipitation gauge weight (filtered) min55-60 (indexed) | kg/m ² | | | 1 | 3 |
| pcpn_amt_pst1hr | past 1-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst1hr_# | past 1-hour precipitation amount (indexed) | mm | | | 1 | 2 |
| pcpn_amt_pst3hrs | past 3-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | past 24-hour precipitation amount | mm | | | 1 | |
| pcpn_snc_last_syno_hr | precipitation since last synoptic hour | mm | | | 1 | |
| air_temp | 1-min average air temperature | °C | | | 1 | |
| air_temp_# | 1-min average air temperature (indexed). | °C | | | 1 | 3 |
| avg_air_temp_pst1hr | past 1-hour average air temperature | °C | | | 1 | |
| avg_air_temp_pst1hr_# | past 1-hour average air temperature (indexed) | °C | | | 1 | 3 |
| max_air_temp_pst1hr | past 1-hour maximum air temperature | °C | | | 1 | |

| | | | | | | |
|---|---|------|--|--|---|---|
| max_air_temp_pst1hr_# | past 1-hour maximum air temperature (indexed) | °C | | | 1 | 3 |
| min_air_temp_pst1hr | past 1-hour minimum air temperature | °C | | | 1 | |
| min_air_temp_pst1hr_# | past 1-hour minimum air temperature (indexed) | °C | | | 1 | 3 |
| max_air_temp_pst6hrs | past 6-hour maximum (1-minute average) hourly air temperature | °C | | | 1 | |
| min_air_temp_pst6hrs | past 6-hour minimum (1-minute average) hourly air temperature | °C | | | 1 | |
| max_air_temp_pst24hrs | past 24-hour maximum (1-minute average) hourly air temperature | °C | | | 1 | |
| min_air_temp_pst24hrs | past 24-hour minimum (1-minute average) hourly air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature (top of the hour) | °C | | | 1 | |
| wetblb_temp | wet bulb temperature (top of hour) | °C | | | 1 | |
| avg_wetblb_temp_pst24hrs | past 24-hour average (1-minute average) wetbulb temperature | °C | | | 1 | |
| avg_wnd_spd_pcpn_gag_pst10mts Previously: avg_wnd_spd_pcpn_gag_mt50-60 | 10-minute average wind speed at the height of the precipitation gauge (approx. 2 m in most cases) | km/h | | | 1 | |
| avg_wnd_spd_10m_pst10mts Previously: avg_wnd_spd_10m_mt50-60 | 10-minute average 10 m wind speed | km/h | | | 1 | |
| avg_wnd_spd_10m_pst10mts_# | 10-minute average 10 m wind speed (indexed) | km/h | | | 1 | 2 |
| avg_wnd_dir_10m_pst10mts Previously: avg_wnd_dir_10m_mt50-60 | 10-minute vector average 10 m wind direction | ° | | | 0 | |
| avg_wnd_dir_10m_pst10mts_# | 10-minute vector average 10 m wind direction (indexed) | ° | | | 0 | 2 |
| avg_wnd_spd_10m_pst2mts Previously: avg_wnd_spd_10m_mt58-60 | 2-minute average 10 m wind speed | km/h | | | 1 | |
| avg_wnd_spd_10m_pst2mts_# | 2-minute average 10 m wind speed (indexed) | km/h | | | 1 | 2 |
| avg_wnd_dir_10m_pst2mts Previously: avg_wnd_dir_10m_mt58-60 | 2-minute vector average 10 m wind direction | ° | | | 0 | |
| avg_wnd_dir_10m_pst2mts_# | 2-minute vector average 10 m wind direction (indexed) | ° | | | 0 | 2 |
| avg_wnd_spd_10m_pst1hr | past 1-hour average 10 m wind speed | km/h | | | 1 | |
| avg_wnd_spd_10m_pst1hr_# | past 1-hour average 10 m wind speed (indexed) | km/h | | | 1 | 2 |
| avg_wnd_dir_10m_pst1hr | past 1-hour vector average 10 m wind direction | ° | | | 0 | |
| avg_wnd_dir_10m_pst1hr_# | past 1-hour vector average 10 m wind direction (indexed) | ° | | | 0 | 2 |
| max_wnd_spd_10m_pst10mts Previously: max_wnd_spd_10m_mt50-60 | 10-minute max 10 m wind speed | km/h | | | 1 | |
| max_wnd_spd_10m_pst10mts_# | 10-minute max 10 m wind speed (indexed) | km/h | | | 1 | 2 |
| wnd_dir_10m_pst10mts_max_spd Previously: wnd_dir_10m_mt50-60_max_spd | Instantaneous 10 m wind direction for max 10-minute wind speed | ° | | | 0 | |
| wnd_dir_10m_pst10mts_max_spd_# | Instantaneous 10 m wind direction for max 10-minute wind speed (indexed) | ° | | | 0 | 2 |

| | | | | | | |
|---|---|-------------------|--------------|-------------------------|---|---|
| max_wnd_spd_10m_pst1hr | 1-hour max 10 m wind speed | km/h | | | 1 | |
| max_wnd_spd_10m_pst1hr_# | 1-hour max 10 m wind speed (indexed) | km/h | | | 1 | 2 |
| wnd_dir_10m_pst1hr_max_spd | Instantaneous 10 m wind direction for max hourly wind speed | ° | | | 0 | |
| wnd_dir_10m_pst1hr_max_spd_# | Instantaneous 10 m wind direction for max hourly wind speed (indexed) | ° | | | 0 | 2 |
| max_wnd_spd_pst1hr_tm | Time of max hourly 10 m wind speed | hhmm | | | 1 | |
| max_wnd_spd_pst1hr_tm_# | Time of max hourly 10 m wind speed (indexed) | hhmm | | | 1 | 2 |
| max_wnd_gst_spd_10m_pst10mts Previously: max_wnd_gst_spd_10m_mt50-60 | 10-min max 10m wind gust speed | km/h | | | 1 | |
| wnd_dir_10m_pst1hr_pk_spd | past 1-hour peak instant wind direction at 10m | ° | | | 0 | |
| max_pk_wnd_spd_10m_pst1hr | past 1-hour peak instantaneous wind speed at 10 m | km/h | | | 1 | |
| max_pk_wnd_tm_pst1hr | past 1-hour peak instantaneous wind speed time | datetime | | | | |
| pk_wnd_rmk | derived peak wind remark | unitless | | | | |
| stn_pres | station pressure (top of hour) | hPa | | | 1 | |
| mslp | mean sea level pressure (top of the hour) | hPa | | | 1 | |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure tendency amount | hPa | | | 1 | |
| pres_tend_char_pst3hrs | past 3-hour differential pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |
| avg_snw_dpth_pst5mts Previously: snw_dpth | 5-min average snow depth | cm | | | 0 | |
| avg_snw_dpth_pst5mts_# Previously: snw_dpth_# | 5-min average snow depth (indexed). Only present if an official value from the three input snow depths could not be determined. | cm | | | 0 | 3 |
| avg_snw_dpth_pst1hr | past 1-hour average snow depth | cm | | | 0 | |
| max_vis_pst1hr | past 1-hour maximum horizontal visibility | km | | | 3 | |
| avg_globl_solr_radn_pst1hr | past 1-hour average global solar radiation (RF1) | W/m ² | | | 1 | |
| tot_globl_solr_radn_pst1hr | past 1-hour total global solar radiation (RF1) | kJ/m ² | | | 1 | |

5.10 PanAm – Minutely MSC & Partner surface weather network - COMPACT

A temporary MSC mesonet installed to support the 2015 PanAm Games. Atmospheric weather data are collected and output on a minutely basis. The stations are self-contained on a single portable platform that allows for the stations to be easily moved and deployed when and where needed. Most stations are deployed at ground level at or near venues, but some are on structures or rooftops (see wind note in section 5.2.1). Campbell Scientific data loggers are the data acquisition system used in this network to obtain data from sensors, as well as process, store, and transmit the data. The data loggers encode the observations and transmit via the Datalogger Retrieval System on a one-observation to one-file basis. The raw files are paired with a configuration file from JICC (using Table 63), which has information on element position, names and units, to decode the CVS file format. The minutely observed values are then used to derive additional minutely, hourly and daily elements. These are then mapped to the short labels below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|---|---|----------------|----------------------|--------------------|-----------|
| wmo_synop_id | wmo identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| tc_id | TC identifier | unitless | | | |
| clim_id | climate identifier | unitless | | | |
| msc_id | MSC identifier | unitless | | | |
| stn_elev | station elevation | m | | | 3 |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| date_tm | date and time | datetime | | | |
| data_avail_pst1hr | data availability | % | | | 0 |
| data_avail_pst1mt | data availability | % | | | 0 |
| min_batry_volt_pst1mt | past 1-minute minimum battery voltage | V | | | 2 |
| min_batry_volt_pst1hr | past 1-hour minimum battery voltage | V | | | 2 |
| max_batry_volt_pst1mt | past 1-minute maximum battery voltage | V | | | 2 |
| max_batry_volt_pst1hr | past 1-hour maximum battery voltage | V | | | 2 |
| logr_panl_temp | datalogger panel temperature | °C | | | 1 |
| air_temp Previously: avg_air_temp_pst1mt | 1-min average air temperature | °C | | | 1 |
| rel_hum Previously: avg_rel_hum_pst1mt | 1-minute average relative humidity | % | | | 0 |
| max_rel_hum_pst1mt | 1-minute maximum relative humidity | % | | | 0 |
| min_rel_hum_pst1mt | 1-minute minimum relative humidity | % | | | 0 |
| dwpt_temp Previously: avg_dwpt_temp_pst1mt | 1-minute average dew point temperature | °C | | | 1 |
| wetblb_temp Previously: avg_wetblb_temp_pst1mt | 1-minute average wet bulb temperature | °C | | | 1 |
| stn_pres Previously: avg_stn_pres_pst1mt | 1-minute average station pressure | hPa | | | 1 |
| avg_wnd_spd_10m_pst1mt | 1-minute average wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst1mt | 1-minute vector average wind direction | ° | | | 0 |
| max_wnd_spd_10m_pst1mt | 1-minute maximum wind speed | km/h | | | 1 |
| wnd_dir_10m_pst1mt_max_spd | 1-minute vector average wind direction | ° | | | 0 |
| max_wnd_spd_10m_pst10mts | 10-minute maximum-wind speed | km/h | | | 1 |
| wnd_dir_10m_pst10mts_max_spd | 1-minute vector average wind direction | ° | | | 0 |
| max_wnd_spd_10m_pst1hr | 1-hour maximum wind speed | km/h | | | 1 |
| wnd_dir_10m_pst1hr_max_spd | 1-hr vector average wind direction | ° | | | 0 |
| max_wnd_spd_10m_pst1hr_tm | 1-hour maximum wind speed | hhmm | | | 1 |
| avg_wnd_spd_10m_pst1hr | past 1-hour average wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst1hr | past 1-hour vector average wind direction | ° | | | 0 |

| | | | | | |
|---|---|------|--------------|-----------------|---|
| avg_wnd_spd_10m_pst10mts | past 10-minute average wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst10mts | past 10-minute vector average wind direction | ° | | | 0 |
| avg_wnd_spd_10m_pst2mts | past 2-minute average wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst2mts | past 2-minute vector average wind direction | ° | | | 0 |
| mslp Previously: avg_mslp_pst1mt | past 1-minute average mean sea level pressure | hPa | | | 1 |
| avg_dwpt_temp_pst1hr | 1-hour average dew point temperature | °C | | | 1 |
| max_rel_hum_pst1hr | 1-hour maximum relative humidity | % | | | 0 |
| min_rel_hum_pst1hr | 1-hour minimum relative humidity | % | | | 0 |
| avg_air_temp_pst1hr | past 1-hour average air temperature | °C | | | 1 |
| max_air_temp_pst1hr | past 1-hour maximum air temperature | °C | | | 1 |
| min_air_temp_pst1hr | past 1-hour minimum air temperature | °C | | | 1 |
| avg_rel_hum_pst1hr | past 1-hour average relative humidity | % | | | 0 |
| rnfl_amt_pst1hr | past 1-hour rainfall amount (TBRG) | mm | | | 1 |
| pcpn_amt_pst1hr | past 1-hour precipitation amount | mm | | | 1 |
| pcpn_amt_pst1mt | past 1-minute precipitation amount | mm | | | 1 |
| pcpn_amt_pst10mts | past 10-minute precipitation amount | mm | | | 1 |
| pcpn_typ_pst1mt | past 1-minute precipitation amount | code | std_code_src | present_weather | 1 |
| pcpn_amt_snc_top_of_hr | precipitation amount since top of the hour | mm | | | 1 |
| max_wnd_gst_spd_10m_pst10mts | 10-min max wind gust speed | km/h | | | 1 |
| wnd_dir_10m_pst1hr_pk_spd | past 1-hour peak instantaneous wind direction | ° | | | 0 |
| max_pk_wnd_spd_10m_pst1hr | past 1-hour peak instantaneous wind speed | km/h | | | 1 |

5.11 OPP Moored Buoy

The Ocean Protection Plan is the largest Government of Canada (GoC) undertaking to improve marine safety and responsible shipping, protect Canada's marine environment, and offer new possibilities for Indigenous and coastal communities. Towards this effort Environment and Climate Change Canada is mandated to deploy new moored buoys along the Pacific and Atlantic coasts. These buoys will report hourly weather, wave and housekeeping (diagnostic) data in CSV (comma separated value) format over the Iridium satellite network. The data will be processed in real-time, quality assessed and products such as WMO synoptic and SWOB will be generated and disseminated to their respective end-points. Additionally, MSC forecasters will use the OPP data in NinJo (forecaster workstation) to produce accurate and localized coastal marine forecasts towards fulfilling GoC OPP objectives.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|--------------|--|----------------|----------------------|--------------------|-----------|--------------------------|
| wmo_synop_id | wmo identifier | unitless | | | | |
| wmo_id_extnd | extended wmo id with 7 digits used by OPP | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| msc_id | MSC identifier | unitless | | | | |
| stn_elev | station elevation | m | | | 3 | |
| snsr_tbl_nbr | output table number and parameter in the uri | unitless | | | | |

| | | | | | | |
|-----------------------------|---|----------|--------------|-------------------------|---|---|
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| date_tm | date and time | datetime | | | | |
| buoy_typ | type of buoy | code | std_code_src | buoy_type | | |
| rpt_typ | report type | code | std_code_src | report_type | | |
| crnt_buoy_lat | current buoy latitude | ° | | | 6 | |
| crnt_buoy_long | current buoy longitude | ° | | | 6 | |
| avg_crnt_volt_pst10mts | 10-minute average current voltage | V | | | 1 | 1 |
| avg_solr_panl_crnt_pst10mts | 10-minute average solar panel current | A | | | 2 | 1 |
| avg_batry_volt_pst10mts | 10-minute average battery voltage | V | | | 1 | 1 |
| avg_air_temp_pst10mts | 10-min average air temperature | °C | | | 1 | 1 |
| avg_stn_pres_pst10mts | 10-minute average station pressure | hPa | | | 1 | 2 |
| avg_sea_sfc_temp_pst10mts | 10-minute sea surface temperature | °C | | | 1 | 1 |
| avg_wnd_spd_pst10mts | 10-minute average wind speed | km/h | | | 1 | 2 |
| avg_wnd_dir_pst10mts | 10-minute vector average wind direction | ° | | | 0 | 2 |
| max_avg_wnd_spd_pst10mts | 10-minute maximum average wind speed | km/h | | | 1 | 2 |
| wnd_snsr_vert_disp | vertical displacement of the wind sensors | m | | | 1 | 2 |
| pk_wave_pd_pst20mts | 20-minute peak wave period | s | | | 1 | 1 |
| pk_wave_hgt_pst20mts | 20-minute peak wave height | m | | | 1 | 1 |
| sig_wave_pd_pst20mts | 20-minute significant wave period | s | | | 1 | 1 |
| sig_wave_hgt_pst20mts | 20-minute significant wave height | m | | | 1 | 1 |
| avg_wave_pd_pst20mts | 20-minute average wave period | s | | | 1 | 1 |
| avg_wave_hgt_pst20mts | 20-minute average wave height | m | | | 1 | 1 |
| avg_max_wave_pd_pst20mts | 20-minute maximum average wave period | s | | | 1 | 1 |
| avg_max_wave_hgt_pst20mts | 20-minute maximum average wave height | m | | | 1 | 1 |
| avg_mslp_pst10mts | 10-minute average mean sea level pressure | hPa | | | 1 | 1 |
| pres_tend_amt_pst3hrs | 3-hour pressure tendency amount | hPa | | | 1 | 1 |
| pres_tend_char_pst3hrs | 3-hour pressure tendency characteristic | code | std_code_src | tendency_characteristic | | |

5.12 BC Ministry of Transportation & Infrastructure (BC-TRAN)

British Columbia Ministry of Transportation and Infrastructure (BC-TRAN) operates a network of automatic weather stations along its highways throughout the province. This network resets accumulations and measurement intervals for statistics at 0600 and 1800 Pacific Standard Time daily. Environment and Climate Change Canada retrieves the data from BC-TRAN server in CSV format and ingests into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-----------------------------|--|----------------|----------------------|----------------------------------|-----------|
| lat | Latitude | ° | | | 6 |
| long | Longitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | |
| msc_id | MSC identifier | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| stn_shrt_nam | Station short name | unitless | | | |
| date_tm | Date and time | datetime | | | |
| data_pvdr | Data provider | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| stn_pres | Station pressure | hPa | | | |
| max_wnd_spd_10m_pst1hr | Past 1-hr maximum 10 m wind speed | km/h | | | 1 |
| avg_wnd_spd_10m_pst10mts | Past 10-min average 10 m wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst10mts | Past 10-min vector average 10 m wind direction | ° | | | 0 |
| air_temp | Air temperature | °C | | | |
| max_air_temp_snc_last_reset | Maximum air temperature since last reset | °C | | | |
| min_air_temp_snc_last_reset | Minimum air temperature since last reset | °C | | | |
| dwpt_temp | Dew point temperature | °C | | | |
| pcpn_amt_pst1hr | Precipitation amount past 1-hr | mm | | | 1 |
| pcpn_snc_last_reset | Precipitation amount since last reset | mm | | | 1 |
| pcpn_dctn | Precipitation detected | unitless | | | |
| pcpn_msrmnt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hrs | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hrs | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hrs | mm | | | 1 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hrs | mm | | | 1 |
| rel_hum | Relative humidity | % | | | |
| snw_dpth | Adjacent snow depth | cm | | | 0 |
| snwfl_snc_last_reset | Snowfall amount since last reset | cm | | | 0 |
| snwfl_amt_pst1hr | Snowfall amount past 1-hr | cm | | | 0 |
| mslp | Mean sea level pressure | hPa | | | 1 |
| last_reset_date_tm | Last reset date time | datetime | | | |
| wnd_snsr_vert_disp | Wind sensor vertical displacement | m | | | 2 |

5.13 BC Wildfire Management Branch (BC-FLNR-WMB)

British Columbia Ministry of Forests, Lands and Natural Resources - Wildfire Management Branch, commonly known as BC forestry, operates approximately 260 hourly automated weather stations to support fire weather forecasting and the Canadian Forest Fire Danger Rating System. BC forestry encodes the data from all stations into single ASCII file and it is retrieved by ECCC. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|--------------------------|--|-------------------|----------------------|----------------------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| lat | Latitude | ° | | | 6 |
| long | Longitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | 3 |
| date_tm | Date and time | datetime | | | |
| data_pvdr | Data provider | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| rnfl_amt_pst1hr | Rainfall amount past 1-hour | mm | | | 1 |
| rnfl_amt_pst3hrs | Rainfall amount past 3 hours | mm | | | 1 |
| rnfl_amt_pst6hrs | Rainfall amount past 6 hours | mm | | | 1 |
| rnfl_amt_pst24hrs | Rainfall amount past 24 hours | mm | | | 1 |
| air_temp | Air temperature | °C | | | 1 |
| rel_hum | Relative humidity | % | | | 0 |
| avg_wnd_dir_10m_pst10mts | Past 10-min vector average 10 m wind direction | ° | | | 0 |
| avg_wnd_spd_10m_pst10mts | Past 10-min average 10 m wind speed | km/h | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1-hour | mm | | | 1 |
| snw_dpth | Snow depth | cm | | | 0 |
| dwpt_temp | Dew point temperature | °C | | | 1 |
| pcpn_msrmt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| cum_pcpn_gag_wt | cumulative precipitation gauge weight | kg/m ² | | | 2 |

5.14 BC Ministry of Environment and Climate Change Strategy-Air Quality (BC-ENV-AQMet)

British Columbia Ministry of Environment and Climate Change Strategy (BC ENV) operates a network of weather stations for the purpose of air quality monitoring. BC ENV operates approximately 50 meteorological monitoring stations that transmit data via cellular or telephone telemetry to a central database every hour. Hourly data is retrieved from BC ENV in a CSV format and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------|-------------------|----------------|----------------------|--------------------|-----------|
| stn_nam | station name | unitless | | | |
| msc_id | msc identifier | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| data_pvdr | data provider | unitless | | | |

| | | | | | |
|--|--|-------------------|--|--|---|
| data_attrib_not | data attribution notice | unitless | | | |
| date_tm | date and time | datetime | | | |
| stn_id | station id | unitless | | | |
| pcpn_msrmnt_mtd | precipitation measurement method | code | | | |
| avg_rel_hum_pst1hr | past 1-hour relative humidity | % | | | 0 |
| avg_stn_pres_pst1hr | past 1-hour station pressure | kPa | | | 1 |
| avg_vpr_pres_pst1hr | past 1-hour vapour pressure | kPa | | | |
| wnd_gst_spd_pst1hr_tm | past 1-hour wind gust speed | km/h | | | |
| avg_cum_pcpn_gag_wt_pst1mt | Past 1-minute cumulative precipitation gauge weight | kg/m ² | | | 1 |
| avg_1mt_wnd_dir_10m_pst1hr_max_avg_1mt_wnd_spd | Past 1-hour average 10m wind direction of maximum 1-minute mean wind speed | ° | | | |
| max_1mt_avg_wnd_spd_10m_pst1hr | past 1-hour maximum 10m 1-minute mean wind speed | km/h | | | 1 |
| std_dev_wnd_spd_sclr_10m_pst1hr | past 1-hour standard deviation 10m scalar wind speed | km/h | | | 1 |
| avg_wnd_spd_sclr_10m_pst1hr | past 1-hour average 10m scalar wind speed | km/h | | | |
| avg_wnd_dir_std_dev_10m_pst1hr | past 1-hour standard deviation 10m wind direction based on 4 15 minute sub-intervals | ° | | | |
| avg_unit_vtr_wnd_dir_10m_pst1hr | past 1-hour average 10m unit vector wind direction | ° | | | |
| max_wnd_gst_spd_10m_pst1hr | past 1-hour maximum 10m wind gust speed | km/h | | | 1 |
| std_dev_wnd_dir_10m_pst1hr | past 1-hour standard deviation 10m wind direction | ° | | | 0 |
| avg_wnd_dir_10m_pst1hr | past 1-hour average 10m wind direction | ° | | | 0 |
| max_wnd_spd_10m_pst1hr | past 1-hour maximum 10m wind speed | km/h | | | 1 |
| avg_wnd_spd_10m_pst1hr | past 1-hour average 10m wind speed | km/h | | | 1 |
| snw_snsr_sgnl_qlty | snow sensor signal quality | unitless | | | |
| weighng_gag_stat | weighing gauge status | unitless | | | |
| data_avail_pst1hr | past 1-hour data availability | % | | | |
| dwpt_temp | dew point temperature | °C | | | 1 |
| avg_air_temp_pst1hr | past 1-hour average air temperature | °C | | | 1 |
| avg_globl_solar_radn_pst1hr | past 1-hour global solar radiation | W/m ² | | | 1 |
| snw_dpth | snow depth | cm | | | 0 |
| pcpn_amt_pst1hr | past 1-hour precipitation amount | mm | | | 1 |
| pcpn_amt_pst3hrs | past 3-hour precipitation amount | mm | | | 1 |
| pcpn_amt_pst6hrs | past 6-hour precipitation amount | mm | | | 1 |
| pcpn_amt_pst12hrs | past 12-hour precipitation amount | mm | | | 1 |
| pcpn_amt_pst24hrs | past 24-hour precipitation amount | mm | | | 1 |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |

5.15 BC Ministry of Environment and Climate Change Strategy-Snow Weather (BC-ENV-SnowWx)

British Columbia Ministry of Environment and Climate Change Strategy (BC ENV) operates a network of automatic weather stations that report snow, precipitation, and temperature values. This network utilizes GOES for transmitting observations from the station to a central processor. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (_#_) |
|-----------------------------|--|----------------|----------------------|--------------------|-----------|----------------------------|
| stn_nam | station name | unitless | | | | |
| msc_id | msc identifier | unitless | | | | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| stn_elev | station elevation | m | | | 3 | |
| data_pvdr | data provider | unitless | | | | |
| data_attrib_not | data attribution notice | unitless | | | | |
| date_tm | date and time | datetime | | | | |
| nesdis_id | NESDIS Identifier | unitless | | | | |
| air_temp_# | current air temperature | °C | | | 1 | 2 |
| air_temp_1hr_ago_# | air temperature 1 hour ago | °C | | | 1 | 2 |
| air_temp_2hrs_ago_# | air temperature 2 hours ago | °C | | | 1 | 2 |
| snw_dpth_wtr_equiv | snow depth water equivalence | cm | | | 1 | |
| snw_dpth_wtr_equiv_1hr_ago | snow depth water equivalence 1 hour ago | cm | | | 1 | |
| snw_dpth_wtr_equiv_2hrs_ago | snow depth water equivalence 2 hours ago | cm | | | 1 | |
| snw_dpth | snow depth | mm | | | 0 | |
| snw_dpth_1hr_ago | snow depth 1 hour ago | mm | | | 0 | |
| snw_dpth_2hrs_ago | snow depth 2 hours ago | mm | | | 0 | |
| cum_pcpn_amt | cumulative rainfall amount | mm | | | 1 | |
| cum_pcpn_amt_1hr_ago | cumulative rainfall amount 1 hour ago | mm | | | 1 | |
| cum_pcpn_amt_2hrs_ago | cumulative rainfall amount 2 hours ago | mm | | | 1 | |
| solr_panl_crnt | solar panel current | A | | | 1 | |
| batry_crnt | battery current | A | | | 1 | |
| batry_volt | battery voltage | V | | | | |
| batry_volt_1hr_ago | battery voltage 1 hour ago | V | | | 2 | |
| batry_volt_2hrs_ago | battery voltage 2 hours ago | V | | | 2 | |
| solr_volt | solar voltage | V | | | 2 | |
| solr_volt_1hr_ago | solar voltage 1 hour ago | V | | | 2 | |
| solr_volt_2hrs_ago | solar voltage 2 hours ago | V | | | 2 | |
| trans_batry_volt | transmitter voltage | V | | | | |
| trans_batry_volt_1hr_ago | transmitter voltage 1 hour ago | V | | | 2 | |
| trans_batry_volt_2hrs_ago | transmitter voltage 2 hours ago | V | | | 2 | |
| wtr_lvl_1hr_ago | water level | m | | | 1 | |
| wtr_lvl_2hrs_ago | water level 2 hours ago | m | | | | |
| snw_dpth_qlty | snow depth quality | unitless | | | | |
| snw_dpth_qlty_1hr_ago | snow depth quality 1 hour ago | unitless | | | | |
| snw_dpth_qlty_2hrs_ago | snow depth quality 2 hours ago | unitless | | | | |

| | | | | | | |
|-------------------|-----------------------------------|----|--|--|---|--|
| wtr_temp | water temperature | °C | | | 1 | |
| wtr_temp_1hr_ago | water temperature 1 hour ago | °C | | | 1 | |
| wtr_temp_2hrs_ago | water temperature 2 hours ago | °C | | | 1 | |
| pcpn_amt_pst1hr | past 1-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst3hrs | past 3-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst6hrs | past 6-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst12hrs | past 12-hour precipitation amount | mm | | | 1 | |
| pcpn_amt_pst24hrs | past 24-hour precipitation amount | mm | | | 1 | |

5.16 NT Department of Environment and Natural Resources (NT Forestry)

The Northwest Territories Department of Environment and Natural Resources operates a network of automatic weather stations to support fire weather operations in the territory. NT forestry encodes the data from all stations into single ASCII file and it is retrieved by ECCC. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Short Label | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------------------|--|----------------|----------------------|--------------------|-----------|
| stn_nam | station name | unitless | | | |
| msc_id | msc identifier | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| nesdis_id | nesdis identifier | unitless | | | |
| date_tm | date and time | datetime | | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| avg_air_temp_pst1hr | air temperature (hourly average) | °C | | | 1 |
| avg_rel_hum_pst1hr | relative humidity (hourly average) | % | | | 0 |
| avg_wnd_spd_10m_pst1hr | wind speed (hourly average) | km/h | std_code_src | data_flags | 1 |
| avg_wnd_spd_3m_pst1hr | wind speed (hourly average at 3m) | km/h | std_code_src | data_flags | 1 |
| max_wnd_spd_10m_pst1hr | wind speed (hourly maximum) | km/h | | | 1 |
| wnd_dir_pst1hr_max_spd | wind direction maximum speed (hourly) | ° | | | 0 |
| avg_wnd_dir_pst1hr | wind direction (wind speed hourly average) | ° | | | 0 |
| rnfl_amt_pst1hr | rainfall amount (hourly) | mm | | | 1 |
| max_air_temp_pst1hr | air temperature (hourly max) | °C | | | 1 |
| min_air_temp_pst1hr | air temperature (hourly min) | °C | | | 1 |
| max_rel_hum_pst1hr | relative humidity (hourly max) | % | | | 0 |
| min_rel_hum_pst1hr | relative humidity (hourly min) | % | | | 0 |
| tlmtry_volt | telemetry voltage | V | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount (24 hour) | mm | | | 1 |

| | | | | | |
|----------------------------|--|----------|------------------|---------------------------------|---|
| max_air_temp_pst24hrs | air temperature (24 hour max) | °C | | | 1 |
| min_air_temp_pst24hrs | air temperature (24 hour min) | °C | | | 1 |
| max_rel_hum_pst24hrs | relative humidity (24 hour max) | % | | | 0 |
| min_rel_hum_pst24hrs | relative humidity (24 hour min) | % | | | 0 |
| avg_globl_solr_radn_pst1hr | global solar radiation (hourly average) | W/m2 | | | 0 |
| cum_rnfl_amt | cumulative rainfall amount | mm | | | 1 |
| trans_batry_volt | transmitter battery voltage | V | | | 1 |
| stdng_wave_ratio | standing wave ratio | unitless | | | 2 |
| batry_volt | battery voltage | V | | | 1 |
| batry_crnt | battery current | V | | | 1 |
| solr_panl_volt | solar panel voltage | A | | | 1 |
| solr_panl_crnt | solar panel current | A | | | 1 |
| fuel_temp | fuel temperature (hourly average) | °C | | | 1 |
| fuel_moist | fuel moisture (hourly average) | % | | | 1 |
| avg_stn_pres_pst1hr | station pressure (hourly average) | hPa | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_ src | tendency_ characteri stic | |
| mslp | mean sea level pressure | hPa | | | 1 |

5.17 NT Water Resources Division (NT Water)

The Government of Northwest Territories, Water Resources Division operates six real-time stations to monitor weather and climate in the territory. This network utilizes GOES for transmitting hourly observations from the stations to a central processor. GOES transmissions are routed through WMO's Global Telecommunication System (GTS) where they are retrieved by ECCC hourly and ingested into the Data Management System (DMS). The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Short Label | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|----------------|-------------------------|----------------|----------------------|--------------------|-----------|
| stn_nam | station name | unitless | | | |
| msc_id | msc identifier | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| data_pvdr | data provider | unitless | | | |
| data_attrb_not | data attribution notice | unitless | | | |
| nesdis_id | nesdis identifier | unitless | | | |

| | | | | | |
|---|--|----------|--|--|---|
| date_tm | date and time | datetime | | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| avg_air_temp_pst1hr | air temperature (hourly average) | °C | | | 1 |
| avg_rel_hum_pst1hr | relative humidity (hourly average) | % | | | 0 |
| avg_wnd_spd_10m_pst1hr | wind speed (hourly average) | km/h | | | 1 |
| avg_wnd_spd_3m_pst1hr | wind speed (hourly average at 3m) | km/h | | | 1 |
| max_wnd_spd_10m_pst1hr | wind speed (hourly maximum) | km/h | | | 1 |
| wnd_dir_pst1hr_max_spd | wind direction maximum speed (hourly) | ° | | | 0 |
| avg_wnd_dir_pst1hr | wind direction (wind speed hourly average) | ° | | | 0 |
| rnfl_amt_pst1hr | rainfall amount (hourly) | mm | | | 1 |
| max_air_temp_pst1hr | air temperature (hourly max) | °C | | | 1 |
| min_air_temp_pst1hr | air temperature (hourly min) | °C | | | 1 |
| max_rel_hum_pst1hr | relative humidity (hourly max) | % | | | 0 |
| min_rel_hum_pst1hr | relative humidity (hourly min) | % | | | 0 |
| tlmtry_volt | telemetry voltage | V | | | 1 |
| max_air_temp_pst24hrs | air temperature (24 hour max) | °C | | | 1 |
| min_air_temp_pst24hrs | air temperature (24 hour min) | °C | | | 1 |
| max_rel_hum_pst24hrs | relative humidity (24 hour max) | % | | | 0 |
| min_rel_hum_pst24hrs | relative humidity (24 hour min) | % | | | 0 |
| avg_globl_solr_radn_pst1hr | global solar radiation (hourly average) | W/m2 | | | 0 |
| cum_rnfl_amt | cumulative rainfall amount | mm | | | 1 |
| trans_batry_volt | transmitter battery voltage | V | | | 1 |
| stdng_wave_ratio | standing wave ratio | unitless | | | 2 |
| batry_volt | battery voltage | V | | | 1 |
| batry_crnt | battery current | V | | | 1 |
| solr_panl_volt | solar panel voltage | A | | | 1 |
| solr_panl_crnt | solar panel current | A | | | 1 |
| snw_dpth | snow depth | cm | | | 1 |
| avg_subsfrc_temp_pst1hr | subsurface temperature (hourly) | °C | | | 2 |
| avg_subsfrc_temp_5cm_dpth_pst1hr | subsurface temperature (hourly, 5cm depth) | °C | | | 2 |
| avg_subsfrc_temp_25cm_dpth_pst1hr | subsurface temperature (hourly, 25cm depth) | °C | | | 2 |
| avg_subsfrc_temp_rd_30cm_dpth_pst1hr | subsurface temperature road (hourly, 30cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_30cm_dpth_pst1hr | subsurface temperature road edge (hourly, 30cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_30cm_dpth_pst1hr | subsurface temperature field (hourly, 30cm depth) | °C | | | 3 |
| avg_subsfrc_temp_50cm_dpth_pst1hr | subsurface temperature (hourly, 50cm depth) | °C | | | 2 |
| avg_subsfrc_temp_100cm_dpth_pst1hr | subsurface temperature (hourly, 100cm depth) | °C | | | 2 |
| avg_subsfrc_temp_rd_100cm_dpth_pst1hr | subsurface temperature road (hourly, 100cm depth) | °C | | | 2 |
| avg_subsfrc_temp_rd_edg_100cm_dpth_pst1hr | subsurface temperature road edge (hourly, 100cm depth) | °C | | | 2 |
| avg_subsfrc_temp_feld_100cm_dpth_pst1hr | subsurface temperature field (hourly, 100cm depth) | °C | | | 2 |

| | | | | | |
|---|---|------|--------------|-------------------------|---|
| avg_subsfrc_temp_rd_150cm_dpht_pst1hr | subsurface temperature road (hourly, 150cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_150cm_dpht_pst1hr | subsurface temperature road edge (hourly,150cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_150cm_dpht_pst1hr | subsurface temperature field (hourly, 150cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_200cm_dpht_pst1hr | subsurface temperature road (hourly, 200cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_200cm_dpht_pst1hr | subsurface temperature road edge (hourly,200cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_200cm_dpht_pst1hr | subsurface temperature field (hourly, 200cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_300cm_dpht_pst1hr | subsurface temperature road (hourly, 300cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_300cm_dpht_pst1hr | subsurface temperature road edge (hourly,300cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_300cm_dpht_pst1hr | subsurface temperature field (hourly, 300cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_450cm_dpht_pst1hr | subsurface temperature road (hourly, 450cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_450cm_dpht_pst1hr | subsurface temperature road edge (hourly,450cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_450cm_dpht_pst1hr | subsurface temperature field (hourly, 450cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_600cm_dpht_pst1hr | subsurface temperature road (hourly, 600cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_600cm_dpht_pst1hr | subsurface temperature road edge (hourly,600cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_600cm_dpht_pst1hr | subsurface temperature field (hourly, 600cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_800cm_dpht_pst1hr | subsurface temperature road (hourly, 800cm depth) | °C | | | 3 |
| avg_subsfrc_temp_rd_edg_800cm_dpht_pst1hr | subsurface temperature road edge (hourly,800cm depth) | °C | | | 3 |
| avg_subsfrc_temp_feld_800cm_dpht_pst1hr | subsurface temperature field (hourly, 800cm depth) | °C | | | 3 |
| avg_subsfrc_temp_1000cm_dpht_pst1hr | subsurface temperature road (hourly, 1000cm depth) | °C | | | 3 |
| avg_stn_pres_pst1hr | station pressure (hourly average) | hPa | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |
| mslp | mean sea level pressure | hPa | | | 1 |

5.18 Meteorological Service of Canada Moored Buoy (MSC Moored Buoy)

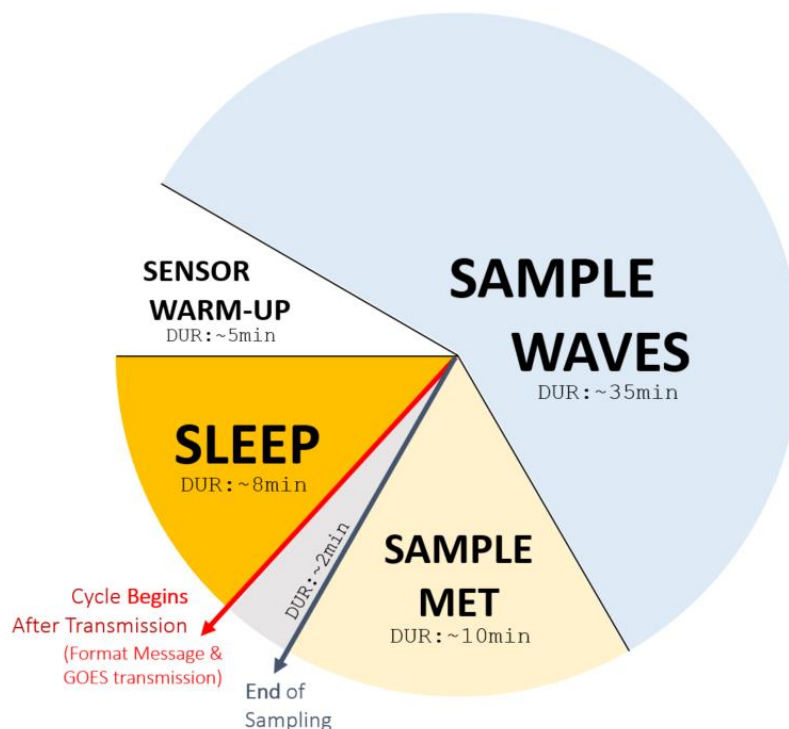
The MSC moored buoy network consists of approximately 20-40 moored buoys, depending on the time of year, operating along the West and East coasts, as well as seasonal inland locations on interior lakes. Two types of buoys are deployed: 3-metre discus buoys off the coasts and both 3 and 1.7 metre Watchkeeper buoys on the inland lakes.

Within the network, there are two types of payloads (combination of sensors, data acquisition hardware and firmware). At present, the network is mainly comprised of Watchman100 (WM100) payloads (see WM100 table below for element composition), but as of 2021 a transition has begun to

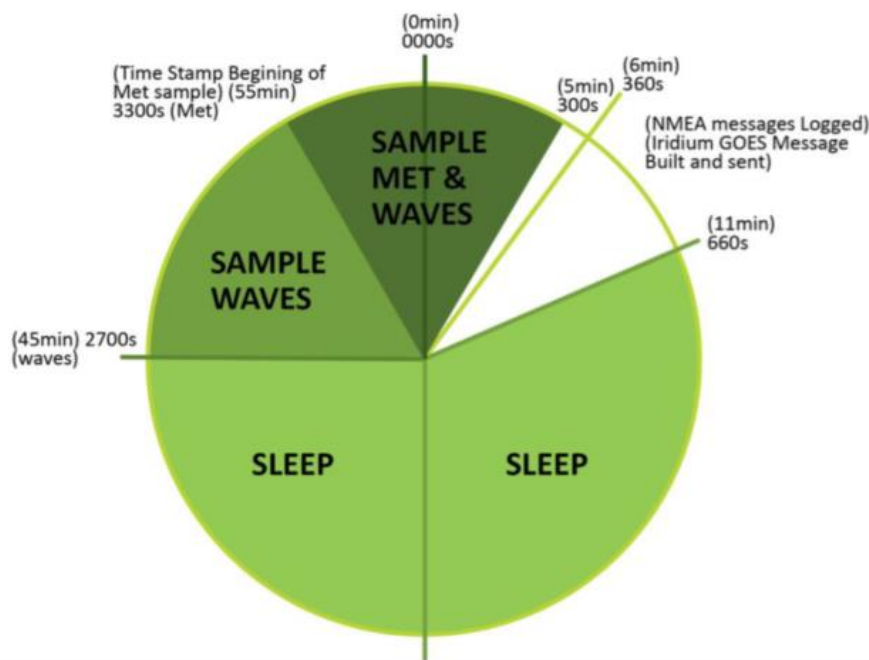
upgrade oceanic and inland buoys to the new Watchman500 (WM500) payloads, which have the following characteristics:

- Full time Iridium data transmission at a regular hourly reporting interval of 5 minutes after each hour, with a back up Inmarsat telemetry system;
- Additional wave and housekeeping elements reported, including spectral wave elements (see WM500 table below); and
- Different sampling periods (Wave data having a duration of 20 minutes: minute 45 to minute 05 of the next hour, and Meteorological data having a duration of 10 minutes: minute 55 to minute 05 of the next hour).

WM100 data sampling, this illustration is for a fictitious buoy that transmits in a GOES window that is 37 minutes after each hour (with all sampling ending at approximately 35 minutes after each hour):



WM500 data sampling. Data samplings begins 45 minutes after each hour for a duration of 20 minutes (ending 5 minutes after each hour) and message transmission 1 minute later (6 minutes after each hour):



The primary mechanism to deliver observations for buoys having the WM100 payload is via satellite telemetry (GOES). Historically the MSC moored buoy programme was managed and processed by a system called WBS (Weather Buoy System), which has now been replaced by the DMS. The buoys report hourly meteorological, housekeeping and wave statistics data, which are quality assessed in real-time by the DMS. WMO and SWOB products are produced and disseminated domestically as well as internationally via the GTS (in the case of WMO products). Below is a full description of the elements reported by this network from the WM100 and WM500 payloads, and the element name as it would appear in the SWOB product.

WM100 elements table:

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (_#) |
|-------------------------|------------------------------------|----------------|----------------------|--------------------|-----------|-----------------------------|
| nesdis_id | nesdis identification | unitless | | | | |
| stn_typ | buoy type | code | std_code_src | buoy_type | | |
| date_tm | date and time | datetime | | | | |
| wmo_identifier | WMO synoptic identification | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| msc_id | MSC identification | unitless | | | | |
| stn_elev | station elevation | m | | | 3 | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| avg_stn_pres_pst10mts_# | 10-minute average station pressure | hPa | | | 1 | 2 |
| avg_mslp_pst10mts | 10-minute average mean sea level | hPa | | | 1 | 1 |

| | | | | | | |
|---------------------------------|--|------|--------------|-------------------------|---|---|
| | pressure | | | | | |
| pres_tend_amt_pst3hrs | 3-hour pressure tendency amount | hPa | | | 1 | 1 |
| pres_tend_char_pst3hrs | 3-hour pressure tendency characteristic | code | std_code_src | tendency_characteristic | | 1 |
| avg_air_temp_pst10mts | 10-minute average air temperature | °C | | | 1 | 1 |
| avg_sea_sfc_temp_pst10mts | 10-minute sea surface temperature | °C | | | 1 | 1 |
| crnt_buoy_lat | current buoy latitude | ° | | | 6 | 1 |
| crnt_buoy_long | current buoy longitude | ° | | | 6 | 1 |
| batry_volt | battery voltage | V | | | | 1 |
| pk_wave_pd_pst35mts_10mts_ago | past 35-minutes peak wave period 10 minutes ago | s | | | 1 | 1 |
| sig_wave_hgt_pst35mts_10mts_ago | past 35-minutes significant wave height 10 minutes ago | m | | | 1 | 1 |
| pk_wave_hgt_pst35mts_10mts_ago | past 35-minutes peak wave height 10 minutes ago | m | | | 1 | 1 |
| avg_wnd_spd_pst10mts_# | 10-minute average wind speed | km/h | | | 1 | 2 |
| max_avg_wnd_spd_pst10mts_# | 10-minute maximum average wind speed | km/h | | | 1 | 2 |
| avg_wnd_dir_pst10mts_# | 10-minute vector average wind direction | ° | | | 0 | 2 |
| rel_hum | relative humidity | % | | | 0 | 1 |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 | 1 |

WM500 elements table:

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-----------------------------|---|----------------|----------------------|-------------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| stn_typ | station type | code | std_code_src | buoy_type | |
| rpt_typ | reporting type | code | std_code_src | report_type | |
| date_tm | date and time | datetime | | | |
| wmo_id_extnd | wmo identifier extended | unitless | | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| avg_stn_pres_pst10mts | average station pressure past 10 minutes | hPa | | | 1 |
| avg_mslp_pst10mts | average mean sea level pressure past 10 minutes | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |
| avg_air_temp_pst10mts | average air temperature past 10 minutes | °C | | | 1 |
| avg_sea_sfc_temp_pst10mts | average sea surface temperature past 10 minutes | °C | | | 1 |
| avg_solr_panl_crnt_pst10mts | average solar panel current past 10 minutes | A | | | 2 |
| avg_cmpss_hdng_pst10mts | average compass heading past 10 minutes | ° | | | 1 |
| wtchmn_boot_cnt_pst1hr | watchmen boot count past 1 hour | unitless | | | |

| | | | | | |
|--|--|----------|--|--|---|
| bad_wnd_smpls | bad wind samples | unitless | | | |
| crnt_buoy_lat | current buoy latitude | ° | | | 6 |
| crnt_buoy_long | current buoy longitude | ° | | | 6 |
| avg_obstrn_lamp_crnt_pst10mts | average obstruction lamp current past 10 minutes | A | | | 2 |
| avg_wtr_lvl_snsr_volt_pst10mts | average water level sensor voltage past 10 minutes | V | | | 2 |
| avg_batry_volt_pst10mts | average battery voltage past 10 minutes | V | | | 1 |
| pk_wave_pd_pst20mts | peak wave period past 20 minutes | s | | | 1 |
| avg_sig_wave_hgt_pst20mts | average significant wave height past 20 minutes | m | | | 1 |
| avg_wave_dir_pst20mts | average wave direction past 20 minutes | ° | | | 0 |
| avg_wave_pd_pst20mts | average wave period past 20 minutes | s | | | 1 |
| avg_wave_hgt_pst20mts | average wave height past 20 minutes | m | | | 1 |
| max_wave_hgt_pst20mts | maximum wave height past 20 minutes | m | | | 1 |
| avg_sig_wave_pd_pst20mts | average significant wave period past 20 minutes | s | | | 1 |
| max_wave_crst_hgt_abv_avg_wtr_lvl_pst20mts | maximum wave crest height above mean water level past 20 minutes | m | | | 1 |
| avg_pk_wave_dir_pst20mts | average peak wave direction past 20 minutes | ° | | | 0 |
| pk_wave_dir_sprd_pst20mts | peak wind direction spread past 20 minutes | ° | | | 0 |
| spetrl_sig_wave_hgt_pst20mts | spectral significant wave height past 20 minutes | m | | | 1 |
| spetrl_wave_enrgy_pd_pst20mts | spectral wave energy period past 20 minutes | s | | | 1 |
| avg_wave_dir_sprd_pst20mts | average wind direction spread past 20 minutes | ° | | | 0 |
| pd_of_max_wave_hgt_pst20mts | period of maximum wave height past 20 minutes | s | | | 1 |
| avg_spetrl_wave_pd_pst20mts | average spectral wave period past 20 minutes | s | | | 1 |
| avg_wnd_spd_pst10mts | average wind speed past 10 minutes | km/h | | | 1 |
| max_wnd_spd_pst10mts | maximum wind speed past 10 minutes | km/h | | | 1 |
| avg_wnd_dir_pst10mts | average wind direction past 10 minutes | ° | | | 0 |
| logr_type | datalogger type | unitless | | | |

5.19 Canadian Coast Guard Lighthouses (CCG Lighthouses)

Observations from Canadian Coast Guard Lighthouses (CCG) are used to supplement monitoring networks on the Pacific coast of British Columbia. Observations from these sites are produced every three hours and are a mix of automated and human observation. Human observations from lighthouses are radioed in to the Canadian Coast Guard and key punched by a radio operator, then the message posted to the telecommunication circuit. CCG lighthouse stations report standard atmospheric data such as temperature, wind, weather conditions and visibility, as well as sea data such as sea state and swell height. Environment and Climate Change Canada receives observations from CCG lighthouse stations in ASCII format. The resulting decoded and quality assessed elements are standardized and stored in XML format, which are then disseminated in the SWOB format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision | Maximum Multiplicity (#) |
|------------|---------------|----------------|----------------------|--------------------|-----------|--------------------------|
| date_tm | date and time | datetime | | | | |

| | | | | | | |
|--------------------|-------------------------------------|----------|--------------|----------------------------|---|---|
| stn_id | station identifier | unitless | | | | |
| stn_nam | station name | unitless | | | | |
| msc_id | MSC identification | unitless | | | | |
| tc_id | TC identifier | unitless | | | | |
| stn_elev | station elevation | m | | | 3 | |
| lat | latitude | ° | | | 6 | |
| long | longitude | ° | | | 6 | |
| data_pvdr | data provider | unitless | | | | |
| data_attrib_not | data attribution notice | unitless | | | | |
| air_temp | air temperature | °C | | | 1 | |
| dwpt_temp | dew point temperature | °C | | | 1 | |
| wnd_dir | wind direction | code | std_code_src | direction | | |
| wnd_spd | wind speed | km/h | | | 1 | |
| max_wnd_gst_spd | wind gust speed | km/h | | | 1 | |
| wnd_gst_char | wind gust character | code | std_code_src | wind_gust_squall_indicator | | |
| tot_cld_amt_code | total cloud amount coded | code | std_code_src | total_cloud_amount | | |
| cld_bas_hgt_# | cloud base height indexed by layer | m | | | 0 | 6 |
| cld_amt_code_# | cloud amount coded indexed by layer | code | std_code_src | total_cloud_amount | | 6 |
| wv_hgt | wave height | m | | | | |
| vis | horizontal visibility | km | | | 3 | |
| prsnt_wx_# | present weather | code | std_code_src | present_weather | | 6 |
| sea_state | sea state | code | std_code_src | state_of_sea | | |
| swell_hgt_coded | swell height coded | code | std_code_src | swell_height | | |
| swell_dir | swell direction | code | std_code_src | direction | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 1 | 2 |
| rmk | remark | unitless | | | | |

5.20 DFO Ocean Data Acquisition System Buoy (DFO ODAS Buoy)

Department of Fisheries and Oceans Canada (DFO) are sharing their ODAS buoy data with Environment and Climate Change Canada (ECCC) in order to support marine forecasting and warnings. The network has eight moored buoys on the East coast, and one buoy on the West coast of Canada. The majority of the network is seasonal, operating between the months of May to October, sending data at frequencies of 15 minutes, 30 minutes, or 60 minutes, depending on the buoy. ECCC receives observations from DFO buoys in ASCII format. The resulting decoded and quality assessed data is made available in the SWOB format on MSC data mart. These elements are then mapped as the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------|--------------------|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |

| | | | | | |
|--|---|----------------------------|--|--|---|
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| wmo_synop_id | WMO Identifier Extended | unitless | | | |
| prov | province | unitless | | | |
| stn_typ | station type | code | | | |
| rptg_freq | reporting Frequency | min | | | 0 |
| rmk | remark | unitless | | | |
| crnt_buoy_lat | current buoy latitude | ° | | | 6 |
| crnt_buoy_long | current buoy longitude | ° | | | 6 |
| avg_wnd_spd_3m_pst1min | average wind speed past 1 minute at 3m | km/h | | | 1 |
| max_wnd_spd_3m_pst1min | maximum wind speed past 1 minute at 3m | km/h | | | 1 |
| avg_wnd_dir_3m_pst1min | vectoral average wind direction past 1 minute at 3m | ° | | | 1 |
| air_temp | air temperature | °C | | | 1 |
| rel_hum | relative humidity | % | | | 0 |
| stn_pres | station pressure | hPa | | | 1 |
| sea_sfc_temp_100cm_dpth | sea surface temperature at -1m | °C | | | 2 |
| wtr_slnty_100cm_dpth | water salinity at -1m | ‰ | | | 2 |
| wtr_dnsty_100cm_dpth | water density at -1m | kg/m ³ | | | 2 |
| avg_photosynthicly_actv_radn_pst1mt | average photosynthetically active radiation past 1 minute | µmoles/m ² s | | | 1 |
| CO2_conc_wtr_100cm_dpth | carbon dioxide concentration in water at -1m | ppm | | | 1 |
| CO2_conc_air | carbon dioxide concentration in air | ppm | | | 1 |
| avg_wtr_pH_lvl_100cm_dpth_pst1mt | average pH level in water past 1 minute at -1m | unitless | | | 4 |
| avg_wave_pd_pst10mts | average wave period past 10 minutes | s | | | 1 |
| sig_wave_hgt_pst10mts | significant wave height past 10 minutes | m | | | 1 |
| max_wave_hgt_pst10mts | maximum wave height past 10 minutes | m | | | 1 |
| avg_batry_volt_pst15mts | average battery voltage past 15 minutes | V | | | 1 |
| avg_solr_panl_crnt_pst15mts | average solar panel current past 15 minutes | A | | | 1 |
| avg_wnd_turbin_crnt_pst15mts | average wind turbine current past 15 minutes | A | | | 1 |
| avg_sys_pwr_consumptn_pst15mts | average system power consumption past 15 minutes | A | | | 1 |
| avg_buoy_ptch_pst1mt | average buoy pitch past 1 minute | ° | | | 1 |
| avg_buoy_rol_pst1mt | average buoy roll past 1 minute | ° | | | 1 |
| avg_sfc_wtr_crnt_spd_100cm_dpth_pst15mts | average surface water current past 15 minutes at -1m | m/s | | | 1 |
| avg_cmpss_hdng_pst_1mt | average buoy heading past 1 minute | ° | | | 1 |
| avg_buoy_drftng_spd_pst1mt | average buoy drifting speed past 1 minute | m/s | | | 1 |
| buoy_drftng_dir | buoy drifting direction | ° | | | 1 |
| rnfl_amt_snc_0utc | accumulated rainfall amount since 00UTC | mm | | | 1 |
| avg_wtr_profил_crnt_spd_pst3mts | average water profile current speed past 3 minutes | m/s | | | 1 |

| | | | | | |
|---------------------------------|--|----------|--------------|-------------------------|---|
| avg_wtr_profil_crnt_dir_pst3mts | average water profile current direction past 3 minutes | ° | | | 0 |
| wtr_in_buoy_controlr | presence of water in buoy controller | unitless | | | |
| wtr_in_pwr_controlr | presence of water in power controller | unitless | | | |
| wtr_in_wnch_controlr | presence of water in winch controller | unitless | | | |
| mslp | mean sea level pressure | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |

5.21 SK Wildfire Management Branch Public Safety Agency (SK Forestry)

The Saskatchewan Public Safety Agency, Wildfire Management Branch (SK Forestry) operates 78 automated weather stations to support fire weather forecasting in the province. This network utilizes GOES for transmitting hourly observations from the station to a central processor. It is updated hourly on the half hour between 06:00 and 19:00 (technically 06:30-18:30). GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|--------------------------|--|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrb_not | data attribution notice | unitless | | | |
| rptg_freq | reporting frequency | min | | | 0 |
| avg_air_temp_ps2mts | average air temperature past 2 minutes | °C | | | 1 |
| avg_rel_hum_pst2mts | average relative humidity past 2 minutes | % | | | 0 |
| avg_wnd_spd_10m_pst10mts | average wind speed past 10 minutes at 10m | km/h | | | 1 |
| max_wnd_spd_10m_pst1hr | maximum wind speed past 1 hour at 10m | km/h | | | 1 |
| avg_wnd_dir_10m_pst10mts | vectoral average wind direction past 10 minutes at 10m | ° | | | 0 |
| rnfl_amt_pst1hr | accumulated rainfall amount past 1 hour | mm | | | 2 |
| stn_pres | instantaneous station pressure | hPa | | | 1 |
| min_air_temp_pst1hr | minimum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst1hr | maximum air temperature past 1 hour | °C | | | 1 |
| min_rel_hum_pst1hr | minimum relative humidity past 1 hour | % | | | 0 |
| max_rel_hum_pst1hr | maximum relative humidity past 1 hour | % | | | 0 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |

| | | | | | |
|------------------------|--|------|------------------|---------------------------------|---|
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_ src | tendency_ characteri stic | |
| mslp | mean sea level pressure | hPa | | | 1 |

5.22 YT Department of Environment Water Resources Branch (YT-DE-WRB)

The Yukon Government Department of Environment, Water Resources Branch (YT-DE-WRB) operates a network of weather stations to support or the purpose of water monitoring. This data is used for flood forecasting, climate change research & long-term baseline data collection. The data is collected and managed using AQUARIUS - a platform used to streamline management of continuous water data. This network utilizes GOES for transmitting observations from the station to a central processor. GOES transmissions are routed through the GTS where they are retrieved by ECCC every three hours and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. The elements are then mapped to the short labels shown below.

It should be noted that there are two different methods of measuring precipitation in this network. One method is vented standpipe gauge (precipitation amount in mm), the other an unvented standpipe gauge (raw uncompensated hydrostatic pressure reporting in kPa). The method used for a given station, is indicated by the code value of the “pcpn_msrmt_mtd” element. The precipitation measurement method used applies to the “pcpn_snc_last_reset” element, and all of its associated precipitation elements (i.e. pcpn_amt_pst3hrs, pcpn_amt_pst6hrs, pcpn_amt_pst12hrs, and pcpn_amt_pst24hrs). The two codes relevant to this situations are either 17 or 18 (see [Appendix 6.22.7](#)):

- 17 = Vented Standpipe Gauge (precipitation amount in mm)
- 18 = Unvented Standpipe Gauge (raw uncompensated hydrostatic pressure reporting in kPa)

For values that report in kPa (i.e. hydrostatic pressure), ECCC converts the values to its equivalent mm value by compensating for air pressure & using density of water.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-----------------|-------------------------|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| rptg_freq | reporting frequency | min | | | |

| | | | | | |
|-----------------------------|---|------------------|--------------|----------------------------------|---|
| nesdis_id | NESDIS Identifier | unitless | | | |
| trans_date_tm | transmission date time | datetime | | | |
| prov | province | unitless | | | |
| snw_dpth | snow depth | cm | | | 0 |
| dis_btwn_snsr_and_snw | distance between sensor and snow | m | | | |
| pcpn_snc_last_reset | precipitation since last reset | mm | | | 1 |
| snw_dpth_wtr_equiv | snow depth water equivalent | mm | | | 1 |
| rnfl_snc_last_reset | rainfall since last reset | mm | | | 1 |
| stn_pres | station pressure | hPa | | | 1 |
| mslp | mean sea level pressure | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| avg_globl_solr_radn_pst3hrs | average global solar radiation past 3 hours | W/m ² | | | 1 |
| air_temp | air temperature | °C | | | 1 |
| air_temp_1hr_ago | air temperature 1 hour ago | °C | | | |
| air_temp_2hrs_ago | air temperature 2 hours ago | °C | | | |
| batry_volt_3hrs_ago | battery voltage 3 hours ago | V | | | |
| subsfrc_moist_30cm_dpth | subsurface moisture 30cm depth | % | | | 0 |
| snw_dpth_snsr_hgt | snow depth sensor height | m | | | |
| pcpn_msrmnt_mtd | precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pcpn_amt_pst3hrs | precipitation amount past 3-hours | mm | | | 1 |
| pcpn_amt_pst6hrs | precipitation amount past 6-hours | mm | | | 1 |
| pcpn_amt_pst12hrs | precipitation amount past 12-hours | mm | | | 1 |
| pcpn_amt_pst24hrs | precipitation amount past 24-hours | mm | | | 1 |

5.23 NL Department of Environment and Climate Change Water Resources Management Division (NL-DECC-WRMD)

The Government of Newfoundland and Labrador Department of Environment and Climate Change, Water Resources Management Division (NL-DECC-WRMD) operates 12 weather stations to support water management activities in the province. The data is collected through dial up modem images. Hourly data is retrieved from their website in a CSV format and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------|--------------------|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |

| | | | | | |
|----------------------------|--|-------------------|--------------|----------------------------------|---|
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| prov | province | unitless | | | |
| snw_dpth | snow depth | cm | | | 0 |
| air_temp | air temperature | °C | | | 1 |
| avg_wnd_dir_pst1hr | average wind direction past 1 hour | ° | | | 0 |
| avg_wnd_spd_pst1hr | average wind speed past 1 hour | km/h | | | 1 |
| batry_volt | battery voltage | V | | | |
| brght_sunshn_pst1hr | bright sunshine past 1 hour | h | | | |
| dwpt_temp | dew point temperature | °C | | | 1 |
| frsh_snw_dpth_pst1hr | fresh snow depth past 1 hour | cm | | | 0 |
| heat_indx | heat index | °C | | | 1 |
| max_wnd_spd_pst1hr | maximum wind speed past1 hour | km/h | | | 1 |
| mslp | mean sea level pressure | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |
| rel_hum | relative humidity | % | | | 0 |
| stn_pres | station pressure | hPa | | | 1 |
| pcpn_msrmt_mtd | precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| snw_dpth_wtr_equiv | snow depth water equivalent | mm | | | 1 |
| soil_wtr_cntnt | soil water content | % | | | |
| tot_globl_solr_radn_pst1hr | total global solar radiation past 1 hour | kJ/m ² | | | 1 |
| wnd_dir_pst1hr_max_spd | wind direction past 1 hour maximum speed | ° | | | 0 |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| wndchl | wind chill | °C | | | 1 |
| pcpn_amt_pst3hrs | precipitation amount past 3-hours | mm | | | 1 |
| pcpn_amt_pst6hrs | precipitation amount past 6-hours | mm | | | 1 |
| pcpn_amt_pst12hrs | precipitation amount past 12-hours | mm | | | 1 |
| pcpn_amt_pst24hrs | precipitation amount past 24-hours | mm | | | 1 |

5.24 Toronto and Region Conservation Authority (ON-TRCA)

The Toronto and Region Conservation Authority (TRCA) operates a network of weather stations in southern Ontario to support flood forecasting and water management. There are 28 stations reporting real-time values in 5-minute intervals. Stations report temperature, humidity, pressure, wind, and precipitation information. The network utilizes an API for data pulls in JSON format. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|----------------|----------------------------------|----------------|----------------------|----------------------------------|-----------|
| pcpn_msrmt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |

| | | | | | |
|---------------------|---|----------|--|--|---|
| wnd_snsr_vert_disp | Wind sensor vertical displacement | m | | | 2 |
| long | Longitude | ° | | | 6 |
| lat | Latitude | ° | | | 6 |
| rptg_freq | Reporting frequency | min | | | |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| prov | Province | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| avg_rel_hum_pst5mts | Average relative humidity past 5 minutes | % | | | 0 |
| avg_wnd_dir_pst5mts | Average wind direction past 5 minutes | ° | | | 0 |
| avg_wnd_spd_pst5mts | Average wind speed past 5 minutes | m/s | | | 2 |
| air_temp | Air temperature | °C | | | 1 |
| stn_pres | Station pressure | hPa | | | 1 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1 hour | mm | | | 1 |
| pcpn_amt_pst5mts | Precipitation amount past 5 minutes | mm | | | 1 |
| pcpn_amt_pst10mts | Precipitation amount past 10 minutes | mm | | | 1 |

5.25 Grand River Conservation Authority (ON-GRCA)

The Grand River Conservation Authority in Ontario (GRCA) operates a network of monitoring stations primarily for flood forecasting purposes. The GRCA network consists of 29 stations for precipitation and water level monitoring along with some climatological parameters. Hourly data is retrieved from GRCA website in ASCII formatted file that contains information on station location, observed elements and their measurement time. All the incoming elements, units and values that are retrieved from GRCA website are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------|--------------------|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| lat | Latitude | ° | | | 6 |
| long | Longitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | 3 |
| date_tm | Date and time | datetime | | | |
| data_pvdr | Data provider | unitless | | | |

| | | | | | |
|-------------------|------------------------------------|----------|--------------|----------------------------------|---|
| data_attrib_not | Data attribution notice | unitless | | | |
| prov | Province | unitless | | | |
| pcpn_amt_pst1hr | Precipitation amount past 1-hour | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_msrmt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| air_temp | Air temperature | °C | | | 1 |

5.26 Ministry of Natural Resources and Forestry (ON-MNRF)

The Ontario Ministry of Natural Resources and Forestry (MNRF) oversees the regional conservation authorities in Ontario that operate networks of monitoring stations (approximately 100 stations) primarily for flood forecasting purposes. MNRF collects the hourly data from its network as well as selected conservation authorities and transmits it to Environment and Climate Change Canada in an ASCII format. All the incoming elements, units and values are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-------------------|--------------------------------------|----------------|----------------------|----------------------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| lat | Latitude | ° | | | 6 |
| long | Longitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | 3 |
| date_tm | Date and time | datetime | | | |
| data_pvdr | Data provider | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| prov | Province | unitless | | | |
| pcpn_amt_pst5mts | Precipitation amount past 5 minutes | mm | | | 1 |
| pcpn_amt_pst15mts | Precipitation amount past 15 minutes | mm | | | 1 |
| pcpn_amt_pst20mts | Precipitation amount past 20 minutes | mm | | | 1 |
| pcpn_amt_pst30mts | Precipitation amount past 30 minutes | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1-hour | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_msrmt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |

5.27 Ministry of Transportation Ontario (MTO)

The Ontario Ministry of Transportation (MTO) operates a road weather network that report temperature, pavement, pressure, wind, precipitation, data quality, and visibility elements. The information generated by this network is crucial to winter road maintenance activities in Ontario. The network operates approximately 200 stations that transmit data retrieved by ECCC. Data are ingested into the DMS in CSV & CMML format. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Short Label | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------------------------|--|----------------|----------------------|-------------------------|-----------|
| stn_id | Station identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| msc_id | MSC identifier | unitless | | | |
| lat | Latitude | ° | | | |
| long | Longitude | ° | | | |
| data_pvdr | Data provider | unitless | | | |
| data_attrb_not | Data attribution notice | unitless | | | |
| stn_elev | Station elevation | m | | | |
| date_tm | Date and time | datetime | | | |
| rel_hum | Relative humidity | % | | | 0 |
| pcpn_amt_pst1hr | precipitation amount past 1-hour | mm | | | 1 |
| pcpn_amt_pst3hrs | precipitation amount past 3-hour | mm | | | 1 |
| pcpn_amt_pst6hrs | precipitation amount past 6-hour | mm | | | 1 |
| pcpn_amt_pst12hrs | precipitation amount past 12-hour | mm | | | 1 |
| pcpn_amt_pst24hrs | precipitation amount past 24-hour | mm | | | 1 |
| stn_pres | Station pressure | hPa | | | 1 |
| air_temp | air temperature | °C | | | 1 |
| dwpt_temp | dew point temperature | °C | | | 1 |
| wetblb_temp | wet bulb temperature | °C | | | 1 |
| max_air_temp_pst24hrs | past 24-hour maximum air temperature | °C | | | 1 |
| min_air_temp_pst24hrs | past 24-hour minimum air temperature | °C | | | 1 |
| max_wnd_spd_10m_pst10mts | Past 10-min maximum 10 m wind speed | km/h | | | 0 |
| wnd_dir_10m_pst10mts_max_spd | Instantaneous 10 m wind direction for max 10-minute wind speed | ° | | | 0 |
| avg_wnd_spd_10m_pst2mts | past 2-minute average 10 m wind speed | km/h | | | 1 |
| avg_wnd_dir_10m_pst2mts | past 2-minute vector average 10 m wind direction | ° | | | 0 |
| pres_tend_amt_pst3hrs | past 3-hour differential pressure tendency amount | hPa | | | 1 |
| pres_tend_char_pst3hrs | past 3-hour differential pressure tendency characteristic | code | std_code_src | tendency_characteristic | 0 |
| mslp | mean sea level pressure | hPa | | | 1 |
| vis | Horizontal visibility | km | | | |
| pvmnt_sfc_temp_# | Pavement surface temperature (indexed) | °C | | | 1 |
| subsfctemp_40cm_# | Subsurface temperature; at a depth of 40 cm (indexed) | °C | | | 1 |

| | | | | | |
|------------------------|--|-----------------|--------------|--------------------------|---|
| subsfrc_temp_150cm_# | Subsurface temperature; at a depth of 150 cm (indexed) | °C | | | 1 |
| pvmnt_sfc_stat_# | Pavement surface status (indexed) | code | std_code_src | surface_status | 0 |
| pvmnt_sfc_salnty_# | Pavement surface salinity (indexed) | % | | | 1 |
| sfc_blk_ice_sgnl_# | Surface black ice signal (indexed) | code | std_code_src | surface_black_ice_signal | 0 |
| sfc_frzng_pt_# | Surface freezing point (indexed) | °C | | | 1 |
| pvmnt_sfc_wtr_dpth_# | Pavement surface water depth (indexed) | cm | | | 1 |
| int_pvmnt_temp_# | Internal pavement temperature (indexed) | °C | | | 1 |
| pvmnt_sfc_conductvty_# | Pavement surface conductivity (indexed) | milli-mhos/10cm | | | 0 |
| pcpn_rt | Precipitation rate | mm/hr | | | 1 |

5.28 Port of Montreal (PoM)

Port of Montreal (PoM) runs a network of five weather-observing stations in support of the Montreal Port Authority. These automatic weather stations transmit data every 30 minutes. PoM encodes the data from all stations into multiple ASCII file and it is retrieved and processed by ECCC. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------------------|--|----------------|----------------------|-------------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| rptg_freq | reporting frequency | min | | | 0 |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| rnfl_amt_pst30mts | rainfall amount past 30 minutes | mm | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| stn_pres | station pressure | hPa | | | 1 |
| mslp | mean sea level pressure | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |
| air_temp | air temperature | °C | | | 1 |

| | | | | | |
|--------------------|--------------------------------------|------|--|--|---|
| air_temp_12hrs_ago | air temperature 12 hours ago | °C | | | 1 |
| avg_wnd_spd_pst1mt | average wind speed past 1 minute | km/h | | | 1 |
| avg_wnd_dir_pst1mt | average wind direction past 1 minute | ° | | | 0 |
| rel_hum | relative humidity | % | | | 0 |

5.29 ON Ministry of Northern Development, Mines, Natural Resources and Forestry, Aviation, Forest Fire and Emergency Services Branch (ON Forestry)

The Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (ON Forestry) operates a network of approximately 120 automatic weather stations to support fire weather operations in the province. Stations report temperature, humidity, pressure, wind and precipitation information. The network utilizes GOES to transmit observations from each station to a central processor every hour 24/7. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|--------------------------|---|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| rptg_freq | reporting frequency | min | | | 0 |
| prov | Province | unitless | | | |
| nesdis_id | NESDIS Identifier | unitless | | | |
| trans_date_tm | transmission date time | datetime | | | |
| rnfl_amt_pst1hr | rainfall amount past 1-hours | mm | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| snw_dpth | snow depth | cm | | | 0 |
| mslp | mean sea level pressure | hPa | | | 1 |
| air_temp | air temperature | °C | | | 1 |
| max_air_temp_pst1hr | maximum air temperature past 1 hour | °C | | | 1 |
| min_air_temp_pst1hr | minimum air temperature past 1 hour | °C | | | 1 |
| dwpt_temp | dew point temperature | °C | | | 1 |
| batry_volt | battery voltage | V | | | |
| avg_wnd_spd_10m_pst10mts | average wind speed past 10 minutes at 10m | km/h | | | 1 |
| max_wnd_spd_10m_pst1hr | maximum wind speed past 1 hour at 10m | km/h | | | 1 |

| | | | | | |
|--------------------------|---|---|--|--|---|
| avg_wnd_dir_10m_pst10mts | average wind direction past 10 minutes at 10m | ° | | | 0 |
| rel_hum | relative humidity | % | | | 0 |
| max_rel_hum_pst1hr | maximum relative humidity past 1 hour | % | | | 0 |
| min_rel_hum_pst1hr | minimum relative humidity past 1 hour | % | | | 0 |

5.30 YT Wildland Fire Management (YT Forestry)

The Yukon Government Wildland Fire Management (YT Forestry) operates 27 automatic weather stations to support fire weather operations in the territory. The network utilizes GOES to transmit observations from each station to a central processor every hour 24/7. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below. For additional information on how to interpret values for weighng_gag_stat and snw_dpth_qlty, see appendix 6.6.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-----------------------|--|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| prov | Province | unitless | | | |
| nesdis_id | NESDIS Identifier | unitless | | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| rnfl_amt_pst1hr | rainfall amount past 1-hours | mm | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pcpn_amt_pst1hr | precipitation amount past 1-hour | mm | | | 1 |
| pcpn_amt_pst3hrs | precipitation amount past 3-hour | mm | | | 1 |
| pcpn_amt_pst6hrs | precipitation amount past 6-hour | mm | | | 1 |
| pcpn_amt_pst12hrs | precipitation amount past 12-hour | mm | | | 1 |
| pcpn_amt_pst24hrs | precipitation amount past 24-hour | mm | | | 1 |
| snw_dpth | snow depth | cm | | | 0 |
| snw_dpth_qlty | snow depth quality | unitless | | | |
| air_temp | air temperature | °C | | | 1 |
| avg_air_temp_pst2mts | average air temperature past 2 minutes | °C | | | 1 |
| max_air_temp_pst1hr | maximum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | maximum air temperature past 24 hours | °C | | | 1 |

| | | | | | |
|------------------------|--|-------------------|--|--|---|
| min_air_temp_pst1hr | minimum air temperature past 1 hour | °C | | | 1 |
| min_air_temp_pst24hrs | minimum air temperature past 24 hours | °C | | | 1 |
| min_batry_volt_pst1hr | minimum battery voltage past 1 hour | V | | | 2 |
| avg_wnd_spd_pst10mts | average wind speed past 10 minutes | km/h | | | 1 |
| max_wnd_spd_pst1hr | maximum wind speed past 1 hour | km/h | | | 1 |
| avg_wnd_dir_pst10mts | average wind direction past 10 minutes | ° | | | 0 |
| wnd_dir_pst1hr_max_spd | wind direction past 1 hour maximum speed | ° | | | 0 |
| rel_hum | relative humidity | % | | | 0 |
| avg_rel_hum_pst2mts | average relative humidity past 2 minutes | % | | | 0 |
| max_rel_hum_pst1hr | maximum relative humidity past 1 hour | % | | | 0 |
| min_rel_hum_pst1hr | minimum relative humidity past 1 hour | % | | | 0 |
| bkup_batry_volt | backup battery voltage | V | | | 2 |
| rnfl_snc_last_reset | rainfall since last reset | mm | | | 2 |
| cum_pcpn_gag_wt | cumulative precipitation gauge weight | kg/m ² | | | 2 |
| weighng_gag_stat | weighing gauge status | unitless | | | |

5.31 *Avalanche Canada and Yukon Avalanche Association (YT Avalanche)*

Avalanche Canada with the support from the Yukon Avalanche Association (YAA) operates 3 automatic weather stations to support avalanche operations in the territory. Stations report temperature, pressure, wind and precipitation information. The network utilizes GOES to transmit observations from each station to a central processor every hour 24/7. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below. For additional information on how to interpret values for weighng_gag_stat and snw_dpht_qlty, see appendix 6.6.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|--------------------|-----------------------------------|----------------|----------------------|--------------------|-----------|
| msc_id | MSC identifier | unitless | | | |
| stn_id | station identifier | unitless | | | |
| stn_nam | station name | unitless | | | |
| lat | latitude | ° | | | 6 |
| long | longitude | ° | | | 6 |
| stn_elev | station elevation | m | | | 3 |
| date_tm | date and time | datetime | | | |
| data_pvdr | data provider | unitless | | | |
| data_attrib_not | data attribution notice | unitless | | | |
| rptg_freq | reporting frequency | min | | | 0 |
| prov | Province | unitless | | | |
| nesdis_id | NESDIS Identifier | unitless | | | |
| wnd_snsr_vert_disp | wind sensor vertical displacement | m | | | 2 |
| rnfl_amt_pst1hr | rainfall amount past 1-hours | mm | | | 1 |
| rnfl_amt_pst3hrs | rainfall amount past 3-hours | mm | | | 1 |
| rnfl_amt_pst6hrs | rainfall amount past 6-hours | mm | | | 1 |

| | | | | | |
|------------------------|--|------------------|--------------|-------------------------|---|
| rnfl_amt_pst12hrs | rainfall amount past 12-hours | mm | | | 1 |
| rnfl_amt_pst24hrs | rainfall amount past 24-hours | mm | | | 1 |
| pcpn_amt_pst1hr | precipitation amount past 1-hour | mm | | | 1 |
| pcpn_amt_pst3hrs | precipitation amount past 3-hour | mm | | | 1 |
| pcpn_amt_pst6hrs | precipitation amount past 6-hour | mm | | | 1 |
| pcpn_amt_pst12hrs | precipitation amount past 12-hour | mm | | | 1 |
| pcpn_amt_pst24hrs | precipitation amount past 24-hour | mm | | | 1 |
| snw_dpth | snow depth | cm | | | 0 |
| pcpn_snc_last_reset | precipitation since last reset | mm | | | 1 |
| mslp | mean sea level pressure | hPa | | | 1 |
| pres_tend_amt_pst3hrs | pressure tendency amount past 3 hours | hPa | | | 1 |
| pres_tend_char_pst3hrs | pressure tendency characteristics past 3 hours | code | std_code_src | tendency_characteristic | |
| snw_dpth_qlty | snow depth quality | unitless | | | |
| air_temp | air temperature | °C | | | 1 |
| max_air_temp_pst1hr | maximum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | maximum air temperature past 24 hours | °C | | | 1 |
| min_air_temp_pst1hr | minimum air temperature past 1 hour | °C | | | 1 |
| min_air_temp_pst24hrs | minimum air temperature past 24 hours | °C | | | 1 |
| dwpt_temp | dew point temperature | °C | | | 1 |
| sfc_temp | surface temperature | °C | | | 1 |
| min_batry_volt_pst1hr | minimum battery voltage past 1 hour | V | | | 2 |
| avg_wnd_spd_pst10mts | average wind speed past 10 minutes | km/h | | | 1 |
| max_wnd_spd_pst1hr | maximum wind speed past 1 hour | km/h | | | 1 |
| avg_wnd_dir_pst10mts | average wind direction past 10 minutes | ° | | | 0 |
| wnd_dir_pst1hr_max_spd | wind direction at maximum speed past 1 hour | ° | | | 0 |
| rel_hum | relative humidity | % | | | 0 |
| refltd_shrtwv_radn | reflected shortwave radiation | W/m ² | | | 2 |
| wnd_run_pst1hr | wind run past 1 hour | m | | | |
| weighng_gag_stat | weighing gauge status | unitless | | | |

5.32 Government of New Brunswick: Department of Natural Resources and Energy Development (NB Forestry)

The Government of New Brunswick, Department of Energy and Resource Development (DERD) operates 28 hourly weather stations to support fire weather operations in the province. Stations report temperature, humidity, wind, and precipitation information. ECCC receives observations in a single ASCII file of hourly data from their data management application, ZRXP. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|--------------------|-----------------------------------|----------------|----------------------|--------------------|-----------|
| wnd_snsr_vert_disp | Wind sensor vertical displacement | m | | | 2 |

| | | | | | |
|-----------------------|---|----------|--|--|---|
| long | Longitude | ° | | | 6 |
| suppl_stn_id | Supplementary station identifier | unitless | | | |
| lat | Latitude | ° | | | 6 |
| rptg_freq | Reporting frequency | min | | | |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| prov | Province | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| min_rel_hum_pst24hrs | Minimum relative humidity past 24 hours | % | | | 0 |
| min_rel_hum_pst1hr | Minimum relative humidity past 1 hour | % | | | 0 |
| max_rel_hum_pst24hrs | Maximum relative humidity past 24 hours | % | | | 0 |
| max_rel_hum_pst1hr | Maximum relative humidity past 1 hour | % | | | 0 |
| avg_rel_hum_pst2mts | Average relative humidity past 2 minutes | % | | | 0 |
| avg_wnd_dir_pst2mts | Average wind direction past 2 minutes | ° | | | 0 |
| max_wnd_spd_pst1hr | Maximum wind speed past 1 hour | km/h | | | 1 |
| avg_wnd_spd_pst2mts | Average wind speed past 2 minutes | km/h | | | 1 |
| min_air_temp_pst24hrs | Minimum air temperature past 24 hours | °C | | | 1 |
| min_air_temp_pst1hr | Minimum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | Maximum air temperature past 24 hours | °C | | | 1 |
| max_air_temp_pst1hr | Maximum air temperature past 1 hour | °C | | | 1 |
| avg_air_temp_pst2mts | Average air temperature past 2 minutes | °C | | | 1 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1 hour | mm | | | 1 |
| rnfl_amt_pst24hrs | Rainfall amount past 24 hours | mm | | | 1 |
| rnfl_amt_pst12hrs | Rainfall amount past 12 hours | mm | | | 1 |
| rnfl_amt_pst6hrs | Rainfall amount past 6 hours | mm | | | 1 |
| rnfl_amt_pst3hrs | Rainfall amount past 3 hours | mm | | | 1 |
| rnfl_amt_pst1hr | Rainfall amount past 1 hour | mm | | | 1 |

5.33 BC Rio Tinto Inc. (BC Rio Tinto)

Rio Tinto Inc. is a private organization that operates a network of weather stations in British Columbia to monitor and forecast flow for hydro generation and flood control to ensure sustainable use of resources. There are five near-real-time hourly stations and one station reporting daily (hourly data). Stations report temperature, humidity, wind, and precipitation information. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|----------------------------|---|-------------------|----------------------|--------------------|-----------|
| wnd_snsr_vert_disp | Wind sensor vertical displacement | m | | | 2 |
| long | Longitude | ° | | | 6 |
| lat | Latitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| prov | Province | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| rel_hum | Relative humidity | % | | | 0 |
| wnd_dir_pst1hr_max_spd | Wind direction past 1 hour maximum speed | ° | | | 0 |
| avg_wnd_dir_pst10mts | Average wind direction past 10 minutes | ° | | | 0 |
| max_wnd_spd_pst1hr | Maximum wind speed past 1 hour | km/h | | | 1 |
| avg_wnd_spd_pst10mts | Average wind speed past 10 minutes | km/h | | | 1 |
| min_air_temp_pst1hr | Minimum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | Maximum air temperature past 24 hours | °C | | | 1 |
| max_air_temp_pst1hr | Maximum air temperature past 1 hour | °C | | | 1 |
| min_air_temp_pst24hrs | Minimum air temperature past 24 hours | °C | | | 1 |
| air_temp | Air temperature | °C | | | 1 |
| avg_cum_pcpn_gag_wt_pst1mt | Average cumulative precipitation gauge weight past 1 minute | kg/m ² | | | 1 |
| snw_dpth_wtr_equiv | Snow depth water equivalent | mm | | | 1 |
| snw_dpth | Snow depth | cm | | | 0 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1 hour | mm | | | 1 |

5.34 BC Capital Regional District (BC CRD)

The Capital Regional District (CRD) is the regional government for 13 municipalities and three electoral areas on southern Vancouver Island and the Gulf Islands. It operates and maintains a network of automated weather and hydrology stations in the Greater Victoria Water Supply Area (GVWSA). The CRD network contains nine stations transmitting 15-minute, and hourly near-real-time data in JSON format. Stations report temperature, humidity, pressure, wind, solar, and precipitation information. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|------------|-------------|----------------|----------------------|--------------------|-----------|
|------------|-------------|----------------|----------------------|--------------------|-----------|

| | | | | | |
|-------------------------------------|---|------------|--------------|----------------------------------|---|
| rnfl_msrmnt_mtd | Rainfall measurement method | code | std_code_src | rainfall_measurement_method | |
| pcpn_msrmnt_mtd | Precipitation measurement method | code | std_code_src | precipitation_measurement_method | |
| long | Longitude | ° | | | 6 |
| lat | Latitude | ° | | | 6 |
| rptg_freq | Reporting frequency | min | | | |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| stn_shrt_nam | Station short name | unitless | | | |
| prov | Province | unitless | | | |
| data_attrb_not | Data attribution notice | unitless | | | |
| rel_hum | Relative humidity | % | | | 0 |
| avg_wnd_dir_10m_pst15mts | Average wind direction at 10 metres past 15 minutes | ° | | | 1 |
| avg_wnd_spd_10m_pst15mts | Average wind speed at 10 metres past 15 minutes | km/h | | | 1 |
| air_temp | Air temperature | °C | | | 1 |
| avg_photosynthicly_actv_radn_pst1hr | Average photosynthetically active radiation past 1 hour | µmoles/m²s | | | 1 |
| avg_globl_solr_radn_pst1hr | Average global solar radiation past 1 hour | W/m² | | | 1 |
| pres_tend_char_pst3hrs | Pressure tendency characteristic past 3 hours | code | std_code_src | tendency_characteristic | |
| pres_tend_amt_pst3hrs | Pressure tendency amount past 3 hours | hPa | | | 1 |
| mslp | Mean sea level pressure | hPa | | | 1 |
| stn_pres | Station pressure | hPa | | | 1 |
| snw_dpth_wtr_equiv | Snow depth water equivalent | mm | | | 1 |
| snw_dpth | Snow depth | cm | | | 0 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1 hour | mm | | | 1 |
| rnfl_amt_pst24hrs | Rainfall amount past 24 hours | mm | | | 1 |
| rnfl_amt_pst12hrs | Rainfall amount past 12 hours | mm | | | 1 |
| rnfl_amt_pst6hrs | Rainfall amount past 6 hours | mm | | | 1 |
| rnfl_amt_pst3hrs | Rainfall amount past 3 hours | mm | | | 1 |
| rnfl_amt_pst1hr | Rainfall amount past 1 hour | mm | | | 1 |
| rnfl_amt_pst15mts | Rainfall amount past 15 minutes | mm | | | 1 |

5.35 Parks Canada Natural Resource Management Branch (PC Forestry)

Parks Canada Natural Resource Management Branch (NRMB) operates a network of weather stations across Canada to support fire management activities. A subset of this network is currently decoded by

the DMS with the remaining stations to be added over time. These stations report temperature, humidity, wind, and precipitation information. The network utilizes GOES to transmit observations from the stations to a central processor every hour 24/7. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|---------------------------|---|----------------|----------------------|--------------------|-----------|
| wnd_snsr_vert_disp | Wind sensor vertical displacement | m | | | 2 |
| long | Longitude | ° | | | 6 |
| lat | Latitude | ° | | | 6 |
| rptg_freq | Reporting frequency | min | | | |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| prov | Province | unitless | | | |
| nesdis_id | National Environmental Satellite Data and Information Service (NESDIS) identifier | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |
| min_rel_hum_pst24hrs | Minimum relative humidity past 24 hours | % | | | 0 |
| min_rel_hum_pst1hr | Minimum relative humidity past 1 hour | % | | | 0 |
| max_rel_hum_pst24hrs | Maximum relative humidity past 24 hours | % | | | 0 |
| max_rel_hum_pst1hr | Maximum relative humidity past 1 hour | % | | | 0 |
| rel_hum | Relative humidity | % | | | 0 |
| avg_soil_wtr_cntnt_pst1hr | Average soil water content past 1 hour | % | | | 0 |
| wnd_dir_pst1hr_max_spd | Wind direction past 1 hour maximum speed | ° | | | 0 |
| avg_wnd_dir_pst10mts | Average wind direction past 10 minutes | ° | | | 0 |
| max_wnd_spd_pst1hr | Maximum wind speed past 1 hour | km/h | | | 1 |
| avg_wnd_spd_pst10mts | Average wind speed past 10 minutes | km/h | | | 1 |
| avg_batry_volt_pst1hr | Average battery voltage past 1 hour | V | | | 2 |
| batry_volt | Battery voltage | V | | | |
| avg_solr_panl_volt_pst1hr | Average solar panel voltage past 1 hour | V | | | 1 |
| avg_batry_crnt_pst1hr | Average battery current past 1 hour | A | | | 1 |
| trans_batry_volt_1hr_ago | Transmitter battery voltage 1 hour ago | V | | | 1 |
| avg_solr_panl_crnt_pst1hr | Average solar panel current past 1 hour | A | | | 1 |
| avg_subsfrc_temp_pst1hr | Average subsurface temperature past 1 hour | °C | | | 1 |
| min_air_temp_pst24hrs | Minimum air temperature past 24 hours | °C | | | 1 |
| min_air_temp_pst1hr | Minimum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | Maximum air temperature past 24 hours | °C | | | 1 |
| max_air_temp_pst1hr | Maximum air temperature past 1 hour | °C | | | 1 |

| | | | | | |
|-------------------------------|---|-------------------|--|--|---|
| air_temp | Air temperature | °C | | | 1 |
| weighng_gag_stat | Weighing gauge status | unitless | | | |
| pcpn_gag_capcty_used | Precipitation gauge capacity used | % | | | |
| cum_pcpn_gag_wt | Cumulative precipitation gauge weight | kg/m ² | | | 1 |
| rnfl_snc_last_reset | Rainfall since last reset | mm | | | 1 |
| medn_dis_btwn_snsr_snw_pst1mt | Median distance between sensor and snow past 1 minute | cm | | | 0 |
| snw_dpth_qlty | Snow depth quality | unitless | | | |
| medn_snw_dpth_pst1mt | Median snow depth past 1 minute | cm | | | 0 |
| pcpn_amt_pst24hrs | Precipitation amount past 24 hours | mm | | | 1 |
| pcpn_amt_pst12hrs | Precipitation amount past 12 hours | mm | | | 1 |
| pcpn_amt_pst6hrs | Precipitation amount past 6 hours | mm | | | 1 |
| pcpn_amt_pst3hrs | Precipitation amount past 3 hours | mm | | | 1 |
| pcpn_amt_pst1hr | Precipitation amount past 1 hour | mm | | | 1 |
| rnfl_amt_pst24hrs | Rainfall amount past 24 hours | mm | | | 1 |
| rnfl_amt_pst12hrs | Rainfall amount past 12 hours | mm | | | 1 |
| rnfl_amt_pst6hrs | Rainfall amount past 6 hours | mm | | | 1 |
| rnfl_amt_pst3hrs | Rainfall amount past 3 hours | mm | | | 1 |
| rnfl_amt_pst1hr | Rainfall amount past 1 hour | mm | | | 1 |

5.36 Nova Scotia Department of Lands and Forestry (NS Forestry)

The Government of Nova Scotia Department of Lands and Forestry, is responsible for the development, management, conservation, and protection of forests in the province of Nova Scotia. They operate a network that consists of 31 weather stations to aid in decision-making and support fire weather operations in the province. Stations report temperature, humidity, wind, solar, and precipitation information. The network utilizes GOES to transmit observations from the stations to a central processor every hour 24/7. GOES transmissions are routed through the GTS where they are retrieved by ECCC hourly within the aforementioned time window and ingested into the DMS. The resulting decoded elements are mapped to the corresponding DMS elements, units, values and qualifiers and stored in XML format. These elements are then mapped to the short labels shown below.

| Label Name | Description | Standard Units | Standard Code Source | Standard Code Type | Precision |
|-----------------|---|----------------|----------------------|--------------------|-----------|
| long | Longitude | ° | | | 6 |
| lat | Latitude | ° | | | 6 |
| stn_elev | Station elevation | m | | | 3 |
| msc_id | Meteorological Service of Canada (MSC) identifier | unitless | | | |
| stn_nam | Station name | unitless | | | |
| data_pvdr | Data provider | unitless | | | |
| stn_id | Station identifier | unitless | | | |
| date_tm | Date time | datetime | | | |
| prov | Province | unitless | | | |
| nesdis_id | National Environmental Satellite Data and Information Service (NESDIS) identifier | unitless | | | |
| data_attrib_not | Data attribution notice | unitless | | | |

| | | | | | |
|--------------------------------|--|------|--|--|---|
| min_rel_hum_pst24hrs | Minimum relative humidity past 24 hours | % | | | 0 |
| min_rel_hum_pst1hr | Minimum relative humidity past 1 hour | % | | | 0 |
| max_rel_hum_pst24hrs | Maximum relative humidity past 24 hours | % | | | 0 |
| max_rel_hum_pst1hr | Maximum relative humidity past 1 hour | % | | | 0 |
| avg_rel_hum_pst2mts | Average relative humidity past 2 minutes | % | | | 0 |
| avg_wnd_dir_10m_pst10mts | Average wind direction at 10 metres past 10 minutes | ° | | | 0 |
| max_wnd_dir_max_spd_10m_pst1hr | Maximum wind direction at maximum speed at 10 metres past 1 hour | ° | | | 0 |
| avg_wnd_spd_10m_pst10mts | Average wind speed at 10 metres past 10 minutes | km/h | | | 1 |
| max_wnd_spd_10m_pst1hr | Maximum wind speed at 10 metres past 1 hour | km/h | | | 1 |
| batry_volt | Battery voltage | V | | | |
| solr_panl_volt | Solar panel voltage | V | | | 1 |
| batry_crnt | Battery current | A | | | 1 |
| trans_batry_volt | Transmitter battery voltage | V | | | 1 |
| solr_panl_crnt | Solar panel current | A | | | 1 |
| tlmtry_volt | Telemetry voltage | V | | | 1 |
| min_air_temp_pst24hrs | Minimum air temperature past 24 hours | °C | | | 1 |
| min_air_temp_pst1hr | Minimum air temperature past 1 hour | °C | | | 1 |
| max_air_temp_pst24hrs | Maximum air temperature past 24 hours | °C | | | 1 |
| max_air_temp_pst1hr | Maximum air temperature past 1 hour | °C | | | 1 |
| avg_air_temp_pst2mts | Average air temperature past 2 minutes | °C | | | 1 |
| cum_rnfl_amt | Cumulative rainfall amount | mm | | | 1 |
| rnfl_amt_pst24hrs | Rainfall amount past 24 hours | mm | | | 1 |
| rnfl_amt_pst12hrs | Rainfall amount past 12 hours | mm | | | 1 |
| rnfl_amt_pst6hrs | Rainfall amount past 6 hours | mm | | | 1 |
| rnfl_amt_pst3hrs | Rainfall amount past 3 hours | mm | | | 1 |
| rnfl_amt_pst1hr | Rainfall amount past 1 hour | mm | | | 1 |

6. Appendices

6.1 Glossary

| Term | Abbreviation For: | Definition |
|---------|---|--|
| ASCII | American Standard Code for Information Interexchange | a code for representing data as numbers, with each character assigned a number from 0 to 127 |
| ATMOS | Automated Transportable Meteorological Observing System | automatic surface weather stations (using Campbell data loggers) operated by EC's Science and Technology Branch |
| AWOS | Automated Weather Observing Station | weather stations that use automated sensors to report weather observations |
| BDQ | Base de Données Qualifiées | decoding and Qa/Qc software used in Quebec Region |
| BUFR | Binary Universal Format for Representation | a binary WMO code form used to transmit numerical or quantitative data |
| CA | Campbell | an ASCII CVS file containing data recoded by a Campbell Scientific data logger |
| CMC | Canadian Meteorological Centre | provides forecast guidance to national and regional prediction centres |
| CMML | Canadian Meteorological Markup Language | An XML product used to encode atmospheric and road weather data from various Canadian road weather networks. |
| COMPACT | | Automatic compact surface weather stations (using Campbell data loggers) operated by the MSC. Temporarily deployed in support of the 2015 PanAm Games |
| CSV | Comma, Space, Value | a file format where data values are delimited by a comma or space |
| DMF | Data Management Framework | new framework data management policies, procedures, processes and standards that are being implement to manage MSC's environmental monitoring data |
| DMI | Data Management Initiative | an initiative used to lead the development, implementation and enhancement of a data management framework and systems that provides clients with an authoritative source of MSC and related external data of known quality |
| DMS | Data Management System | a real-time data acquisition, standardization, quality assessment and product generation software of observation, forecast, and warning data |
| DND | Department of National Defense | Department of National Defense |
| ECCC | Environment and Climate Change Canada | the department of the Government of Canada responsible for coordinating environmental policies and programs, providing weather forecasts and detailed meteorological information as well as preserving and enhancing the natural environment and renewable resources |
| GML | Geography Markup Language | The XML grammar defined by the Open Geospatial Consortium (OGC) to express geographical features; serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet. |
| HWOS | Human Weather Observation Stations | weather stations that require an observer to report |

| | | |
|----------|--|--|
| | | weather conditions |
| ICAO | International Civil Aviation Organization | a specialized agency of the United Nations that codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth |
| ISAx41 | | telecommunications circuit header used to transmit BUFR data collected from manned stations |
| ISAx61 | | telecommunications circuit header used to transmit BUFR data collected from Nav Canada automated stations |
| ISAx62 | | telecommunications circuit header used to transmit BUFR data collected from Nav Canada manned stations |
| LWIS | Limited Weather Information System | a more basic automated weather system (AWOS), capable of measuring only wind, altimeter setting, temperature and dew point temperature |
| JICC | Java Interactive CodeCon | a software interface for entering and maintaining automatic station configuration data and used to decode their raw messages |
| MANOBS | Manual for Surface Weather Observation | a manual that prescribes the standard procedures of the Meteorological Service of Canada for observing, recording and reporting weather conditions |
| METAR | Meteorological Aviation Report | an ASCII format for routine surface weather observation for aviation purposes, reported on-the-hour; |
| MIDS | | a legacy interface for entering weather observations at aviation stations |
| MSC | Meteorological Services of Canada | a Branch of Environment and Climate Change Canada, which provides public meteorological information, weather forecasts and warnings of severe weather and also monitors and conducts research on climate, atmospheric science, air quality, water quantities, ice and other environmental issues |
| MSLP | Mean Sea Level Pressure | station pressure reduced to the level of mean sea level |
| NativeQC | Native Quality Control | Incoming information and flags indicating data quality or quality control performed at source |
| NC | Nav Canada (National Aviation Canada) | private corporation that provides aviation data and weather briefings |
| O&M | Observations and Measurements international standard | Defines standard models and XML schema for encoding observations and meteorological data from a sensor, both archived and real-time. O&M is one of the core standards in the OGC Sensor Web Enablement (SWE) suite. |
| OGC | Open Geospatial Consortium | an international industry consortium of companies, government agencies and universities participating in a consensus process to develop publicly available interface standards |
| OPP | Ocean Protection Plan | Government of Canada (GoC) undertaking to improve marine safety and responsible shipping, protects Canada's marine environment, and offer new possibilities for Indigenous and coastal communities |
| PG | Product Generator | software that generates products (e.g. SYNOP, |

| | | |
|----------|-----------------------------------|---|
| | | METAR, SWOB) |
| Qa | Quality Assessment | an evaluation where data are subjected to quality check routines used to assess and characterize the quality of data |
| QC | Quality Control | measures taken to correct or control bad data |
| RA | | bulletin header for MSC's legacy AWOS weather observation reports |
| RCS | Reference Climate Station | an enhanced automatic surface weather observing station operated by the MSC |
| SA | Surface Analysis | decommissioned ASCII format used for surface weather observation |
| SP | Special | special aviation weather report issued off the top of the hour when there is significant change in weather |
| SWE | Sensor Web Enablement | an OGC initiative that enables all types of Web and/or Internet-accessible sensors, instruments, and imaging devices to be accessible and, where applicable, controllable via the Web |
| SWOB-XML | Surface Weather Observation XML | An XML product containing surface weather and climate observations from MSC, partner and 3 rd party monitoring networks. It is simplified XML product that focuses on core weather data without the clutter and complexity of auxiliary metadata |
| SWOB | Surface Weather Observation | a condensed reference to the SWOB-XML product |
| SYNOP | Synoptic | weather observations reported at least four times a day at 0000 UTC, 0600 UTC, 1200 UTC and 1800 UTC |
| Taxonomy | | structure for classifying content (a unique dataset) according to a predetermined information domain; assists in organizing and describing information |
| TBRG | Tipping Bucket Rain Gauge | a tipping bucket rain gauge is used to measure liquid precipitation (rainfall) or rate of rainfall |
| TC_ID | Transport Canada identifier | unique 3-letter ID's traditionally assigned by Transport Canada aviation weather stations, but also assigned by MSC to public surface weather stations |
| URI | Uniform Resource Identifier | The path that uniquely identifies an individual instance of a dataset. It is made up of the taxonomy and additional parameters unique to the dataset. |
| WinIDE | Windows Interactive Data Entry | a software interface that allows data to be recorded at manned aviation weather stations and transmits the data in BUFR format |
| WMO | World Meteorological Organization | specialized agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences |
| XML | Extensible Markup Language | a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable |

6.2 Short Label Abbreviations

The table below shows the full word being abbreviated for the name portion of the SWOB element 'short label'.

| Word/Phrase | abbrev |
|--------------------------------|----------|
| 00utc | 0utc |
| 10minute | 10mt |
| 2minute | 2mt |
| above | abv |
| above mean sea level | amsl |
| accretion | accretn |
| accumulated | accum |
| accuracy | acc |
| acquisition | acq |
| active | actv |
| actual | actl |
| aerial | aerl |
| agency | agncy |
| aircraft | acft |
| airframe | arfrm |
| algorithm | algo |
| alternate | alt |
| altimeter | altmetr |
| altitude | altd |
| amount | amt |
| anemometer | anemom |
| angle | angl |
| approximated | aprxd |
| arrangement | arrngmnt |
| arrival | arrivl |
| attribution | attrib |
| automatic/automated | auto |
| availability | avail |
| average | avg |
| aviation | avtn |
| awos | aws |
| aws (automatic weather system) | aws |
| azimuth | azmth |
| backup | bkup |
| barometer | baro |
| base | bas |
| battery | batry |
| bearing | berng |
| below | blw |
| between | btwn |
| black | blck |
| block | blk |
| bound | bnd |

| | |
|--------------------------|-----------|
| boundary | bndry |
| bright | brght |
| buildup | bldup |
| bypass | bypas |
| cable | cabl |
| calibration | cal |
| capability | cap |
| capacity | capcty |
| carbon dioxide | CO2 |
| carbon monoxide | CO |
| ceiling | clg |
| ceilometer | ceilmtr |
| change | chg |
| channel | chanl |
| characteristic/character | char |
| checksum | cksum |
| chosen | chsn |
| clear | clr |
| climate | clim |
| cloud | cld |
| code/coded | code |
| coefficient | coeff |
| compartment | comp |
| compass | cmpss |
| computer | comp |
| concentration | conc |
| conditions/condition | condn |
| conductivity | condctvty |
| configuration | config |
| constant | const |
| consumption | consumptn |
| contamination | contamntn |
| content | cntnt |
| controller | controlr |
| correction | cor |
| count | cnt |
| cover | cvr |
| creation | crt |
| crest | crst |
| crossings | crsngs |
| cumulative | cum |
| current | crnt |
| datalogger | logr |
| datetime | datetm |
| day | dy |
| decode | decod |
| degree | deg |
| density | dnsty |

| | |
|------------------|----------|
| departure | depart |
| deposit | dpst |
| depression | deprssn |
| depth | dpth |
| derived | der |
| description | desc |
| descriptor | dscrptr |
| designator | dsgntr |
| destination | dest |
| detected | dctn |
| detection | dtctn |
| development | devlmt |
| deviation | dev |
| dewpoint | dwpt |
| diagnostic | diagnstc |
| diameter | dia |
| differential | diff |
| diffuse | dfuse |
| digit | digit |
| direct | direct |
| direction | dir |
| discrimination | discrmn |
| displacement | dsplcmt |
| distance/distant | dis |
| drift | drft |
| drifting | drftg |
| drogue | drog |
| duff | dff |
| dummy | dum |
| duration | dur |
| during | drng |
| edge | edg |
| efficiency | effcncny |
| element | elemt |
| elevation | elev |
| emittance | emit |
| energy | enrgy |
| engineering | eng |
| enroute | enrt |
| equipment | eqpt |
| equivalent | equiv |
| error | err |
| evaporation | evap |
| events | evnts |
| evolution | evoln |
| extended | extnd |
| factor | factr |
| field | feld |

| | |
|--|-----------|
| filtered | fltrd |
| flag/flags | flg |
| flight | flt |
| flood | fld |
| fluorometer | fluoromtr |
| forward | fwd |
| freezing | frzng |
| frequency | freq |
| fresh | frsh |
| friction | fric |
| gauge | gag |
| Geonor | gnor |
| geopotential | geoptl |
| global | globl |
| globe | glob |
| GPS (global positioning system) | gps |
| ground | gnd |
| group | grp |
| gust | gst |
| hailstone | halstn |
| hardware | hrdwr |
| hazard | hzrd |
| header/HDR (high data rate GOES transmitter) | hdr |
| heading | hdng |
| height | hgt |
| high | hi |
| horizontal | hor |
| hour | hr |
| hourly | hly |
| hours | hrs |
| humidity | hum |
| hwos (human weather observing system) | hwos |
| hydrostatic | hydrosttc |
| icao (international civil aviation organization) | icao |
| icing | icng |
| identifier, identify | id |
| index | indx |
| indicator | indctr |
| information | info |
| infrared | ir |
| initial | initl |
| input | inpt |
| instantaneous | inst |
| instrument | instr |
| intensity | intnsty |
| interface | intrfc |
| internal | int |

| | |
|--|---------|
| irradiance | irrad |
| isobaric | isobar |
| issuing | issug |
| julian day (day of year) | jday |
| latitude | lat |
| layer | lyr |
| legacy | lgcy |
| length | len |
| level | lvl |
| lightning | ltng |
| linear | lnr |
| liquid | lqd |
| local | locl |
| local standard time | lst |
| logger | logr |
| longitude | long |
| low | lo |
| lower | lwr |
| lowest | lwst |
| magnitude | mag |
| maintenance | matnanc |
| mandatory | mand |
| manned | mnd |
| marine | marin |
| marsden | marsden |
| maximum | max |
| maxmean | max_avg |
| mean (average) | avg |
| mean sea level | msl |
| mean sea level pressure | mslp |
| measurement | msrmnt |
| median | medn |
| mercury | Hg |
| message | msg |
| method | mtd |
| middle | mid |
| minimum | min |
| minute | mt |
| minutes | mts |
| mobile | mbi |
| model | modl |
| modulation | mod |
| moisture | moist |
| motion | mtn |
| MSC (meteorological service of Canada) | msc |
| name | nam |
| national | natl |
| navigational/navigation | nav |

| | |
|--------------------|----------------|
| network | ntwk |
| nitrogen dioxide | NO2 |
| nitrogen monoxide | NO |
| nitrogen oxides | NOx |
| notice | not |
| number | nbr |
| obscuration | obscn |
| obscuring | obscg |
| obstruction | obstrn |
| observation | obs |
| occurrence | ocr |
| octas | octas |
| office | off |
| official | ofcl |
| opacity | opcty |
| operating | oprating |
| oscillator | oscil |
| other | othr |
| override | ovrd |
| ozone | O3 |
| panel | panl |
| part | prt |
| particulate matter | PM |
| partner | prtnr |
| past | pst |
| pavement | pvmnt |
| peak | pk |
| period | pd |
| peripheral | periphl |
| phase | phas |
| phenomena | phenom |
| phenomenon | phenom |
| photosynthetically | photosnthticly |
| pitch | ptch |
| plateau | plat |
| point | pt |
| position | pos |
| power | pwr |
| precipitation | pcpn |
| precision | precisn |
| present | prsnt |
| pressure | pres |
| prevailing | prev |
| processed | procssd |
| product | prdct |
| profile | profil |
| program | prg |
| provider | pvrdr |

| | |
|------------------------------------|----------|
| province | prov |
| proximity | prxmty |
| pyranometer | pyrnmtr |
| quadrant | quad |
| qualifier | qlfr |
| quality | qlty |
| radiation | radn |
| radiometer | radiomtr |
| rainfall | rnfl |
| range | rng |
| rapid | rpd |
| rate | rt |
| read/reading | read |
| recent | recnt |
| reference | ref |
| reflected | refltd |
| refuel | reful |
| region | regn |
| relative | rel |
| release | rls |
| remark | rmk |
| removal | remov |
| report | rpt |
| reporting | rptg |
| revised | rev |
| revision | rev |
| road | rd |
| roll | rol |
| runway | rwy |
| rvr (runway visual range) | rvr |
| salinity | salnty |
| samples | smpls |
| satellite | sat |
| scalar | sclr |
| short | shrt |
| send | snd |
| sensor | snsr |
| serial | ser |
| service | serv |
| setting | setng |
| shear | shr |
| shift | shft |
| ship | shp |
| shortwave | shrtwv |
| shutdown | shtdwn |
| signal | sgnl |
| significant/significance/signature | sig |
| since | snc |

| | |
|-----------------------|-----------|
| situation | situatn |
| snow | snw |
| snowfall | snwfl |
| SOG (snow on ground) | sog |
| solar | solr |
| solid | sld |
| sonde | sonde |
| space | spce |
| special | spcl |
| specification | spec |
| spectral | spetrl |
| speed | spd |
| spray | spry |
| spread | sprd |
| square | sq |
| stage | stg |
| standard | std |
| standing | stdng |
| station | stn |
| statistical | statcal |
| status | stat |
| stop | stop |
| storm | strm |
| strength | strngh |
| strike | strk |
| string (text string) | strng |
| subasphalt | subashplt |
| subsurface | subsfc |
| Sulphur dioxide | SO2 |
| summation | sum |
| sunshine | sunshn |
| supplementary | suppl |
| supply | suply |
| suppressed | spprssd |
| surface | sfc |
| suspect | suspct |
| synoptic | syno |
| system | sys |
| table | tbl |
| TC (Transport Canada) | tc |
| technique | technq |
| telemetry | tlmtry |
| temperature | temp |
| tendency | tend |
| thickness | thknes |
| time | tm |
| total | tot |
| towards | twds |

| | |
|---------------------------------------|-----------|
| track | trk |
| tracking | trkng |
| transducer | transdcr |
| transient | trnsnt |
| transmission/transmitter | trans |
| transmit | trans |
| trend | trnd |
| tropopause | tropo |
| turbine | turbin |
| turbulence | turb |
| type | typ |
| ultraviolet radiation | uv |
| ultraviolet A radiation | uva |
| ultraviolet B radiation | uvb |
| unfiltered | unfiltrd |
| unknown | unkn |
| unprocessed | unprocssd |
| upper | upr |
| UTC (universal coordinated time) | utc |
| valid | vld |
| value | val |
| vapour | vpr |
| variable/variation | var |
| vector | vtr |
| version | ver |
| vertical | vert |
| vicinity | vcnity |
| visibility | vis |
| voltage | volt |
| vortex | vrtx |
| warning | wrng |
| watchman | wtchmn |
| water | wtr |
| weather | wx |
| weighing | weighng |
| weight | wt |
| wet-bulb | wetblb |
| winch | wrch |
| wind | wnd |
| windchill | wrchl |
| with | w |
| without | wo |
| wmo (world metrological organisation) | wmo |
| year | yr |
| zone | zn |

6.3 Units of Measure

The table below is an inventory of all units of measure used by the DMS.

| UNIT CLASS | UNIT NAME | UNIT SYMBOL | UNIT DESCRIPTION |
|---------------------|----------------------------------|--------------------|--|
| Angle | decadegree(s) | da° | Angle, azimuth or coordinates in tens of a degree |
| Angle | decidegree(s) | d° | Angle, azimuth or coordinates in tenth of a degree |
| Angle | decidegree(s) | 0.1° | Angle, azimuth or coordinates in tenth of a degree |
| Angle | minute(s) of arc - (1/60) degree | ' | Angle in second(s) of arc - (1/60) degree |
| Angle | degree(s) - equal to (pi/180)rad | ° | Angle in degree(s)degree(s) - unit of angle equal to (pi/180)rad |
| Angle | decadegrees | 10° | Angle in tens of degrees azimuth |
| Angle | second(s) of arc - (1/60) minute | " | Angle in second(s) of arc - (1/60) minute |
| Angle | millidegrees | m° | Angle in thousandths of a degree |
| Area | square kilometre(s) | km ² | Area in square kilometre(s) |
| Area | hectare(s) | ha | Area in hectare(s) |
| Area | square metre(s) | m ² | Area in square metre(s) |
| Area | acre(s) | acre | Area in acre(s) |
| Area | square mile(s) | mi ² | Area in square mile(s) |
| Areal_Weight | kilograms per square metre(s) | kg/m ² | Areal Weight in kilograms per square metre(s) |
| Calibration | centimetre(s) per square hertz | cm/Hz ² | unit for a calibration coefficient parameter used to convert a weighing precipitation gauge transducer value (from a vibrating wire of a specific length) to precipitation weight per unit area (kg/m ²), which is equivalent to mm) |
| Calibration | centimetre(s) per hertz | cm/Hz | unit for a calibration coefficient parameter used to convert a weighing precipitation gauge transducer value (from a vibrating wire of a specific length) to precipitation weight per unit area (kg/m ²), which is equivalent to mm) |
| Code | unit is a code value | code | Unit is a code value |
| Density | microgram(s) per cubic meter | µg/m ³ | Unit used to measure density |
| Density | kilograms per cubic metre(s) | kg/m ³ | Unit used to measure density |
| Density | milligram(s) per litre | mg/L | Unit used to measure density/concentration |
| Density | micrograms(s) per litre | µg/L | Unit used to measure density/concentration |
| Electrical/Magnetic | Siemens | S | The Siemens (symbol: S) is the SI derived unit of electric conductance and electric admittance |
| Electrical/Magnetic | milliSiemens | mS | The Siemens (symbol: S) is the SI derived unit of electric conductance and electric admittance |
| Electrical/Magnetic | milliSiemens per 10 cm | mS/10cm | Unit used to measure rate of electrical conductivity over 10 cm |
| Electrical/Magnetic | milli-mhos per 10 cm | milli-mhos/10cm | Rate of electrical conductivity in milli-mhos over 10 cm where mhos is a non-SI unit of conductivity which is equivalent to 1 Siemens |
| Electrical/Magnetic | milliSiemens per 10 cm | mS/dm | Unit used to measure rate of electrical conductivity over 10 cm (i.e. a decimeter) |

| | | | |
|---------------------|--|-----------------------|--|
| Electrical/Magnetic | milli-mhos per 10 cm | milli-mhos/dm | Rate of electrical conductivity in milli-mhos over 10 cm (i.e. a decimeter) where mhos is a non-SI unit of conductivity which is equivalent to 1 Siemens |
| Electrical/Magnetic | milliSiemens per cm | mS/cm | Unit used to measure rate of electrical conductivity over 1 cm |
| Electrical/Magnetic | volt | V | Electrical/Magnetic in volt(s) - potential difference |
| Electrical/Magnetic | Relative Fluorescence Unit | RFU | Unit used to measure fluorescence of particles in a fluid |
| Energy_Flux | kilojoule(s) per square metre | kJ/m ² | Energy Flux in kilojoule(s) per square metre |
| Energy_Flux | joule(s) per square metre | J/m ² | Energy Flux in joule(s) per square metre |
| Energy_Flux | watt(s) per square metre | W/m ² | Energy Flux in watt(s) per square metre |
| Energy_Flux | watt(s) | W | Rate of energy conversion in watt(s), equivalent to one joule per second |
| Energy_Flux | microvolt-watt per square metre | μVW/m ² | calibration coefficient to convert voltage into W/m ² |
| Energy_Flux | micro-mole(s) of a substance per square metre per second | μmol/m ² s | Energy flux in micro-mole(s) per square metre per second |
| Energy_Flux | megajoule(s) per square metre | MJ/m ² | Energy Flux in megajoule(s) per square metre |
| Flow/Rate | cubic metre(s) per second | m ³ /s | Flow/Rate in cubic metre(s) per second |
| Flow/Rate | litre(s) per minute | L/min | Flow/Rate in litre(s) per minute |
| Flow/Rate | litre(s) per hour | L/h | Flow/Rate in litre(s) per hour |
| Flow/Rate | millilitre(s) per second | mL/s | Flow/Rate in millilitre(s) per second |
| Flow/Rate | millilitre(s) per hour | mL/h | Flow/Rate in millilitre(s) per hour |
| Flow/Rate | millimetre(s) per hour | mm/h | Flow/Rate in millimetre(s) per hour |
| Flow/Rate | U.S. gallon(s) per hour | USgal/h | Flow/Rate in U.S. gallon(s) per hour |
| Flow/Rate | Imperial gallon(s) per hour | gal/h | Flow/Rate in Imperial gallon(s) per hour |
| Flow/Rate | Imperial gallon(s) per minute | gal/min | Flow/Rate in Imperial gallon(s) per minute |
| Flow/Rate | Jackson Turbidity Unit | JTU | Unit used to measure turbidity in water |
| Frequency | hertz(s) | Hz | Unit of frequency defined as the number of cycles per second of a periodic phenomenon |
| Intensity | unit is particular m per second | m ² /s | Intensity in particular m per second |
| Length | tenths of mile(s) | 0.1mi | Length in tenths of a mile(s) |
| Length | tenths of millimetre(s) | 0.1mm | Length in tenths of millimetre(s) |
| Length | nanometre(s) | nm | Length in nanometre(s) |
| Length | millimetre(s) | mm | Length in millimetre(s) |
| Length | centimetre(s) | cm | Length in centimetre(s) |
| Length | half metre(s) | 0.5m | Length in half metre(s) |
| Length | metre(s) | m | Length in metre(s) |
| Length | hectometre(s) | hm | Length in hectometre(s) |
| Length | kilometre(s) | km | Length in kilometre(s) |
| Length | foot or feet | ft | Length in feet |
| Length | thirties of metres | 30m | Length in thirties of metres |
| Length | hundreds of feet | 100ft | Length in hundreds of feet |
| Length | inch(es) | in | Length in inch(es) |
| Length | hundredths of inch(es) | 0.01in | Length in hundredths of inch(es) |
| Length | (statute) mile(s) | mi | Length in (statute) mile(s) |
| Length | nautical mile(s) | n.mi | Length in nautical mile(s) |
| Length | yard(s) | yd | Length in yard(s) |
| Length | geopotential metre(s) | gpm | Length in Geopotential metre(s) |

| | | | |
|------------------------|----------------------------------|----------|--|
| Length | tenths of millimeter(s) | mm/10 | Length in tenths millimetre(s) |
| Length | hectometre(s) | 100m | Length in hundreds of metres |
| Length | decimeter(s) | dm | Length in tenths of metres |
| Mass | kilogram(s) | kg | Mass in kilogram(s) |
| Mass | gram(s) | g | Mass in gram(s) |
| Mass | ounce(s) | oz | Mass in ounce(s) |
| Mass | pound(s) | lb | Mass in pound(s) |
| Mass | milligram(s) | mg | Mass in milligram(s) |
| Mass | kilogram per kilogram | kg/kg | Mass in kilogram per kilogram |
| Percent/Fraction/Index | hundredths part(s) per thousand | 0.01ppt | hundredths part(s) per thousand |
| Percent/Fraction/Index | part(s) per million | ppm | Percent/Fraction/Index in part(s) per million |
| Percent/Fraction/Index | hundredths of a percent | 100% | Percent/Fraction/Index in hundredths of a percent |
| Percent/Fraction/Index | percent | % | Percent/Fraction/Index in percent |
| Percent/Fraction/Index | part(s) per billion | ppb | Percent/Fraction/Index in part(s) per billion |
| Percent/Fraction/Index | eighth(s) | 1/8 | Percent/Fraction/Index in eighth(s) |
| Percent/Fraction/Index | tenth(s) | 1/10 | Percent/Fraction/Index in tenth(s) |
| Percent/Fraction/Index | part(s) per thousand | ppt | parts per thousands |
| Percent/Fraction/Index | part(s) per thousand | ‰ | parts per thousands |
| Pressure/Stress | pounds per square inch | psi | Pressure/Stress in pounds per square inch |
| Pressure/Stress | atmosphere(s) | atm | Pressure/Stress in atmosphere(s) |
| Pressure/Stress | hectopascal(s) | hPa | Pressure/Stress in hectopascal(s) |
| Pressure/Stress | centibar(s) | cbar | Pressure/Stress in centibar(s) |
| Pressure/Stress | decapascal(s) | daPa | Pressure/Stress in tens of pascals |
| Pressure/Stress | inches of mercury | inHg | Pressure/Stress in inches of mercury |
| Pressure/Stress | kilopascal(s) | kPa | Pressure/Stress in kilopascal(s) |
| Pressure/Stress | pascal(s) | Pa | Pressure/Stress in pascal(s) |
| Pressure/Stress | millimetres of mercury | mmHg | Pressure/Stress in millimetres of mercury |
| Pressure/Stress | millibar(s) | mbar | Pressure/Stress in millibar(s) |
| Signal_Strength | decibel(s) milliwatt | dBm | The expression dBm is used to define signal strength in wires and cables at RF and AF frequencies. The symbol is an abbreviation for "decibels relative to one milliwatt" (dBmW) |
| Temperature | degree(s) Fahrenheit | °F | Temperature in degree(s) Fahrenheit |
| Temperature | low precision Kelvin | bufrK | Temperature in Kelvin decoded from MSC CodeCon BUFR (precision of 0.1) |
| Temperature | Kelvin | K | Temperature in Kelvin |
| Temperature | decidegree(s) Celsius | d°C | Temperature in tenth of degree(s) Celsius |
| Temperature | centidegrees Celsius | c°C | hundredths of a degree(s) Celsius |
| Temperature | degree(s) Celsius | °C | Temperature in degree(s) Celsius |
| Time/Date | annum (year) | a | Time/Date in annum (year) |
| Time/Date | month(s) | mo | Time/Date in month(s) |
| Time/Date | day(s) | d | Time/Date in day(s) |
| Time/Date | date-time | datetime | Time/Date in full ISO 8601 format YYYY-MM-DDTHH:MM:SS.000Z |
| Time/Date | hour(s) and minute(s) | hhmm | Time/Date in hour(s) and minute(s) |
| Time/Date | hour(s), minute(s) and second(s) | hhmmss | Time/Date in hour(s), minute(s) and second(s) |
| Time/Date | minute(s) | min | Time/Date in minute(s) |
| Time/Date | hour(s) | H | Time/Date in hour(s) |
| Time/Date | day of year | doy | Time/Date in day of year (also referred to as Julian day) |

| | | | |
|-----------|-------------------------|-----------------|--|
| Time/Date | second(s) | S | Time/Date in second(s) |
| Time/Date | millisecond(s) | ms | Time/Date in millisecond(s) |
| Time/Date | decisecond(s) | 0.1s | Time/Date in tenths of a second |
| Unitless | unit is not applicable | unitless | Unit is not applicable |
| Velocity | knot(s) | kn | Velocity in knot(s)- nautical mile(s) per hour |
| Velocity | mile(s) per hour | mph | Velocity in mile(s) per hour |
| Velocity | kilometre(s) per hour | km/h | Velocity in kilometre(s) per hour |
| Velocity | foot or feet per second | ft/s | Velocity in foot or feet per second |
| Velocity | decimetre(s) per second | dm/s | Velocity in decimetre(s) per second |
| Velocity | metre(s) per second | m/s | Velocity in metre(s) per second |
| Velocity | centimetres per second | cm/s | Velocity in centimetres per second |
| Volume | quart(s) | qt | Volume in quart(s) |
| Volume | pint(s) | pt | Volume in pint(s) |
| Volume | fluid ounce(s) | fl.oz | Volume in fluid ounce(s) |
| Volume | U.S. gallon(s) | USgal | Volume in U.S. gallon(s) |
| Volume | cubic yard(s) | yd ³ | Volume in cubic yard(s) |
| Volume | millilitre(s) | mL | Volume in millilitre(s) |
| Volume | cubic metre(s) | m ³ | Volume in cubic metre(s) |
| Volume | litre(s) | L | Volume in litre(s) |
| Volume | cubic centimetre(s) | cm ³ | Volume in cubic centimetre(s) |
| Volume | Imperial gallon(s) | gal | Volume in Imperial gallon(s) |

6.4 Unit Conversions

The table below is an inventory of unit conversions employed in the DMS

| ORIGINAL UNIT | MULTIPLIER | OFFSET | TARGET UNIT |
|-------------------|------------|---------|-------------------|
| 0.1mi | 0.1609344 | 0 | km |
| 0.1mi | 0.1 | 0 | mi |
| 0.1mm | 0.1 | 0 | kg/m ² |
| 0.1mm | 0.1 | 0 | mm |
| 0.1s | 0.1 | 0 | s |
| 0.5m | 0.5 | 0 | m |
| 1/10 | 10 | 0 | % |
| 1/8 | 12.5 | 0 | % |
| 100ft | 1 | 0 | 30m |
| 100ft | 30 | 0 | m |
| 10° | 10 | 0 | ° |
| 30m | 30 | 0 | m |
| J/m ² | 0.001 | 0 | kJ/m ² |
| K | 1 | -273.15 | °C |
| MJ/m ² | 1000 | 0 | kJ/m ² |
| MJ/m ² | 1000000 | 0 | J/m ² |
| Pa | 0.1 | 0 | daPa |
| Pa | 0.01 | 0 | hPa |
| Pa | 0.001 | 0 | kPa |
| Pa | 0.0002953 | 0 | inHg |
| bufrK | 1 | -273.2 | °C |
| cbar | 10 | 0 | hPa |

| | | | |
|-------------------|-------------|--------|-------|
| cm | 10 | 0 | mm |
| cm | 0.01 | 0 | m |
| daPa | 10 | 0 | Pa |
| daPa | 0.1 | 0 | hPa |
| da° | 10 | 0 | ° |
| dm | 0.1 | 0 | m |
| dm/s | 0.36 | 0 | km/h |
| ds | 0.1 | 0 | s |
| d° | 0.1 | 0 | ° |
| d°C | 0.1 | 273.15 | K |
| d°C | 0.1 | 0 | °C |
| ft | 0.3048 | 0 | m |
| ft | 0.0003048 | 0 | km |
| h | 60 | 0 | min |
| hPa | 100 | 0 | Pa |
| hPa | 10 | 0 | daPa |
| hPa | 1 | 0 | mbar |
| hPa | 0.1 | 0 | kPa |
| hPa | 0.02952998 | 0 | inHg |
| hm | 100 | 0 | m |
| in | 2.54 | 0 | cm |
| in | 25.4 | 0 | mm |
| inHg | 33.86389 | 0 | hPa |
| inHg | 3386.389 | 0 | Pa |
| kPa | 10 | 0 | mbar |
| kPa | 0.2952998 | 0 | inHg |
| kPa | 10 | 0 | hPa |
| kg/m ² | 1 | 0 | mm |
| km | 1000 | 0 | m |
| km | 0.62137119 | 0 | mi |
| km | 0.539957 | 0 | n.mi |
| km/h | 0.539957 | 0 | kn |
| km/h | 0.277778 | 0 | m/s |
| km/h | 0.62137119 | 0 | mph |
| kn | 1.150779 | 0 | mph |
| kn | 1.852 | 0 | km/h |
| kn | 0.514444 | 0 | m/s |
| m | 0.033333 | 0 | 100ft |
| m | 0.03333333 | 0 | 30m |
| m | 2 | 0 | 0.5m |
| m | 100 | 0 | cm |
| m | 3.2808399 | 0 | ft |
| m | 0.01 | 0 | hm |
| m | 0.001 | 0 | km |
| m | 0.000621371 | 0 | mi |
| m | 1000 | 0 | mm |
| m/s | 3.6 | 0 | km/h |
| m/s | 1.94384 | 0 | kn |
| mbar | 0.02952998 | 0 | inHg |
| mbar | 1 | 0 | hPa |
| mbar | 0.1 | 0 | kPa |

| | | | |
|-----------------|-------------|-----------|-------------------|
| mbar | 100 | 0 | Pa |
| mbar | 10 | 0 | daPa |
| mi | 1.609344 | 0 | km |
| mi | 0.868976 | 0 | n.mi |
| mi | 1609.344 | 0 | m |
| milli-mhos/10cm | 1 | 0 | mS/10cm |
| milli-mhos/10cm | 1 | 0 | mS/dm |
| mS/cm | 10 | 0 | mS/dm |
| mS/dm | 0.1 | 0 | mS/cm |
| ms | 0.00016667 | 0 | min |
| s | 0.016666667 | 0 | min |
| min | 0.016666667 | 0 | h |
| mm | 10 | 0 | 0.1mm |
| mm | 1 | 0 | kg/m ² |
| mm | 0.001 | 0 | m |
| mm/10 | 0.1 | 0 | mm |
| mph | 1.609344 | 0 | km/h |
| mph | 0.44704 | 0 | m/s |
| m° | 0.001 | 0 | ° |
| n.mi | 1.852 | 0 | km |
| n.mi | 1.150779 | 0 | mi |
| n.mi | 1852 | 0 | m |
| s | 10 | 0 | 0.1s |
| ° | 0.1 | 0 | da° |
| ° | 10 | 0 | d° |
| ° | 10 | 0 | 0.1° |
| °C | 1 | 273.15 | K |
| °C | 1.8 | 32 | °F |
| °C | 10 | 0 | d°C |
| °F | 0.55556 | -17.77778 | °C |

6.5 Standard Code Tables

The tables below provide descriptions of the standard code values for a given code type (i.e. table name)

6.5.1 buoy_type

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-----------|-----------|--|
| std_code_src | buoy_type | 0 | Unspecified drifting buoy |
| | | 1 | Standard Lagrangian drifter (Global Drifter Programme) |
| | | 2 | Standard FGGE-type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| | | 3 | Wind measuring FGGE-type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| | | 4 | Ice float |
| | | 5 | Reserved |
| | | 6 | Reserved |
| | | 7 | Reserved |

| | | | |
|--|--|----|------------------------------|
| | | 8 | Unspecified subsurface float |
| | | 9 | SOFAR |
| | | 10 | ALACE |
| | | 11 | MARVOR |
| | | 12 | RAFOS |
| | | 13 | Reserved |
| | | 14 | Reserved |
| | | 15 | Reserved |
| | | 16 | Unspecified moored buoy |
| | | 17 | 6-metre Nomad |
| | | 18 | 3-metre discus |
| | | 19 | 10–12-metre discus |
| | | 20 | ODAS 30 series |
| | | 21 | ATLAS (e.g. TAO area) |
| | | 22 | TRITON |
| | | 23 | Reserved |
| | | 24 | Omnidirectional wave rider |
| | | 25 | Directional wave rider |
| | | 26 | Subsurface ARGO float |
| | | 27 | Reserved |
| | | 28 | Reserved |
| | | 29 | Reserved |
| | | 30 | Reserved |
| | | 31 | Reserved |
| | | 32 | Reserved |
| | | 33 | Reserved |
| | | 34 | Reserved |
| | | 35 | Reserved |
| | | 36 | Reserved |
| | | 37 | Reserved |
| | | 38 | Reserved |
| | | 39 | Reserved |
| | | 40 | Reserved |
| | | 41 | Reserved |
| | | 42 | Reserved |
| | | 43 | Reserved |
| | | 44 | Reserved |
| | | 45 | Reserved |
| | | 46 | Reserved |
| | | 47 | Reserved |
| | | 48 | Reserved |
| | | 49 | Reserved |

| | | | |
|--|--|----|--|
| | | 50 | Reserved |
| | | 51 | Reserved |
| | | 52 | Reserved |
| | | 53 | Reserved |
| | | 54 | Reserved |
| | | 55 | Reserved |
| | | 56 | Reserved |
| | | 57 | Reserved |
| | | 58 | Reserved |
| | | 59 | Reserved |
| | | 60 | Reserved |
| | | 61 | Reserved |
| | | 62 | Reserved |
| | | 63 | Missing value (// in SYNOP & coded 63 in BUFR) |
| | | 64 | 1.7-metre WatchKeeper |
| | | 65 | Standard Lagrangian drifting Buoy with barometer |
| | | 66 | ODAS Viking |

6.5.2 ceiling_type

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|--------------|-----------|--|
| std_code_src | ceiling_type | 0 | RESERVED |
| | | 1 | Measured by aircraft |
| | | 2 | Measured by balloon |
| | | 3 | Estimated |
| | | 4 | Delimited by precipitation |
| | | 5 | Indefinite |
| | | 6 | Measured |
| | | 7 | ground-base layer delimited by precipitation |
| | | 8 | ground-base layer not delimited by precipitation |

6.5.3 data_flags

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|------------|-----------|---|
| std_code_src | data_flags | 0 | reserved |
| | | 1 | Value has been reformulated or mathematically derived (ARKEON flag D) |
| | | 2 | Reported value received as an estimate (ARKEON flag E) |
| | | 3 | Reported value the result of an adjustment (e.g. precipitation under catch) |
| | | 4 | Incomplete - element derivation contains at least one missing value (ARKEON flag I) |
| | | 5 | Trace. Value is zero (ARKEON flag T) |
| | | 6 | More than one occurrence (ARKEON flag S) |

| | | | |
|--|--|----|--|
| | | 7 | Missing inputs interpolated within completeness constraints (ARKEON flag E) |
| | | 8 | Accumulated amount (ARKEON flag A) |
| | | 9 | Precipitation occurred, amount uncertain; value is 0 (ARKEON flag C) |
| | | 10 | Accumulated and estimated (ARKEON flag F) |
| | | 11 | Precipitation may or may not have occurred; value is 0 or 0.1 (ARKEON flag L) |
| | | 12 | Temperature missing, but known to be ABOVE freezing (ARKEON flag N) |
| | | 13 | Temperature missing, but known to be BELOW freezing (ARKEON flag Y) |
| | | 14 | Value is uncorrected (ARKEON flag G) |
| | | 15 | The reported value is lower than the true value (e.g. measurement limit of instrumentation exceeded, or manual observation upper limit for reporting exceeded) |
| | | 16 | Value represents a cumulative amount over a period greater than the normal interval between two successive values |

6.5.4 direction

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-----------|-----------|---|
| std_code_src | direction | 0 | Calm |
| | | 1 | Northeast (NE) |
| | | 2 | East (E) |
| | | 3 | Southeast (SE) |
| | | 4 | South (S) |
| | | 5 | Southwest (SW) |
| | | 6 | West (W) |
| | | 7 | Northwest (NW) |
| | | 8 | North (N) |
| | | 9 | All directions (in Da, D1), or confused (in DK), or variable (in D(wind)), or unknown (in Ds), or unknown or clouds invisible (in DH, DL, DM) |
| | | 10 | Not reported |
| | | 11 | Ship in shore or flaw lead |
| | | 12 | Not determined (ship in ice) |
| | | 13 | Unable to report, because of darkness, lack of visibility or because only ice of land origin is visible |
| | | 14 | North-northeast (NNE) |
| | | 15 | East-northeast (ENE) |
| | | 16 | East-southeast (ESE) |
| | | 17 | South-southeast (SSE) |
| | | 18 | South-southwest (SSW) |
| | | 19 | West-southwest (WSW) |
| | | 20 | West-northwest (WNW) |
| | | 21 | North-northwest (NNW) |

6.5.5 obscuring_phenomena

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|---------------------|-----------|---|
| std_code_src | obscuring_phenomena | 0 | Alto cumulus |
| | | 1 | Alto cumulus castellanus |
| | | 2 | Alto stratus |
| | | 3 | Cirrocumulus |
| | | 4 | Cirrostratus |
| | | 5 | Cirrus. For the Nav Canada NC-HWOS data set this code is used for Cirrus and Sky Clear (SKC). |
| | | 6 | Cumulonimbus |
| | | 7 | Cumulus |
| | | 8 | Cumulus fractus |
| | | 9 | Stratus fractus |
| | | 10 | Towering cumulus (aka cumulus congestus) |
| | | 11 | Nimbo stratus |
| | | 12 | Stratocumulus |
| | | 13 | Stratus |
| | | 14 | Missing |
| | | 15 | Cloud not visible owing to darkness, fog, dust storm, sandstorm, or other analogous phenomena. For the Nav Canada NC-HWOS data set this means smoke (i.e. FU, equivalent to code 65). |
| | | 16 | No CH clouds |
| | | 17 | Cirrus fibratus, sometimes uncinus, not progressively invading the sky |
| | | 18 | Cirrus spissatus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus castellanus or floccus |
| | | 19 | Cirrus spissatus cumulonimbogenitus |
| | | 20 | Cirrus uncinus or fibratus, or both, progressively invading the sky; they generally thicken as a whole |
| | | 21 | Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole, but the continuous veil does not reach 45 degrees above the horizon |
| | | 22 | Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered |
| | | 23 | Cirrostratus covering the whole sky |
| | | 24 | Cirrostratus not progressively invading the sky and not entirely covering it |
| | | 25 | Cirrocumulus alone, or Cirrocumulus predominant among the Ch cloud |
| | | 26 | CH clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds |
| | | 27 | No CL clouds |
| | | 28 | Cumulus humilis or Cumulus fractus other than of bad weather, or both. For the Nav Canada NC-HWOS data set this means only Cumulus fractus (i.e. equivalent to code 8) |
| | | 29 | Cumulus mediocris or congestus, Towering cumulus (TCU), with or without Cumulus of species fractus or humilis or Stratocumulus, |

| | | | |
|--|--|----|---|
| | | | all having their bases at the same level. For the Nav Canada NC-HWOS data set this means only TCU (i.e. equivalent to code 10). |
| | | 30 | Cumulonimbus calvus, with or without Cumulus, Stratocumulus or Stratus |
| | | 31 | Stratocumulus cumulogenitus |
| | | 32 | Stratocumulus other than Stratocumulus cumulogenitus |
| | | 33 | Stratus nebulosus or Stratus fractus other than of bad weather |
| | | 34 | Stratus fractus or Cumulus fractus of bad weather, or both (pannus), usually below Altostratus or Nimbostratus. For the Nav Canada NC-HWOS data set this means only Stratus fractus (i.e. equivalent to code 9) |
| | | 35 | Cumulus and Stratocumulus other than Stratocumulus cumulogenitus, with bases at different levels |
| | | 36 | Cumulonimbus capillatus (often with an anvil), with or without Cumulonimbus calvus, Cumulus, Stratocumulus, Stratus or pannus |
| | | 37 | CL clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena |
| | | 38 | No CM clouds |
| | | 39 | Altostratus translucidus |
| | | 40 | Altostratus opacus or Nimbostratus |
| | | 41 | Alto cumulus translucidus at a single level |
| | | 42 | Patches (often lenticular) of Alto cumulus translucidus, continually changing and occurring at one or more levels |
| | | 43 | Alto cumulus translucidus in bands, or one or more layers of Alto cumulus translucidus or opacus, progressively invading the sky; these Alto cumulus as a whole clouds generally thicken as a whole |
| | | 44 | Alto cumulus cumulogenitus (or cumulonimbogenitus) |
| | | 45 | Alto cumulus translucidus or opacus in two or more layers, or Alto cumulus opacus in a single layer, not progressively invading the sky, or Alto cumulus with Altostratus or Nimbostratus |
| | | 46 | Alto cumulus castellanus or floccus. For the Nav Canada NC-HWOS data set this means only Alto cumulus castellanus (i.e. equivalent to code 1). |
| | | 47 | Alto cumulus of a chaotic sky, generally at several levels |
| | | 48 | CM clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of continuous layer of lower clouds |
| | | 49 | Reserved |
| | | 50 | Reserved |
| | | 51 | Reserved |
| | | 52 | Reserved |
| | | 53 | Reserved |
| | | 54 | Rain |
| | | 55 | Hail |
| | | 56 | Ice pellets |
| | | 57 | Drizzle |
| | | 58 | Ice crystals |
| | | 59 | Snow |
| | | 60 | Blowing snow |
| | | 61 | Fog |

| | | | |
|--|--|----|--------------------|
| | | 62 | Dust, blowing dust |
| | | 63 | Haze |
| | | 64 | Sand, blowing sand |
| | | 65 | Smoke |
| | | 66 | Volcanic ash |
| | | 67 | CH |
| | | 68 | CM |
| | | 69 | CL |
| | | 70 | Reserved |
| | | 71 | Reserved |
| | | 72 | Reserved |
| | | 73 | Reserved |
| | | 74 | Reserved |
| | | 75 | Reserved |
| | | 76 | Reserved |
| | | 77 | Reserved |
| | | 78 | Reserved |
| | | 79 | Reserved |
| | | 80 | Reserved |
| | | 81 | Reserved |
| | | 82 | Reserved |
| | | 83 | Reserved |
| | | 84 | Reserved |
| | | 85 | Reserved |
| | | 86 | Dust storm |
| | | 87 | Sandstorm |

6.5.6 operating_agency

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|------------------|-----------|---|
| std_code_src | operating_agency | 0 | Australia, Bureau of Meteorology (BOM) |
| | | 1 | Australia, Joint Australian Facility for Ocean Observing Systems (JAFOOS) |
| | | 2 | Australia, the Commonwealth Scientific and Industrial Research Organization (CSIRO) |
| | | 3 | Canada, Marine Environmental Data Service (MEDS) |
| | | 4 | Canada, Institute of Ocean Sciences (IOS) |
| | | 5 | Canada, Environment and Climate Change Canada |
| | | 6 | Canada, Department of National Defence |
| | | 7 | Canada, Nav Canada |
| | | 8 | China, The State Oceanic Administration |
| | | 9 | China, Second Institute of Oceanography, State Oceanic Administration |
| | | 10 | China, Institute of Ocean Technology |
| | | 11 | France, Institut de Recherche pour le Développement (IRD) |

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| | | 12 | France, Institut Français de Recherche pour l'Exploitation de la mer (IFREMER) |
| | | 13 | Germany, Bundesamt fuer Seeschifffahrt und Hydrographie (BSH) |
| | | 14 | Germany, Institut fuer Meereskunde, Kiel |
| | | 15 | India, National Institute of Oceanography (NIO) |
| | | 16 | India, National Institute for Ocean Technology (NIOT) |
| | | 17 | India, National Centre for Ocean Information Service |
| | | 18 | Japan, Japan Meteorological Agency (JMA) |
| | | 19 | Japan, Frontier Observational Research System for Global Change |
| | | 20 | Japan, Japan Marine Science and Technology Centre (JAMSTEC) |
| | | 21 | Republic of Korea, Seoul National University |
| | | 22 | Republic of Korea, Korea Ocean Research and Development Institute (KORDI) |
| | | 23 | Republic of Korea, Meteorological Research Institute |
| | | 24 | New Caledonia, Institut de Recherche pour le Développement (IRD) |
| | | 25 | New Zealand, National Institute of Water and Atmospheric Research (NIWA) |
| | | 26 | Russian Federation, State Oceanographic Institute of Roshydromet |
| | | 27 | Russian Federation, Federal Service for Hydrometeorology and Environmental Monitoring |
| | | 28 | Spain, Instituto Español de Oceanografía |
| | | 29 | United Kingdom, Hydrographic Office |
| | | 30 | United Kingdom, Southampton Oceanography Centre (SOC) |
| | | 31 | USA, NOAA Atlantic Oceanographic and Meteorological Laboratories (AOML) |
| | | 32 | USA, NOAA Pacific Marine Environmental Laboratories (PMEL) |
| | | 33 | USA, Scripps Institution of Oceanography (SIO) |
| | | 34 | USA, Woods Hole Oceanographic Institution (WHOI) |
| | | 35 | USA, University of Washington |
| | | 36 | USA, Naval Oceanographic Office |

6.5.7 precipitation_measurement_method

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|----------------------------------|-----------|--|
| std_code_src | precipitation_measurement_method | 0 | Manual measurement |
| | | 1 | Tipping bucket method |
| | | 2 | Weighing method |
| | | 3 | Optical method |
| | | 4 | Pressure method (impact plate - piezoelectric) |
| | | 5 | Float method |
| | | 6 | Drop counter method |
| | | 7 | Reserved |

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| | | 8 | Reserved |
| | | 9 | Reserved |
| | | 10 | Reserved |
| | | 11 | Reserved |
| | | 12 | Reserved |
| | | 13 | Reserved |
| | | 14 | Other |
| | | 15 | Missing |
| | | 16 | Doppler radar |
| | | 17 | Pressure method (vented standpipe) |
| | | 18 | Pressure method (unvented standpipe) |
| | | 19 | Tipping bucket method (heated) |

6.5.8 present_weather

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-----------------|-----------|--|
| std_code_src | present_weather | 0 | Manned Observation: Cloud development not observed or not observable |
| | | 1 | Manned Observation: Clouds generally dissolving or becoming less developed. (Characteristic change of the state of sky during the past hour) |
| | | 2 | Manned Observation: State of sky on the whole unchanged. (Characteristic change of the state of sky during the past hour) |
| | | 3 | Manned Observation: Clouds generally forming or developing. (Characteristic change of the state of sky during the past hour) |
| | | 4 | Manned Observation: Visibility reduced by smoke, e.g. veldt or forest fires, industrial smoke or volcanic ashes |
| | | 5 | Manned Observation: Haze |
| | | 6 | Manned Observation: Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation |
| | | 7 | Manned Observation: Dust or sand raised by wind at or near the station at the time of observation, but no well-developed dust whirl(s) or sand whirl(s), and no dust storm or sandstorm seen; or, in the case of sea stations and coastal stations, blowing spray at the station |
| | | 8 | Manned Observation: Well-developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no dust storm or sandstorm. |
| | | 9 | Manned Observation: Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour |
| | | 10 | Manned Observation: Mist |
| | | 11 | Manned Observation: Shallow fog or ice fog patches at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea |
| | | 12 | Manned Observation: Shallow fog or ice fog, more or less continuous, at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea |
| | | 13 | Manned Observation: Lightning visible, no thunder heard |
| | | 14 | Manned Observation: Precipitation within sight, not reaching the ground or the surface of the sea |
| | | 15 | Manned Observation: Precipitation within sight, reaching the ground or the surface of the sea, but distant, i.e. estimated to be more than 5 km from the station |
| | | 16 | Manned Observation: Precipitation within sight, reaching the ground or |

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| | | | the surface of the sea, near to, but not at the station |
| | | 17 | Manned Observation: Thunderstorm, but no precipitation at the time of observation |
| | | 18 | Manned Observation: Squalls (at or within sight of the station during the preceding hour or at the time of observation) |
| | | 19 | Manned Observation: Funnel cloud(s) [Tornado cloud or water-spout] (at or within sight of the station during the preceding hour or at the time of observation) |
| | | 20 | Manned Observation: Drizzle (not freezing) or snow grains (not falling as shower(s)) |
| | | 21 | Manned Observation: Rain (not freezing) (not falling as shower(s)) |
| | | 22 | Manned Observation: Snow (not falling as shower(s)) |
| | | 23 | Manned Observation: Rain and snow or ice pellets (not falling as shower(s)) |
| | | 24 | Manned Observation: Freezing drizzle or freezing rain (not falling as shower(s)) |
| | | 25 | Manned Observation: Shower(s) of rain |
| | | 26 | Manned Observation: Shower(s) of snow, or of rain and snow |
| | | 27 | Manned Observation: Shower(s) of hail [hail, small hail, snow pellets], or of rain and hail [hail, small hail, snow pellets] |
| | | 28 | Manned Observation: Fog or ice fog |
| | | 29 | Manned Observation: Thunderstorm (with or without precipitation) |
| | | 30 | Manned Observation: Slight or moderate duststorm or sandstorm has decreased during the preceding hour |
| | | 31 | Manned Observation: Slight or moderate duststorm or sandstorm - no appreciable change during the preceding hour |
| | | 32 | Manned Observation: Slight or moderate duststorm or sandstorm has begun or has increased during the preceding hour |
| | | 33 | Manned Observation: Severe duststorm or sandstorm has decreased during the preceding hour |
| | | 34 | Manned Observation: Severe duststorm or sandstorm - no appreciable change during the preceding hour |
| | | 35 | Manned Observation: Severe duststorm or sandstorm has begun or has increased during the preceding hour |
| | | 36 | Manned Observation: Slight or moderate drifting snow - generally low (below eye level) |
| | | 37 | Manned Observation: Heavy drifting snow - generally low (below eye level) |
| | | 38 | Manned Observation: Slight or moderate blowing snow - generally high (above eye level) |
| | | 39 | Manned Observation: Heavy blowing snow - generally high (above eye level) |
| | | 40 | Manned Observation: Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer |
| | | 41 | Manned Observation: Fog or ice fog in patches |
| | | 42 | Manned Observation: Fog or ice fog, sky visible - has become thinner during the preceding hour |
| | | 43 | Manned Observation: Fog or ice fog, sky invisible - has become thinner during the preceding hour |
| | | 44 | Manned Observation: Fog or ice fog, sky visible - no appreciable change during the preceding hour |
| | | 45 | Manned Observation: Fog or ice fog, sky invisible - no appreciable change during the preceding hour |
| | | 46 | Manned Observation: Fog or ice fog, sky visible - has begun or has become thicker during the preceding hour |

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| | | 47 | Manned Observation: Fog or ice fog, sky invisible - has begun or has become thicker during the preceding hour |
| | | 48 | Manned Observation: Fog, depositing rime, sky visible |
| | | 49 | Manned Observation: Fog, depositing rime, sky invisible |
| | | 50 | Manned Observation: Very light drizzle |
| | | 51 | Manned Observation: Light drizzle (not freezing, continuous) |
| | | 52 | Manned Observation: Moderate drizzle (not freezing, continuous) |
| | | 53 | Manned Observation: Heavy drizzle (not freezing, continuous) |
| | | 54 | Manned Observation: Light drizzle (not freezing, intermittent) |
| | | 55 | Manned Observation: Moderate drizzle (not freezing, intermittent) |
| | | 56 | Manned Observation: Heavy drizzle (not freezing, intermittent) |
| | | 57 | Manned Observation: Very light freezing drizzle |
| | | 58 | Manned Observation: Light freezing drizzle |
| | | 59 | Manned Observation: Moderate freezing drizzle |
| | | 60 | Manned Observation: Heavy freezing drizzle |
| | | 61 | Manned Observation: Moderate or heavy freezing drizzle |
| | | 62 | Manned Observation: Light drizzle and rain |
| | | 63 | Manned Observation: Moderate or heavy drizzle and rain |
| | | 64 | Manned Observation: Very light rain |
| | | 65 | Manned Observation: Light rain (not freezing, continuous) |
| | | 66 | Manned Observation: Moderate rain (not freezing, continuous) |
| | | 67 | Manned Observation: Heavy rain (not freezing, continuous) |
| | | 68 | Manned Observation: Light rain (not freezing, intermittent) |
| | | 69 | Manned Observation: Moderate rain (not freezing, intermittent) |
| | | 70 | Manned Observation: Heavy rain (not freezing, intermittent) |
| | | 71 | Manned Observation: Very light freezing rain |
| | | 72 | Manned Observation: Light freezing rain |
| | | 73 | Manned Observation: Moderate freezing rain |
| | | 74 | Manned Observation: Heavy freezing rain |
| | | 75 | Manned Observation: Moderate or heavy freezing rain |
| | | 76 | Manned Observation: Rain or drizzle and snow, slight |
| | | 77 | Manned Observation: Rain or drizzle and snow, moderate or heavy |
| | | 78 | Manned Observation: Very light snow |
| | | 79 | Manned Observation: Light snow (continuous) |
| | | 80 | Manned Observation: Moderate snow (continuous) |
| | | 81 | Manned Observation: Heavy snow (continuous) |
| | | 82 | Manned Observation: Light snow (intermittent) |
| | | 83 | Manned Observation: Moderate snow (intermittent) |
| | | 84 | Manned Observation: Heavy snow (intermittent) |
| | | 85 | Manned Observation: Ice crystals |
| | | 86 | Manned Observation: Snow grains (with or without fog) |
| | | 87 | Manned Observation: Very light snow grains |

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| | | 88 | Manned Observation: Light snow grains |
| | | 89 | Manned Observation: Moderate snow grains |
| | | 90 | Manned Observation: Heavy snow grains |
| | | 91 | Manned Observation: Isolated star-like snow crystals (with or without fog) |
| | | 92 | Manned Observation: Ice pellets |
| | | 93 | Manned Observation: Very light ice pellets |
| | | 94 | Manned Observation: Light ice pellets |
| | | 95 | Manned Observation: Moderate ice pellets |
| | | 96 | Manned Observation: Heavy ice pellets |
| | | 97 | Manned Observation: Very light rain showers |
| | | 98 | Manned Observation: Light rain showers |
| | | 99 | Manned Observation: Moderate rain showers |
| | | 100 | Manned Observation: Heavy rain showers |
| | | 101 | Manned Observation: Moderate or heavy rain showers |
| | | 102 | Manned Observation: Light showers of rain and snow mixed |
| | | 103 | Manned Observation: Moderate or heavy showers of rain and snow mixed |
| | | 104 | Manned Observation: Very light snow showers |
| | | 105 | Manned Observation: Light snow showers |
| | | 106 | Manned Observation: Moderate snow showers |
| | | 107 | Manned Observation: Heavy snow showers |
| | | 108 | Manned Observation: Moderate or heavy snow showers |
| | | 109 | Manned Observation: Light showers of snow pellets or small hail, with or without rain or rain and snow mixed |
| | | 110 | Manned Observation: Moderate or heavy showers of snow pellets or small hail, with or without rain or rain and snow mixed |
| | | 111 | Manned Observation: Very light hail |
| | | 112 | Manned Observation: Light showers of hail, with or without rain or rain and snow mixed, not associated with thunder |
| | | 113 | Manned Observation: Moderate hail |
| | | 114 | Manned Observation: Heavy hail |
| | | 115 | Manned Observation: Moderate or heavy showers of hail, with or without rain or rain and snow mixed, not associated with thunder |
| | | 116 | Manned Observation: Light rain at time of observation - Thunderstorm during the preceding hour but not at time of observation |
| | | 117 | Manned Observation: Moderate or heavy rain at time of observation - Thunderstorm during the preceding hour but not at time of observation |
| | | 118 | Manned Observation: Light snow, or rain and snow mixed or hail [hail, small hail, snow pellets] at time of observation - Thunderstorm during the preceding hour but not at time of observation |
| | | 119 | Manned Observation: Moderate or heavy snow, or rain and snow mixed or hail [hail, small hail, snow pellets] at time of observation - Thunderstorm during the preceding hour but not at time of observation |
| | | 120 | Manned Observation: Thunderstorm, slight or moderate, without hail [hail, small hail, snow pellets], but with rain and/or snow at time of observation - Thunderstorm at time of observation |
| | | 121 | Manned Observation: Thunderstorm, slight or moderate, with hail [hail, small hail, snow pellets] at time of observation - Thunderstorm at time of observation |

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| | | 122 | Manned Observation: Thunderstorm, heavy, without hail [hail, small hail, snow pellets], but with rain and/or snow at time of observation - Thunderstorm at time of observation |
| | | 123 | Manned Observation: Thunderstorm combined with duststorm or sandstorm at time of observation - Thunderstorm at time of observation |
| | | 124 | Manned Observation: Thunderstorm, heavy, with hail [hail, small hail, snow pellets] at time of observation - Thunderstorm at time of observation |
| | | 125 | Manned Observation: No present or recent weather |
| | | 126 | Manned Observation: Slight or moderate blowing dust |
| | | 127 | Manned Observation: Heavy blowing dust |
| | | 128 | Manned Observation: Slight or moderate blowing snow |
| | | 129 | Manned Observation: Slight or moderate blowing sand |
| | | 130 | Manned Observation: Heavy blowing sand |
| | | 131 | Manned Observation: Drifting sand |
| | | 132 | Manned Observation: Drifting snow |
| | | 133 | Manned Observation: Drifting dust |
| | | 134 | Manned Observation: Funnel cloud(s) |
| | | 135 | Manned Observation: Tornado |
| | | 136 | Manned Observation: Waterspout |
| | | 137 | Manned Observation: Tornado or waterspout |
| | | 138 | Manned Observation: Fog (prevailing visibility < 5/8 miles) |
| | | 139 | Manned Observation: Freezing fog (prevailing visibility < 5/8 miles, temperatures < 0 °C and ≥ -30 °C) |
| | | 140 | Manned Observation: Shallow Fog |
| | | 141 | Manned Observation: Ice Fog |
| | | 142 | Manned Observation: Patchy fog |
| | | 143 | Manned Observation: Fog covering part of the aerodrome |
| | | 144 | Manned Observation: Smoke |
| | | 145 | Manned Observation: Thunderstorm |
| | | 146 | Manned Observation: Heavy Thunderstorm |
| | | 147 | Manned Observation: Well-developed dust whirl(s) or sand whirl(s), but no duststorm or sandstorm |
| | | 148 | Manned Observation: Very light snow pellet showers, or small hail (i.e. diameter of largest stone < 5mm) |
| | | 149 | Manned Observation: Light snow pellet showers, or small hail (i.e. diameter of largest stone < 5mm) |
| | | 150 | Manned Observation: Moderate snow pellet showers, or small hail (i.e. diameter of largest stone < 5mm) |
| | | 151 | Manned Observation: Heavy snow pellet showers, or small hail (i.e. diameter of largest stone < 5mm) |
| | | 152 | Manned Observation: Very light ice pellet showers |
| | | 153 | Manned Observation: Light ice pellet showers |
| | | 154 | Manned Observation: Moderate ice pellet showers |
| | | 155 | Manned Observation: Heavy ice pellet showers |
| | | 156 | Manned Observation: Slight or moderate sandstorm |
| | | 157 | Manned Observation: Severe sandstorm |

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| | | 158 | Manned Observation: Slight or moderate duststorm |
| | | 159 | Manned Observation: Severe duststorm |
| | | 160 | Manned Observation: Volcanic ash |
| | | 161 | Manned Observation: Blowing dust in the vicinity |
| | | 162 | Manned Observation: Blowing sand in the vicinity |
| | | 163 | Manned Observation: Blowing snow in the vicinity |
| | | 164 | Manned Observation: Duststorm in the vicinity |
| | | 165 | Manned Observation: Fog in the vicinity |
| | | 166 | Manned Observation: Dust/sand whirls in the vicinity |
| | | 167 | Manned Observation: Showers in the vicinity |
| | | 168 | Manned Observation: Sandstorm in the vicinity |
| | | 169 | Manned Observation: Volcanic ash in the vicinity |
| | | 170 | Manned Observation: Funnel cloud in the vicinity |
| | | 171 | Manned Observation: Recent blowing snow |
| | | 172 | Manned Observation: Recent duststorm |
| | | 173 | Manned Observation: Recent Funnel Cloud, Tornado, Waterspout |
| | | 174 | Manned Observation: Recent freezing drizzle |
| | | 175 | Manned Observation: Recent freezing rain |
| | | 176 | Manned Observation: Recent hail |
| | | 177 | Manned Observation: Recent snow pellets |
| | | 178 | Manned Observation: Recent ice pellets |
| | | 179 | Manned Observation: Recent sandstorm |
| | | 180 | Manned Observation: Recent volcanic ash |
| | | 181 | Manned Observation: Recent drizzle |
| | | 182 | Manned Observation: Recent snow |
| | | 183 | Manned Observation: Recent rain |
| | | 184 | Manned Observation: Recent thunderstorm |
| | | 185 | RESERVED |
| | | 186 | RESERVED |
| | | 187 | RESERVED |
| | | 188 | RESERVED |
| | | 189 | RESERVED |
| | | 190 | RESERVED |
| | | 191 | RESERVED |
| | | 192 | RESERVED |
| | | 193 | RESERVED |
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| | | 200 | RESERVED |
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| | | 206 | RESERVED |
| | | 207 | RESERVED |
| | | 208 | RESERVED |
| | | 209 | RESERVED |
| | | 210 | RESERVED |
| | | 300 | Automated Station Observation: No significant weather observed |
| | | 301 | Automated Station Observation: Clouds generally dissolving or becoming less developed during the past hour |
| | | 302 | Automated Station Observation: State of sky on the whole unchanged during the past hour |
| | | 303 | Automated Station Observation: Clouds generally forming or developing during the past hour |
| | | 304 | Automated Station Observation: Haze or smoke, or dust in suspension in the air, visibility equal to or greater than 1 km |
| | | 305 | Automated Station Observation: Haze or smoke, or dust in suspension in the air, visibility less than 1 km |
| | | 306 | RESERVED |
| | | 307 | RESERVED |
| | | 308 | RESERVED |
| | | 309 | RESERVED |
| | | 310 | Automated Station Observation: Mist |
| | | 311 | Automated Station Observation: Diamond dust |
| | | 312 | Automated Station Observation: Distant lightning |
| | | 313 | RESERVED |
| | | 314 | RESERVED |
| | | 315 | RESERVED |
| | | 316 | RESERVED |
| | | 317 | RESERVED |
| | | 318 | Automated Station Observation: Squalls |
| | | 319 | RESERVED |
| | | 320 | Automated Station Observation: Fog |
| | | 321 | Automated Station Observation: PRECIPITATION at the station during the preceding hour but not at the time of observation |
| | | 322 | Automated Station Observation: Drizzle (not freezing) or snow grains |
| | | 323 | Automated Station Observation: Rain (not freezing) |
| | | 324 | Automated Station Observation: Snow |
| | | 325 | Automated Station Observation: Freezing drizzle or freezing rain |
| | | 326 | Automated Station Observation: Thunderstorm (with or without precipitation) |
| | | 327 | Automated Station Observation: BLOWING OR DRIFTING SNOW OR SAND |

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| | | 328 | Automated Station Observation: Blowing or drifting snow or sand, visibility equal to or greater than 1 km |
| | | 329 | Automated Station Observation: Blowing or drifting snow or sand, visibility less than 1 km |
| | | 330 | Automated Station Observation: FOG |
| | | 331 | Automated Station Observation: Fog or ice fog in patches |
| | | 332 | Automated Station Observation: Fog or ice fog, has become thinner during the past hour |
| | | 333 | Automated Station Observation: Fog or ice fog, no appreciable change during the past hour |
| | | 334 | Automated Station Observation: Fog or ice fog, has begun or has become thicker during the past hour |
| | | 335 | Automated Station Observation: Fog, depositing rime. Freezing Fog for Nav Canada stations |
| | | 336 | RESERVED |
| | | 337 | RESERVED |
| | | 338 | RESERVED |
| | | 339 | RESERVED |
| | | 340 | Automated Station Observation: PRECIPITATION |
| | | 341 | Automated Station Observation: Light or moderate precipitation |
| | | 342 | Automated Station Observation: Heavy precipitation |
| | | 343 | Automated Station Observation: Light or moderate liquid precipitation |
| | | 344 | Automated Station Observation: Heavy liquid precipitation |
| | | 345 | Automated Station Observation: Light or moderate solid precipitation |
| | | 346 | Automated Station Observation: Heavy solid precipitation |
| | | 347 | Automated Station Observation: Light or moderate freezing precipitation |
| | | 348 | Automated Station Observation: Heavy freezing precipitation |
| | | 349 | RESERVED |
| | | 350 | Automated Station Observation: DRIZZLE |
| | | 351 | Automated Station Observation: Very light drizzle |
| | | 352 | Automated Station Observation: Light drizzle (not freezing) |
| | | 353 | Automated Station Observation: Moderate drizzle (not freezing) |
| | | 354 | Automated Station Observation: Heavy drizzle (not freezing) |
| | | 355 | Automated Station Observation: Very light freezing drizzle |
| | | 356 | Automated Station Observation: Light freezing drizzle |
| | | 357 | Automated Station Observation: Moderate freezing drizzle |
| | | 358 | Automated Station Observation: Heavy freezing drizzle |
| | | 359 | Automated Station Observation: Light drizzle and rain |
| | | 360 | Automated Station Observation: Moderate or heavy drizzle and rain |
| | | 361 | RESERVED |
| | | 362 | Automated Station Observation: RAIN |
| | | 363 | Automated Station Observation: Very light rain |
| | | 364 | Automated Station Observation: Light rain (not freezing) |
| | | 365 | Automated Station Observation: Moderate rain (not freezing) |
| | | 366 | Automated Station Observation: Heavy rain (not freezing) |

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| | | 367 | Automated Station Observation: Very light freezing rain |
| | | 368 | Automated Station Observation: Light freezing rain |
| | | 369 | Automated Station Observation: Moderate freezing rain |
| | | 370 | Automated Station Observation: Heavy freezing rain |
| | | 371 | Automated Station Observation: Light rain (or drizzle) and snow |
| | | 372 | Automated Station Observation: Moderate or heavy rain (or drizzle) and snow |
| | | 373 | RESERVED |
| | | 374 | Automated Station Observation: SNOW |
| | | 375 | Automated Station Observation: Very light snow |
| | | 376 | Automated Station Observation: Light snow |
| | | 377 | Automated Station Observation: Moderate snow |
| | | 378 | Automated Station Observation: Heavy snow |
| | | 379 | Automated Station Observation: Light ice pellets |
| | | 380 | Automated Station Observation: Moderate ice pellets |
| | | 381 | Automated Station Observation: Heavy ice pellets |
| | | 382 | Automated Station Observation: Snow grains |
| | | 383 | Automated Station Observation: Ice crystals |
| | | 384 | RESERVED |
| | | 385 | Automated Station Observation: SHOWERS or INTERMITTENT PRECIPITATION |
| | | 386 | Automated Station Observation: Light rain showers or light intermittent rain |
| | | 387 | Automated Station Observation: Moderate rain showers or moderate intermittent rain |
| | | 388 | Automated Station Observation: Heavy rain showers or heavy intermittent rain |
| | | 389 | Automated Station Observation: Violent rain showers or violent intermittent rain |
| | | 390 | Automated Station Observation: Light snow showers or light intermittent snow |
| | | 391 | Automated Station Observation: Moderate snow showers or moderate intermittent snow |
| | | 392 | Automated Station Observation: Heavy snow showers or heavy intermittent snow |
| | | 393 | RESERVED |
| | | 394 | Automated Station Observation: Hail |
| | | 395 | Automated Station Observation: Very light hail |
| | | 396 | Automated Station Observation: Light hail |
| | | 397 | Automated Station Observation: Moderate hail |
| | | 398 | Automated Station Observation: Heavy hail |
| | | 399 | Automated Station Observation: THUNDERSTORM |
| | | 400 | Automated Station Observation: Thunderstorm, slight or moderate with no precipitation |
| | | 401 | Automated Station Observation: Thunderstorm, slight or moderate, with rain showers and/or snow showers |
| | | 402 | Automated Station Observation: Thunderstorm, slight or moderate, with hail |
| | | 403 | Automated Station Observation: Thunderstorm, heavy, with no |

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| | | | precipitation |
| | | 404 | Automated Station Observation: Thunderstorm, heavy, with rain showers and/or snow showers |
| | | 405 | Automated Station Observation: Thunderstorm, heavy, with hail |
| | | 406 | RESERVED |
| | | 407 | RESERVED |
| | | 408 | Automated Station Observation: Tornado |
| | | 409 | Automated Station Observation: No precipitation |
| | | 410 | Automated Station Observation: Very light unclassified precipitation |
| | | 411 | Automated Station Observation: Light unclassified precipitation |
| | | 412 | Automated Station Observation: Moderate unclassified precipitation |
| | | 413 | Automated Station Observation: Heavy unclassified precipitation |
| | | 414 | Automated Station Observation: Error in present weather determination, none could be reported |
| | | 415 | Automated Station Observation: Light frozen precipitation |
| | | 416 | Automated Station Observation: Moderate frozen precipitation |
| | | 417 | Automated Station Observation: Heavy frozen precipitation |
| | | 418 | Automated Station Observation: Other |
| | | 500 | Not used |
| | | 501 | Not used |
| | | 502 | Not used |
| | | 503 | Not used |
| | | 504 | Manned or Automated Station Observation: Volcanic ash suspended in the air aloft |
| | | 505 | Not used |
| | | 506 | Manned or Automated Station Observation: Thick dust haze, visibility less than 1 km |
| | | 507 | Manned or Automated Station Observation: Blowing spray at the station |
| | | 508 | Manned or Automated Station Observation: Drifting dust (sand) |
| | | 509 | Manned or Automated Station Observation: Wall of dust or sand in distance (like haboob) |
| | | 510 | Manned or Automated Station Observation: Snow haze |
| | | 511 | Manned or Automated Station Observation: Whiteout |
| | | 512 | Not used |
| | | 513 | Manned or Automated Station Observation: Lightning, cloud to surface |
| | | 514 | Not used |
| | | 515 | Not used |
| | | 516 | Not used |
| | | 517 | Manned or Automated Station Observation: Dry thunderstorm |
| | | 518 | Not used |
| | | 519 | Manned or Automated Station Observation: Tornado cloud (destructive) at or within sight of the station during preceding hour or at the time of observation |
| | | 520 | Manned or Automated Station Observation: Deposition of volcanic ash |
| | | 521 | Manned or Automated Station Observation: Deposition of dust or sand |

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| | | 522 | Manned or Automated Station Observation: Deposition of dew |
| | | 523 | Manned or Automated Station Observation: Deposition of wet snow |
| | | 524 | Manned or Automated Station Observation: Deposition of soft rime |
| | | 525 | Manned or Automated Station Observation: Deposition of hard rime |
| | | 526 | Manned or Automated Station Observation: Deposition of hoarfrost |
| | | 527 | Manned or Automated Station Observation: Deposition of glaze |
| | | 528 | Manned or Automated Station Observation: Deposition of ice crust (ice slick) |
| | | 529 | Not used |
| | | 530 | Manned or Automated Station Observation: Dust storm or sandstorm with temperature below 0 degrees C |
| | | 531 | Not used |
| | | 532 | Not used |
| | | 533 | Not used |
| | | 534 | Not used |
| | | 535 | Not used |
| | | 536 | Not used |
| | | 537 | Not used |
| | | 538 | Not used |
| | | 539 | Manned or Automated Station Observation: Blowing snow, impossible to determine whether snow is falling or not |
| | | 540 | Not used |
| | | 541 | Manned or Automated Station Observation: Fog on sea |
| | | 542 | Manned or Automated Station Observation: Fog in valleys |
| | | 543 | Manned or Automated Station Observation: Arctic or Antarctic sea smoke |
| | | 544 | Manned or Automated Station Observation: Steam fog (sea, lake or river) |
| | | 545 | Manned or Automated Station Observation: Steam fog (land) |
| | | 546 | Manned or Automated Station Observation: Fog over ice or snow cover |
| | | 547 | Manned or Automated Station Observation: Dense fog, visibility 60-90 m |
| | | 548 | Manned or Automated Station Observation: Dense fog, visibility 30-60 m |
| | | 549 | Manned or Automated Station Observation: Dense fog, visibility less than 30 m |
| | | 550 | Manned or Automated Station Observation: Drizzle, rate of fall less than 0.10 mm/h |
| | | 551 | Manned or Automated Station Observation: Drizzle, rate of fall 0.10-0.19 mm/h |
| | | 552 | Manned or Automated Station Observation: Drizzle, rate of fall 0.20-0.39 mm/h |
| | | 553 | Manned or Automated Station Observation: Drizzle, rate of fall 0.40-0.79 mm/h |
| | | 554 | Manned or Automated Station Observation: Drizzle, rate of fall 0.80-1.59 mm/h |
| | | 555 | Manned or Automated Station Observation: Drizzle, rate of fall 1.60-3.19 mm/h |
| | | 556 | Manned or Automated Station Observation: Drizzle, rate of fall 3.20-6.39 mm/h |

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| | | 557 | Manned or Automated Station Observation: Drizzle, rate of fall 6.4 mm/h or more |
| | | 558 | Not used |
| | | 559 | Manned or Automated Station Observation: Drizzle and snow |
| | | 560 | Manned or Automated Station Observation: Rain, rate of fall less than 1.0 mm/h |
| | | 561 | Manned or Automated Station Observation: Rain, rate of fall 1.- 1.9 mm/h |
| | | 562 | Manned or Automated Station Observation: Rain, rate of fall 2.- 3.9 mm/h |
| | | 563 | Manned or Automated Station Observation: Rain, rate of fall 4.- 7.9 mm/h |
| | | 564 | Manned or Automated Station Observation: Rain, rate of fall 8.-15.9 mm/h |
| | | 565 | Manned or Automated Station Observation: Rain, rate of fall 16.0-31.9 mm/h |
| | | 566 | Manned or Automated Station Observation: Rain, rate of fall 32.0-63.9 mm/h |
| | | 567 | Manned or Automated Station Observation: Rain, rate of fall 64.0 mm/h or more |
| | | 568 | Not used |
| | | 569 | Not used |
| | | 570 | Manned or Automated Station Observation: Snow, rate of fall less than 1.0 cm/h |
| | | 571 | Manned or Automated Station Observation: Snow, rate of fall 1.0-1.9 cm/h |
| | | 572 | Manned or Automated Station Observation: Snow, rate of fall 2.0-3.9 cm/h |
| | | 573 | Manned or Automated Station Observation: Snow, rate of fall 4.0-7.9 cm/h |
| | | 574 | Manned or Automated Station Observation: Snow, rate of fall 8.0-15.9 cm/h |
| | | 575 | Manned or Automated Station Observation: Snow, rate of fall 16.0-31.9 cm/h |
| | | 576 | Manned or Automated Station Observation: Snow, rate of fall 32.0-63.9 cm/h |
| | | 577 | Manned or Automated Station Observation: Snow, rate of fall 64.0 cm/h or more |
| | | 578 | Manned or Automated Station Observation: Snow or Ice crystal precipitation from a clear sky |
| | | 579 | Manned or Automated Station Observation: Wet snow, freezing on contact |
| | | 580 | Manned or Automated Station Observation: Precipitation of rain |
| | | 581 | Manned or Automated Station Observation: Precipitation of rain, freezing |
| | | 582 | Manned or Automated Station Observation: Precipitation of rain and snow mixed. |
| | | 583 | Manned or Automated Station Observation: Precipitation of snow |
| | | 584 | Manned or Automated Station Observation: Precipitation of snow pellets or small hail |
| | | 585 | Manned or Automated Station Observation: Precipitation of snow pellets or small hail, with rain |
| | | 586 | Manned or Automated Station Observation: Precipitation of snow pellets or small hail, with rain and snow mixed |
| | | 587 | Manned or Automated Station Observation: Precipitation of snow pellets or small hail, with snow |
| | | 588 | Manned or Automated Station Observation: Precipitation of hail |

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| | | 589 | Manned or Automated Station Observation: Precipitation of hail, with rain |
| | | 590 | Manned or Automated Station Observation: Precipitation of hail, with rain and snow mixed |
| | | 591 | Manned or Automated Station Observation: Precipitation of hail, with snow |
| | | 592 | Manned or Automated Station Observation: Shower(s) or thunderstorm over sea |
| | | 593 | Manned or Automated Station Observation: Shower(s) or thunderstorm over mountains |
| | | 594 | Not used |
| | | 595 | Not used |
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| | | 806 | Reserved |
| | | 807 | Reserved |
| | | 808 | Manned or Automated Station Observation: No significant phenomenon to report, present and past weather omitted |
| | | 809 | Manned or Automated Station Observation: No observation, data not available, present and past weather omitted |
| | | 810 | Manned or Automated Station Observation: Present and past weather missing, but expected |
| | | 811 | Missing value |
| | | 812 | Automated Station Observation: Rain, hail detected |
| | | 813 | Automated Station Observation: Snow, rain detected |
| | | 814 | Automated Station Observation: Snow, hail detected |
| | | 815 | Automated Station Observation: Snow, rain, hail detected |
| | | 816 | Automated Station Observation: Unclassified precipitation detected |
| | | 817 | Automated Station Observation: Rain, unclassified precipitation detected |
| | | 818 | Automated Station Observation: Hail, unclassified precipitation detected |
| | | 819 | Automated Station Observation: Rain, hail, unclassified precipitation detected |
| | | 820 | Automated Station Observation: Snow, unclassified precipitation detected |
| | | 821 | Automated Station Observation: Snow, rain, unclassified precipitation detected |
| | | 822 | Automated Station Observation: Snow, hail, unclassified precipitation detected |
| | | 823 | Automated Station Observation: Snow, hail, rain, unclassified precipitation detected |
| | | 824 | Automated Station Observation: Light snow grains |
| | | 825 | Automated Station Observation: Moderate snow grains |
| | | 826 | Automated Station Observation: Heavy snow grains |
| | | 827 | Automated Station Observation: Snow pellets |
| | | 828 | Automated Station Observation: Thunderstorm in vicinity |
| | | 829 | Automated Station Observation: Sand |
| | | 830 | Automated Station Observation: Dust |
| | | 831 | Automated Station Observation: Haze |
| | | 832 | Automated Station Observation: Smoke |
| | | 833 | Automated Station Observation: Volcanic ash |
| | | 834 | Automated Station Observation: Blowing snow |
| | | 835 | Automated Station Observation: Blowing sand |
| | | 836 | Automated Station Observation: Light unclassified freezing precipitation |
| | | 837 | Automated Station Observation: Moderate unclassified freezing precipitation |
| | | 838 | Automated Station Observation: Heavy unclassified freezing precipitation |
| | | 839 | Automated Station Observation: No precipitation detected |
| | | 840 | Manned or Automated Station Observation: Thunderstorm with rain (light) |
| | | 841 | Manned or Automated Station Observation: Precipitation of rain and drizzle (light) |

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| | | 842 | Manned or Automated Station Observation: Precipitation of rain and drizzle (moderate) |
| | | 843 | Manned or Automated Station Observation: Precipitation of rain and drizzle (heavy) |
| | | 845 | Manned or Automated Station Observation: Heavy drizzle and rain |
| | | 846 | Manned or Automated Station Observation: Drizzle and mist |
| | | 847 | Manned Observation: Sand |
| | | 848 | Manned or Automated Station Observation: Light showers |
| | | 849 | Manned or Automated Station Observation: Light haze |
| | | 850 | Manned or Automated Station Observation: Light Thunderstorm |
| | | 851 | Manned or Automated Station Observation: Thunderstorm with drizzle, light |
| | | 852 | Manned or Automated Station Observation: Thunderstorm with drizzle, moderate |
| | | 853 | Manned or Automated Station Observation: Thunderstorm with drizzle, heavy |
| | | 854 | Manned or Automated Station Observation: Thunderstorm with mist in vicinity |
| | | 855 | Manned or Automated Station Observation: Thunderstorm with drizzle in vicinity |
| | | 856 | Manned or Automated Station Observation: Thunderstorm with rain in vicinity |
| | | 857 | Manned or Automated Station Observation: Thunderstorm with showers in vicinity |
| | | 858 | Manned or Automated Station Observation: Rain in vicinity |
| | | 859 | Manned or Automated Station Observation: Showers with rain and drizzle, light |
| | | 860 | Manned or Automated Station Observation: Showers with rain and drizzle, moderate |
| | | 861 | Manned or Automated Station Observation: Showers with rain and drizzle, heavy |
| | | 862 | Manned or Automated Station Observation: Showers with rain and snow, light |
| | | 863 | Manned or Automated Station Observation: Showers with rain and snow, moderate |
| | | 864 | Manned or Automated Station Observation: Showers with rain and snow, heavy |
| | | 865 | Manned or Automated Station Observation: Patches of mist |
| | | 866 | Manned or Automated Station Observation: Blowing widespread dust |
| | | 867 | Manned or Automated Station Observation: Shallow fog |
| | | 868 | Manned or Automated Station Observation: Partial fog |
| | | 869 | Manned or Automated Station Observation: Snow in vicinity |
| | | 870 | Manned or Automated Station Observation: Rain showers in vicinity |
| | | 871 | Manned or Automated Station Observation: Light rain and snow |
| | | 872 | Manned or Automated Station Observation: Rain and snow |
| | | 873 | Manned or Automated Station Observation: Recent drizzle |
| | | 874 | Manned or Automated Station Observation: Recent rain |
| | | 875 | Manned or Automated Station Observation: Recent snow |

6.5.9 rapid_pressure_change

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-----------------------|-----------|--------------------------|
| std_code_src | rapid_pressure_change | 0 | not occurring |
| | | 1 | Pressure rising rapidly |
| | | 2 | Pressure falling rapidly |

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| | | 3 | missing |
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6.5.10 report_type

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-------------|-----------|---|
| std_code_src | report_type | 0 | hourly regular report (SA) |
| | | 1 | hourly special report (SP) |
| | | 2 | hourly regular special report (RS) |
| | | 3 | SA and SM reports |
| | | 4 | SA and CS reports |
| | | 5 | SA, CS and SM reports |
| | | 6 | SA and SX reports |
| | | 7 | SP and SX reports |
| | | 8 | CS and SX reports |
| | | 9 | SA, SX and SM reports |
| | | 10 | SA, SX, SM and CS reports |
| | | 11 | reserved |
| | | 12 | reserved |
| | | 13 | reserved |
| | | 14 | reserved |
| | | 15 | missing |
| | | 16 | reserved |
| | | 17 | SM (Synoptic) Reports, e.g. FM-12 LAND SYNOP (6 hr) |
| | | 18 | SA + SM |
| | | 19 | CS Reports |
| | | 20 | SA + CS |
| | | 21 | SM + CS |
| | | 22 | SA + SM + CS |
| | | 23 | SX (Soil) Reports |
| | | 24 | SA + SX (Soil) |
| | | 25 | SM + SX (Soil) |
| | | 26 | SA + SM + SX(Soil) |
| | | 27 | CS + SX (Soil) |
| | | 28 | SA + CS + SX(Soil) |
| | | 29 | SM + CS + SX (Soil) |
| | | 30 | SA + SM + CS + SX (Soil) |
| | | 31 | SX (UV) Reports |
| | | 32 | SA + SX(UV) |
| | | 33 | SM + SX (UV) |
| | | 34 | SA + SM + SX(UV) |
| | | 35 | CS + SX (UV) |
| | | 36 | SA + CS + SX (UV) |

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| | | 37 | SM + CS + SX (UV) |
| | | 38 | SA + SM + CS + SX(UV) |
| | | 39 | SX(Soil + UV) |
| | | 40 | SA + SX(Soil + UV) |
| | | 41 | SM + SX(Soil + UV) |
| | | 42 | SA + SM + SX(Soil + UV) |
| | | 43 | CS + SX (Soil + UV) |
| | | 44 | SA + CS + SX (Soil + UV) |
| | | 45 | SM + CS + SX (Soil + UV) |
| | | 46 | SA + SM + CS + SX (Soil + UV) |
| | | 47 | SX (Unofficial) Reports |
| | | 48 | SA + SX (Unoff) |
| | | 49 | SM + SX(Unoff) |
| | | 50 | SA + SM + SX(Unoff) |
| | | 51 | CS + SX(Unoff) |
| | | 52 | SA + CS + SX (Unoff) |
| | | 53 | SM + CS + SX(Unoff) |
| | | 54 | SA + SM + CS + SX(Unoff) |
| | | 55 | SX(Soil + Unoff) |
| | | 56 | SA + SX(Soil + Unoff) |
| | | 57 | SM + SX(Soil + Unoff) |
| | | 58 | SA + SM + SX(Soil + Unoff) |
| | | 59 | CS + SX(Soil + Unoff) |
| | | 60 | SA + CS + SX(Soil + Unoff) |
| | | 61 | SM + CS + SX(Soil + Unoff) |
| | | 62 | SA + SM + CS + SX(Soil + Unoff) |
| | | 63 | SX(UV + Unoff) |
| | | 64 | SA + SX(UV + Unoff) |
| | | 65 | SM + SX(UV + Unoff) |
| | | 66 | SA + SM + SX(UV + Unoff) |
| | | 67 | CS + SX(UV + Unoff) |
| | | 68 | SA + CS + SX (UV + Unoff) |
| | | 69 | SM + CS + SX(UV + Unoff) |
| | | 70 | SA + SM + CS + SX (UV + Unoff) |
| | | 71 | SX(Soil + UV + Unoff) |
| | | 72 | SA + SX (Soil + UV + Unoff) |
| | | 73 | SM + SX (Soil + UV + Unoff) |
| | | 74 | SA + SM + SX(Soil + UV + Unoff) |
| | | 75 | CS + SX (Soil + UV + Unoff) |
| | | 76 | SA + CS + SX(Soil + UV + Unoff) |
| | | 77 | SM + CS + SX(Soil + UV + Unoff) |
| | | 78 | SA + SM + CS + SX(Soil + UV + Unoff) |
| | | 79 | Reserved |

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| | | 80 | FM-13 SHIP SYNOP |
| | | 81 | DRIBU, DRIFTER, Ship |
| | | 82 | Great Lakes obs |
| | | 83 | FM-18 BUOY SYNOP |
| | | 84 | FM-14 MOBIL SYNOP |
| | | 85 | Quebec Co-op Partner data. Hourly report with optional multi-hour data (e.g. 6, 12, 24 hour intervals). |
| | | 86 | Correction to a previously issued product (COR) |
| | | 87 | Amendment to a previously issued product (AMD) |
| | | 88 | Correction to a previously issued amended product (COR AMD) |
| | | 89 | Cancellation of a previously issued product (CNL) |
| | | 90 | No product available (NIL) |
| | | 91 | Corrected special report (SPECI COR) |
| | | 92 | Reserved |
| | | 93 | Reserved |
| | | 94 | Reserved |
| | | 95 | Reserved |
| | | 96 | Reserved |
| | | 97 | Reserved |
| | | 98 | Reserved |
| | | 99 | Minutely message other than SPECI and METAR |
| | | 100 | Any message type other than 1) a regular hourly message, 2) SPECI or 3) minutely messages other than SPECI and METAR |
| | | 101 | Report for storm (wind) conditions encountered at sea |
| | | 102 | Regular report (taken at 06:00 and 18:00 PST) |
| | | 103 | Hourly regular report from an LWIS station |
| | | 104 | Supplementary Aviation Weather Report |
| | | 105 | Moored buoy report - Cell GPRS meteorological data |
| | | 106 | Moored buoy report - Cell GPRS housekeeping data |
| | | 107 | Moored buoy report - Cell Wave Data |
| | | 108 | Moored buoy report - Iridium combined meteorological, wave and housekeeping data |
| | | 109 | Reserved |
| | | 110 | Moored buoy report - Iridium combined meteorological and housekeeping data |
| | | 111 | Moored buoy report - Iridium Wave Data |

6.5.11 sky_condition

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|---------------|-----------|--|
| std_code_src | sky_condition | 0 | Clear (CLR) - The sky condition when no cloud or obscuring phenomena are present |
| | | 1 | Thin scattered (-SCT) |
| | | 2 | Scattered (SCT) - a layer aloft with a summation opacity of 4/10 to 5/10 (amount of 3/8 - 4/8 in METAR), inclusive |
| | | 3 | Thin broken (-BKN) |

| | | | |
|--|--|----|--|
| | | 4 | Broken (BKN) - a layer aloft with a summation opacity of 6/10 - 9/10 (amount of 5/8 - 7/8 in METAR), inclusive |
| | | 5 | Thin overcast (-OVC) |
| | | 6 | Overcast (OVC) - a layer aloft with a summation amount of 10/10 (amount of 8/8 in METAR) |
| | | 7 | Obscured (X) - a surface-based layer with summation opacity of 10/10 |
| | | 8 | Partially obscured (-X) - a surface-based layer with summation opacity of at least 1/10 but less than 10/10 |
| | | 9 | Thin few (-FEW) |
| | | 10 | Few (FEW) - a layer aloft with a summation opacity of 1/10 to 3/10 (amount of 1/8 - 2/8 in METAR) |

6.5.12 state_of_sea

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|--------------|-----------|-------------------------------|
| std_code_src | station_type | 0 | Calm (glassy) 0m |
| | | 1 | Calm (rippled) 0m – 0.1m |
| | | 2 | Smooth (wavelets) 0.1m – 0.5m |
| | | 3 | Slight 0.5m – 1.25m |
| | | 4 | Moderate 1.25m – 2.5m |
| | | 5 | Rough 2.5m – 4m |
| | | 6 | Very rough 4m – 6m |
| | | 7 | High 6m – 9m |
| | | 8 | Very high 9m – 14m |
| | | 9 | Phenomenal Over 14m |
| | | 10 | Chop; 1-2 ft waves |
| | | 11 | Moderate; 3-6 ft waves |
| | | 12 | Rough, > 6 ft waves |

6.5.13 station_type

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|--------------|-----------|---|
| std_code_src | station_type | 0 | AUTO 1 (MARS I) |
| | | 1 | AUTO 2 (MARS II) |
| | | 2 | AUTO 3 (MAPS I) |
| | | 3 | AUTO 4 (MAPS II) |
| | | 4 | AUTO 5 - MSC Automatic Weather Observing System (AWOS) |
| | | 5 | AUTO 6 (Hurricane) |
| | | 6 | AUTO 7 - Campbell Scientific data logger automatic weather station (Partner, non-MS) |
| | | 7 | AUTO 8 - Campbell Scientific data logger automatic weather station (MSC owned & operated) |
| | | 8 | AUTO 9 |
| | | 9 | Generic AUTO station |
| | | 10 | Limited Weather Information System (LWIS)—MSC or NavCan |
| | | 11 | Nav Canada Human Weather Observing System (NC-HWOS) |
| | | 12 | Nav Canada Automatic Weather Observing System (NC-AWOS) |

| | | | |
|--|--|----|--|
| | | 13 | SAWR (Supplementary Aviation Weather Report—Manned); MSC or NavCan |
| | | 14 | IHR (WinIDE - Manned hourly observations) |
| | | 15 | MIDS (WinIDE-type interface for Manned hourly observations) |
| | | 16 | Generic manual/manned station |
| | | 17 | Generic hybrid: both Manned and Automatic |
| | | 18 | Missing Value |
| | | 19 | A station that reports temperature and precipitation |
| | | 20 | A station that reports temperature only |
| | | 21 | A station that reports precipitation only |
| | | 22 | A station that reports precipitation twice in a day: once in the morning and once in the evening |
| | | 23 | A station that reports precipitation once a day in the evening |
| | | 24 | A station that reports temperature and precipitation once a day in the morning |
| | | 25 | A station that reports temperature and precipitation once a day in the evening |
| | | 26 | A station that reports temperature and precipitation twice a day in the morning and evening |
| | | 27 | A station that reports temperature once a day in the morning, and reports precipitation twice a day in the morning and evening |
| | | 28 | A station that reports temperature once a day in the evening, and reports precipitation twice a day in the morning and evening |
| | | 29 | A station that reports precipitation once a day in the morning |
| | | 30 | Quebec stations which observe precipitation 1-5 times a day |
| | | 31 | Dept. of National Defense Automatic Weather Observing System (DND-AWOS) |

6.5.14 swell_height

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-------------------------|-----------|---|
| std_code_src | tendency_characteristic | 0 | No swell height |
| | | 1 | Low; swell waves < 7 ft |
| | | 2 | Low-moderate; swell waves ranging 1-12 ft |
| | | 3 | Moderate; swell waves are 7-12 ft |
| | | 4 | Moderate-heavy; swell waves are ranging 7-13 ft or more |
| | | 5 | Heavy; swell waves are > 12 ft |

6.5.15 tendency_characteristic

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|-------------------------|-----------|---|
| std_code_src | tendency_characteristic | 0 | Increasing, then decreasing; atmospheric pressure the same or higher than three hours ago |
| | | 1 | Increasing, then steady; or increasing, then increasing more slowly |
| | | 2 | Increasing (steadily or unsteadily) |
| | | 3 | Decreasing or steady, then increasing; or increasing, then increasing more rapidly |
| | | 4 | Steady; atmospheric pressure the same as three hours ago |
| | | 5 | Decreasing, then increasing; atmospheric pressure the same or lower than three hours ago |

| | | | |
|--|--|----|--|
| | | 6 | Decreasing, then steady; or decreasing, then decreasing more slowly |
| | | 7 | Decreasing (steadily or unsteadily) |
| | | 8 | Steady or increasing, then decreasing; or decreasing, then decreasing more rapidly |
| | | 9 | Reserved |
| | | 10 | Reserved |
| | | 11 | Reserved |
| | | 12 | Reserved |
| | | 13 | Reserved |
| | | 14 | Reserved |
| | | 15 | Missing value |
| | | 16 | Rising Rapidly (≥ 2.0 hPa in 3 hours) |
| | | 17 | Falling Rapidly (≥ 2.0 hPa in 3 hours) |

6.5.16 total_cloud_amount

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|--------------------|-----------|---|
| std_code_src | total_cloud_amount | 0 | Sky clear (cloud amount of 0 octas or 0/10) - Manned or Auto station |
| | | 1 | FEW - cloud amount of 1 to 2 octas (1/10 to 3/10) |
| | | 2 | Scattered (SCT) - cloud amount of 3 to 4 octas (cloud coverage of $\leq 49\%$ for MSC AWOS observations) |
| | | 3 | Broken (BKN) - cloud amount of 5 to 7 octas (cloud coverage of 50% to 89% for MSC AWOS observations) |
| | | 4 | Overcast (OVC) - cloud amount of 8 octas (cloud coverage of $\geq 90\%$ for MSC AWOS observations) |
| | | 5 | Reserved |
| | | 6 | Scattered/broken (Many forecasts use scattered/broken or broken/overcast) |
| | | 7 | Broken/overcast followed by cloud type(s)) |
| | | 8 | Isolated (Used on aviation charts to describe the cloud type Cb) |
| | | 9 | Isolated embedded (Used on aviation charts to describe the cloud type Cb) |
| | | 10 | Occasional (Used on aviation charts to describe the cloud type Cb) |
| | | 11 | Occasional embedded (Used on aviation charts to describe the cloud type Cb) |
| | | 12 | Frequent (Used on aviation charts to describe the cloud type Cb) |
| | | 13 | Dense (Used on aviation charts to describe cloud that would cause sudden changes in visibility (less than 1 000 m)) |
| | | 14 | Layers |
| | | 15 | Obscured (OBSC) |
| | | 16 | Embedded (EMBD) |
| | | 17 | Frequent embedded |
| | | 18 | reserved |
| | | 19 | reserved |
| | | 20 | reserved |
| | | 21 | reserved |
| | | 22 | reserved |

| | | | |
|--|--|----|---|
| | | 23 | reserved |
| | | 24 | reserved |
| | | 25 | reserved |
| | | 26 | reserved |
| | | 27 | reserved |
| | | 28 | reserved |
| | | 29 | reserved |
| | | 30 | reserved |
| | | 31 | missing |
| | | 32 | 1 okta or less, but not zero (1/10 or less, but not zero) |
| | | 33 | 2 oktas (2/10 - 3/10) |
| | | 34 | 3 oktas (4/10) |
| | | 35 | 4 oktas (5/10) |
| | | 36 | 5 oktas (6/10) |
| | | 37 | 6 oktas (7/10 - 8/10) |
| | | 38 | 7 oktas or more, but not 8 oktas (9/10 or more, but not 10/10) |
| | | 39 | 8 oktas (10/10) |
| | | 40 | Sky obscured by fog and/or other meteorological phenomena |
| | | 41 | Cloud cover is indiscernible for reasons other than for or other meteorological phenomena, or observation is not made |
| | | 42 | Sky Clear reported from manned station. |
| | | 43 | Nil Significant Cloud (clear below 1500 meters) |
| | | 44 | Obscured Significance |
| | | 45 | Sky Clear reported from auto station. |
| | | 46 | Sky obscured by a surface-based layer of coverage $\geq 90\%$ |
| | | 47 | Sky partially obscured by a surface-based layer with coverage of $< 90\%$ |
| | | 48 | No clouds detected below 10000 ft |
| | | 49 | Sky partially obscured by fog and/or other meteorological phenomena |
| | | 50 | No cloud detected |
| | | 51 | No clouds detected below 25,000 ft (NC-AWOS) |
| | | 52 | Ceiling and Visibility OK |
| | | 53 | No significant weather |
| | | 54 | Thin few |
| | | 55 | Thin scattered |
| | | 56 | Thin broken |
| | | 57 | Thin overcast |
| | | 58 | No general weather |

6.5.17 transient_phenomenon

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|----------------------|-----------|---------------------------|
| std_code_src | transient_phenomenon | 0 | reserved |
| | | 1 | wind Shift |
| | | 2 | peak instant wind |
| | | 3 | peak 2-min-averaged wind |
| | | 4 | peak 10-min averaged wind |
| | | 5 | start of precipitation |
| | | 6 | end of precipitation |
| | | 7 | reserved |
| | | 8 | reserved |
| | | 9 | reserved |
| | | 10 | reserved |
| | | 11 | reserved |
| | | 12 | reserved |
| | | 13 | reserved |
| | | 14 | reserved |
| | | 15 | reserved |
| | | 16 | reserved |
| | | 17 | reserved |
| | | 18 | reserved |
| | | 19 | reserved |
| | | 20 | reserved |
| | | 21 | reserved |
| | | 22 | reserved |
| | | 23 | reserved |
| | | 24 | reserved |
| | | 25 | reserved |
| | | 26 | reserved |
| | | 27 | reserved |
| | | 28 | reserved |
| | | 29 | reserved |
| | | 30 | reserved |
| | | 31 | missing |

6.5.18 wind_gust_squall_indicator

| CodeSource | CodeType | CodeValue | CodeDescEng |
|--------------|----------------------------|-----------|---------------------------|
| std_code_src | wind_gust_squall_indicator | 0 | Gust from an auto station |
| | | 1 | Gust |
| | | 2 | Squall |

6.6 Reference Tables

6.6.1 Weighing gauge status

The weighing gauge status is a sum of all non-zero statuses, and ranges from 0 (“OK”) to 1024. The table of values is pasted below, and it comes from page 26 of the Pluvio manual,

https://www.stevenswater.com/resources/documentation/pluvio2_manual.pdf.

| Status (pbbb) | Description |
|---|-----------------------------------|
| +001 | W: Bucket content > 80% |
| +002 | W: USB interface is/was connected |
| +004 | W: Restart (due to power failure) |
| +008 | W: Restart (due to firmware) |
| +016 | W: Weight change out of range |
| +032 | W: Supply voltage < 7V |
| +064 | A: Weight measurement unstable |
| +128 | A: Weight measurement incorrect |
| +256 | A: Weight below minimum |
| +512 | A: Weight above maximum |
| +1024 | A: No weight calibration |
| p – sign (+) b – number W = warning; A = alarm Intermediate values: there are several results. For further information see Chapter 7.5 Troubleshooting | |

6.6.2 Snow depth quality

The element reports the quality of the SR50A snow depth measurement, the quality range description is provided in the table below.

| Quality Number Range | Quality Range Description |
|----------------------|----------------------------------|
| 0 | Not able to read distance |
| 152 to 210 | Good measurement quality numbers |
| 210 to 300 | Reduced echo signal strength |
| 300 to 600 | High measurement uncertainty |