



Common Data Model for in situ observations

C3S311a Lot 2: Global Land and Marine Observations Database

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Executive Summary

This document defines the initial version of the Common Data Model (CDM) developed within the Copernicus Climate Change Service (C3S) Access to Global Land and Marine Observations Database (C3S 311a Lot 2) service. This has been developed in consultation across the four C3S 311a (Collection and Processing of In Situ Observations) Lots and ECMWF.

Tab separated versions of the code tables defining the data model can be found at:

https://github.com/glamod/common_data_model/tree/master/tables/

| Version | Release date | Release notes |
|---------|--------------|---|
| 1 | 31/08/2017 | Initial version of the common data model |
| 1.01 | 12/09/2017 | 'sub_region' table updated |
| 1.02 | 13/10/2017 | Updates to a number of tables to fix broken references |
| 1.03 | 16/11/2017 | Code tables updated and place holders swapped for data in preparation for use with test data delivery service |
| 1.04 | 29/11/2017 | Observations_table updated to add extra columns for linking to sources and original units. conversion_method updated with values and additional column. |
| 1.05 | 04/12/2017 | observation_code_table and conversion_method updated. |
| 1.06 | 23/08/2018 | encoding of precision in observation_code_table changed. Additional column added to sub_region to give 3 character country code. |
| 1.07 | 09/11/2018 | changes following autumn 2018 governance call. Uncertainty and QC simplified, additions to code tables. |
| 1.08 | 25/11/2018 | correction to observations table following recent changes and addition of new variables |
| 1.09 | 21/01/2019 | Correction to snow depth in conversion method |
| 1.10 | 25/07/2019 | Update following July governance call |
| 1.11 | 29/01/2020 | Update following last call |
| 1.12 | 29/01/2020 | Update following 29th Jan 2020 call (draft) |
| 1.13 | 19/02/2020 | Minor update to tables for database compatibility |
| 1.14 | 23/07/2020 | Minor update to code tables |
| 1.15 | 02/10/2020 | Addition of optional tables for header and observation tables. Additional entries in code tables |
| 1.16 | 16/06/2021 | Changes (additions to code tables) following calls on 26th Jan 2021 and 16th June 2021. |
| 1.17 | 17/06/2021 | Addition of missing code table (feedback_method). |



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1 Introduction

1.1 Purpose of this document

This document defines the current version of the Common Data Model (CDM)¹, initially developed within the Copernicus Climate Change Service (C3S) Access to Global Land and Marine Observations Database (C3S 311a Lot 2) service. The CDM has subsequently been further developed in consultation across the four C3S 311a (Collection and Processing of In Situ Observations) Lots, C3S 311c Lot 2, and with ECMWF..

1.2 Scope

The defined common data model is intended for use with in situ observations of various types including surface, columnar and profile measurement techniques. Instantaneous (or point) observations and temporal aggregations (e.g. daily and monthly min / max temperatures, accumulated precipitation etc.) are supported. Similarly, column average data and profiling data are supported. Whilst initially intended for use with observations of Essential Climate Variables (ECVs; e.g. GCOS, 2016), the data model is not restricted to the consideration of ECVs. Following the ECMWF Observations DataBase (ODB) type data model, the observed variable is reported alongside the observed value.

Comprehensive metadata is supported through the use of configuration tables, recording information on:

- Source level metadata: e.g. original source of data, source data centre, citation information etc.
- Station level metadata: e.g. location, operating institute, parameters reported etc.
- Profile level metadata: Additional information for profile data, e.g. unwinder type, type of balloon or expendable bathythermograph (XBT) etc.
- Sensor level metadata: e.g. calibration history and status, sensor type / serial number etc.

Comprehensive quality control and uncertainty information can be recorded using linked Entity-Attribute-Value (EAV) tables.

1.3 Structure of this document

Section 2 of this document provides background information on the data model and existing data models and standards that have been used as drivers for the in situ C3S CDM. Section 3 describes the governance mechanism for the CDM in recognition that the data model will change and evolve as

¹As noted in the ITT: A common data model is different from a file format, which defines how information is encoded in a file. The purpose of a data model is to provide a well-defined data structure that can be used to represent data records from a variety of sources, in such a way that the information contained in those records can be unambiguously accessed using a common set of tools. Development of a common data model for observations involves specification of data attributes and their symbolic names, including, for example, identifiers for different instruments, observed parameters, geolocation and timing, etc. A governance structure is required to manage such specifications, ensure consistency with standards where they exist, and to ensure a controlled evolution of the data model.



the requirements of the users and the C3S Climate Data Store develop. Section 4 describes the core components and tables of the data model. The appendix includes the individual table definitions and preliminary versions of the code tables. The code tables listed are provisional and will be expanded as the service develops.

2 Background and existing standards

2.1 Observational sources and requirements of the data model

Across the C3S 311 in situ services access will be provided to observations from surface terrestrial and marine environments, columnar products, such as total column ozone, and upper air data in a common data model. The observations included range from point observations made from moving platforms to daily and monthly statistics at fixed locations. The parameters reported include, inter alia: air temperature; humidity; wind speed; pressure; cloud cover information; present weather; atmospheric composition. The statistics include, inter alia: daily min, max and mean air temperature; accumulated precipitation over 3 or 24 hours; mean wind speed over the preceding 10 minutes. The full range of parameters and statistics to be reported will evolve as the service is developed. As new parameters are recovered from newly digitised sources and the reprocessed climate archives the list of parameters will need to expand.

Both surface level (terrestrial and marine) and upper air data are currently being processed by C3S. The surface level data include observations made at standard and non-standard heights. The upper air data include multiple observations, starting at the surface and at increasing heights through the atmosphere as a function of pressure or geopotential height. Columnar averages are also provided from a range of instrument types. As a result of this heterogeneity, the data model needs to include the flexibility to record the height and the units used for reporting the height of measurement with every observation. Similarly, some reporting stations or platforms (such as ships, buoys and weather balloons), and hence observations, will move in the horizontal plane, and the horizontal coordinates need to be reported with each observation. To avoid ambiguity, the coordinate reference system (CRS) should be provided with each location reported.

The period covered by the data ranges from the 1700s to present with the period of record varying by both observational technique and ECV. Over this period there have been many changes to the instruments and practices used to record the various parameters. The choice of instruments and practices will influence the quality of the observations and a change in instrumentation, or location, may introduce inhomogeneities into the record. To mitigate this risk comprehensive observational metadata are required. Similarly, information on adjustments and conversions, such as Fahrenheit to Kelvin or Beaufort force to m/s, applied to the data need to be recorded. The full range of observational practices and instruments used requires that the data model be extendable to accommodate new metadata as required.

The observations to be included are sourced from a variety of existing datasets, such as the International Comprehensive Ocean and Atmosphere Data Set (ICOADS; e.g. Freeman et al., 2017), and newly digitised sources arising from C3S 311a Lot 1. In defining the data model, the provenance and lineage



of the data sources need to be preserved. Similarly, usage rights and citation information need to be preserved and provided to users alongside the observational data. This is a common requirement across all in situ Lots within the service.

In order to meet the above requirements a data model based on the original version of the ECMWF Observations DataBase (ODB) model has been developed, with the use of linked tables providing information on the observational and provenance metadata. The ODB type model allows for extension to new parameters through the use of a parameterized observation list (see next section). The linked tables will define a core set of parameters under 4 different categories (station, source, profile and sensor), flexibility are provided through the specification of optional elements and associated decode tables.

2.2 ECMWF Observations DataBase (ODB)

The data model developed and used in the ECMWF Observations DataBase (ODB) software allows the representation of environmental data from many sources, including in situ observations and weather reports, satellite data and model output. As noted in Hersbach et al. (2015), in the ODB implementation a distinction is made between weather reports and observations and this same distinction is made within the CDM and this document. A weather report, such as a ship weather report or a radiosonde ascent, may contain multiple observations of one or more parameters. In the case of a ship weather report observations of the air temperature and humidity, sea level pressure, sea surface temperature, wind speed and direction are typically made and recorded in a single report. In the case of a radiosonde report observations of the temperature will be made at a range of levels from the surface to the burst point of the balloon. To enable flexibility and scalability with the ODB data model the different elements making up a weather report are split into header elements, recording information common across a weather report, and observational (or body) elements specific to a single observation.

In the original version of ODB, e.g. Saarinen (2004), these elements were split between a header table, containing the header elements, and a linked body table containing the observations or body elements. Within the body table the name of the parameter being observed, or its numerical code, is recorded in one column and the observed value within a second column. Other columns, recording information such as QC results, are permissible. This data model allows the efficient expansion of the data model to new variables, without the need to change the underlying structure, by the addition of the new variable to the enumerated list defining the reportable variables. Within the latest version of ODB (ODB-2; e.g. Hersbach et al., 2015) the header and body tables have been combined into a single flat table, with the header rows repeated, to enable efficient archival within the ECMWF MARS system. A simplified schematic of the ODB-2 structure is shown in Table 1.

Within the CDM defined in this document we have opted for the original ODB type data model, with the reports split into header and observational records stored within separate tables. These are described fully within Section 3 of this document. When these tables are stored in a relational database, or similar structure, performing a join on the tables should result in ODB-2 compatible records.



Table 1: Simplified example of records in ODB type data model, with observations from reports 1 and 2 spanning multiple records. For simplicity, the z coordinate has been omitted but profile data would be represented with each layer / height as a separate record

| header information | | | | | observation information | | |
|--------------------|-----------|--------|----------------------|-------------------|-------------------------|--------|-------|
| record id | report id | obs id | date | location | parameter | value | units |
| 1 | 1 | 1 | 2012-01-01 12:00+0.0 | POINT(-40 40) | air temperature | 300.0 | K |
| 2 | 1 | 2 | 2012-01-01 12:00+0.0 | POINT(-40 40) | sea level pressure | 1013.0 | hPa |
| 3 | 2 | 3 | 2012-01-01 18:00+0.0 | POINT(-40.1 40.2) | air temperature | 300.3 | K |
| 4 | 2 | 4 | 2012-01-01 18:00+0.0 | POINT(-40.1 40.2) | sea level pressure | 1013.2 | hPa |
| End of table | | | | | | | |

2.3 BUFR and WIGOS Metadata Standard

There has been a large body of work and significant effort invested in defining data models and parameterising the data and metadata for encoding the data into those data models. Within the scope of the CDM and the C3S 311a service, the WMO Binary Universal Form for the Representation of meteorological data (BUFR) (e.g. WMO, 2015a) and the WMO Integrated Observing System Metadata Standard (WMDS) (e.g. WMO, 2015b) are key background material. Since the original specification of this CDM both the BUFR and WMDS specifications and code tables have been updated. The latest versions can be found at <https://codes.wmo.int>.

The BUFR format (WMO 2015a) is a flexible and efficient table driven format for reporting weather observations on the WMO Global Telecommunications System (GTS) in binary. The tables defined as part of the BUFR format include many of the parameters that will be included in the CDM. For example, Common code table C6 (WMO 2015a) includes all the measurement units reportable in BUFR (and other WMO codes). Similarly, code tables are defined for reporting instrument types and methods, station types etc. Where possible, these code tables have been referenced and used in preference to defining new code tables. BUFR tables from Version 27 of Master Table 0 have been used in this version of this document.

In recognition of the increasing importance of observational metadata the WMDS is currently under development and phased implementation (WMO, 2015b). The WMDS extends the ISO19115 metadata standard, with additional mandatory elements describing both the station level and discovery metadata as well as specific information on the instrumentation used and processing steps. As part of the process simplified versions of BUFR and other tables have been included in the WMDS standard.



As with BUFR these tables have been referenced, where appropriate, in preference to defining new code tables.

3 Governance of the Common Data Model

A working group manages the governance of the common data model. This group operates remotely via email and regular teleconferences. Proposals to add new entries to the code tables or make changes to the structure of the common data model are made via email to email address:

`c3s_311a_CDM_governance@surfacetemperatures.org`.

Emails to this address will be distributed to all members of the working group. Proposals sent to the above email address are assessed monthly, with discussion via email and teleconference as required. Accepted changes are implemented at the beginning of the following month or with at least 2 weeks notice.

The working group is self nominating and must contain at least one member from each in situ Lot to act as a primary point of contact for that Lot and to represent their requirements on the working group. The working group also contains at least one representative from ECMWF, or a nominated representative from another organisation, to represent the needs of the wider C3S community. Additional members are welcomed. In the case of disagreement over proposed changes, each Lot will have one vote irrespective of the number of members in the working group. In the case of a hung vote ECMWF, or their representative, will have the deciding vote.

4 Common Data Model

As noted above, the CDM is based on the original ODB data model, with meteorological reports split into header and observational records stored in separate tables, `header_table` and `observations_table` respectively. In support of these two primary tables, four auxiliary tables have been defined to enable the comprehensive reporting of metadata at different levels:

- Source level metadata (*source_configuration* table). This level contains detailed information on the source dataset, including: information on the product; whether any processing has been applied; the original data centre the data were sourced from; citation information; the data licence for the product; how to cite the data source etc.
- Station level metadata (*station_configuration* table). This level contains detailed information on the station reporting the data including: station operator; the type of station; station / AWS model type; location; operating territory; reporting frequency etc.



- Profile level metadata (*profile_configuration* table). This level contains detailed metadata for atmospheric and oceanic profiles, including: profile type; type of launcher; direction of profile; balloon / XBT type etc.
- Instrument (or sensor) level metadata (*sensor_configuration* table). This level contains detailed information on the sensor used to make a particular observation, including: calibration status; sampling strategy; observing method; sensor housing and ventilation; instrument model and serial number etc.

These tables are defined in the following section and contain elements that are mandatory across all report types. Additional optional elements are provided through Entity-Attribute-Value based tables linked to the configuration tables. Two additional tables have been defined to include the reporting of comprehensive uncertainty estimates and quality control flags. A simplified schematic of the 12 tables forming the core of the CDM is shown in Figure 1 - a more complete schematic can be found at https://github.com/glamod/common_data_model/blob/master/cdm_full.pdf.

Within the tables in the following sections the following syntax has been used:

- numeric Any numeric value (integer or floating point).
- int An integer value.
- varchar A variable length character string.
- timestamp A timestamp with time zone, e.g. "2017-07-01 00:00:0.0+00".
- [] An array of the indicated type.
- * An optional element.
- (pk) The indicated elements marked as (pk) within a table form the unique ID for the record.

Unless indicated otherwise all elements listed are mandatory but may be encoded as missing (e.g NA, NULL or format specific equivalent) if not available. Optional elements are indicated by *. Whilst arrays have been indicated for the elements containing multiple values this does not preclude other implementations. Within the table definitions references to external tables are indicated in the *external_table* column. These references are composed of two parts separated by a colon (:). The first part indicates the table, the second the element within the table. For example, *station_configuration:primary_id* indicates a reference to the *primary_id* element in the *station_configuration* table.

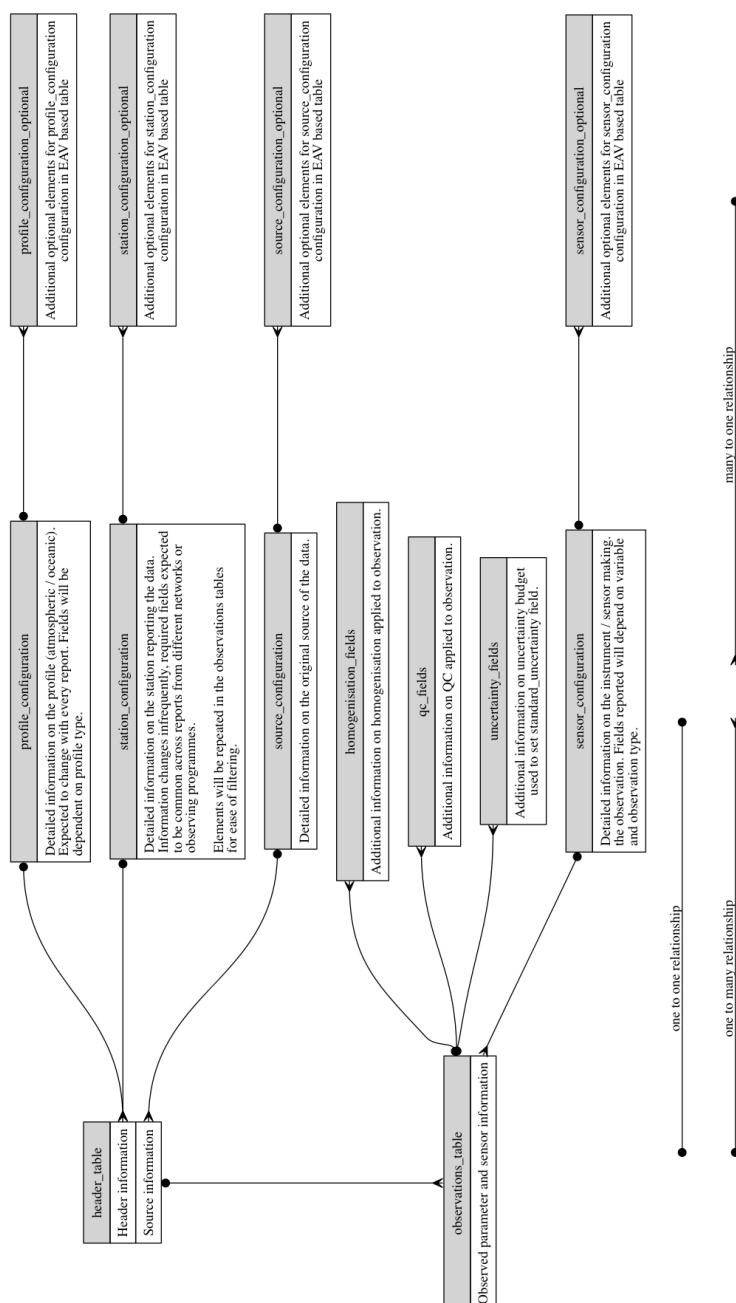


Figure 1: Simplified schematic showing overview of common data model



4.1 Header table

Table 2: header_table definition

| element_name | kind | external_table | description |
|---------------------------|--------------|---|--|
| report_id | varchar (pk) | | Unique ID for report (unique ID given by combination of report_id and observation_id) |
| region | int | region:region | Region (WMO region / Ocean basin) |
| sub_region | int | sub_region:sub_region | Country / regional sea |
| application_area | int[] | application_area:application_area | WMO application area(s) |
| observing_programme | int[] | observing_programme:observing_programme | Observing programme, e.g. VOS |
| report_type | int | report_type:type | e.g. SYNOP, TEMP, CLIMAT, etc |
| station_name | varchar | | e.g. GRUAN station name, ship name, site name etc |
| station_type | int | station_type:type | Type of station, e.g. land station, sea station etc |
| platform_type | int | platform_type:type | Structure upon which sensor is mounted, e.g. ship, drifting buoy, tower etc |
| platform_sub_type | int | platform_sub_type:sub_type | Sub-type for platform, e.g. 3m discuss buoy |
| primary_station_id | varchar | station_configuration:primary_id | Primary station identifier, e.g. WIGOS ID |
| station_record_number | int | station_configuration:record_number | Together with primary_station_id this forms a link to the station configuration table. |
| primary_station_id_scheme | int | id_scheme:scheme | Scheme used for station ID |
| longitude | numeric | | Longitude of station, -180.0 to 180.0 (or other as defined by station_crs) |
| latitude | numeric | | Latitude of station, -90 to 90 (or other as defined by station_crs) |
| location_accuracy | numeric | | Accuracy to which station location recorded (radius in km) |
| location_method | int | location_method:method | Method by which location determined |

Continued on next page



Table 2 header_table (cont.)

| element_name | kind | external_table | description |
|--|--------------------------|----------------------------------|--|
| location_quality | int | location_quality:quality | Quality flag for station location |
| crs | int | crs:crs | Coordinate reference scheme for station location |
| station_speed | numeric | | Station speed over ground if mobile (m/s) |
| station_course | numeric | | Station course over ground if mobile (degree true) |
| station_heading | numeric | | Station heading if mobile |
| height_of_station_above_local_ground | numeric | | Height of station above local ground (m) |
| height_of_station_above_sea_level | numeric | | Height of station above mean sea level (m), negative values for below sea level. |
| height_of_station_above_sea_level_accuracy | numeric | | Accuracy to which height of station known (m) |
| sea_level_datum | int | sea_level_datum:datum | Datum used for sea level |
| report_meaning_of_timestamp | int | meaning_of_timestamp:meaning | Report time - beginning, middle or end of reporting period |
| report_timestamp | timestamp with time-zone | | e.g. 1991-01-01 12:00:0.0+0 |
| report_duration | int | duration:duration | Report duration |
| report_time_accuracy | numeric | | Precision to which time was recorded (s) |
| report_time_quality | int | time_quality:quality | Quality flag for report_timestamp |
| report_time_reference | int | time_reference:reference | Reference Time (e.g. referenced to time server, atomic clock, radio clock etc) |
| profile_id | varchar | profile_configuration:profile_id | Information on profile (atmospheric / oceanographic) configuration. Set to Record ID for profile data or missing (NULL) otherwise. |
| events_at_station | int[]* | events_at_station:event | e.g. ship hove to, crop burning etc. |
| report_quality | int | quality_flag:flag | Overall quality of report |
| duplicate_status | int | duplicate_status:status | E.g. no duplicates, best duplicate, duplicate, not checked. |

Continued on next page



Table 2 header_table (cont.)

| element_name | kind | external_table | description |
|---------------------|--------------------------|--------------------------------|--|
| duplicates | varchar[]* | header_table:report_id | Array of report_id's for duplicates |
| record_timestamp | timestamp with time-zone | | Timestamp of revision for this record |
| history | varchar | | Sequence of processing steps. Free text with timestamp 1 : history 1; timestamp 2 : history 2 etc. |
| processing_level | int | report_processing_level:level | Level of processing applied to this report |
| processing_codes | int[]* | report_processing_codes:code | Processing applied to this report |
| source_id | varchar | source_configuration:source_id | Original source of data, link to external table |
| source_record_id | varchar | | Record ID in source data, e.g. ID of event from GRUAN meta database |

End of table

Table 3: header_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|------------------------|---|
| report_id | varchar | header_table:report_id | Link to report for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | header_fields:field_id | Field that this entry corresponds to |
| value | varchar | Kind | inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.2 Observations table

Table 4: observations_table definition

| element_name | kind | external_table | description |
|---------------------|--------------|-----------------------|---------------------------|
| observation_id | varchar (pk) | | unique ID for observation |

Continued on next page



Table 4 observations_table (cont.)

| element_name | kind | external_table | description |
|--|--------------------------|-------------------------------|---|
| report_id | varchar | header_table:report_id | Link to header information |
| data_policy_licence | int | data_policy_licence:policy | WMOessential, WMOadditional, WMOother |
| date_time | timestamp with time-zone | | timestamp for observation |
| date_time_meaning | int | meaning_of_time_stamp:meaning | beginning, middle, end |
| observation_duration | int | duration:duration | Duration/period over which observation was made |
| longitude | numeric | | Longitude of the observed value, -180 to 180 (or other as defined by CRS). This may or may not be the same as the report location. |
| latitude | numeric | | Latitude of the observed value, -90 to 90 (or other as defined by CRS) |
| crs | int | crs:crs | Coordinate reference scheme use to encode location |
| z_coordinate | numeric | | z coordinate of observation |
| reference_z_coordinate | numeric | | z coordinate of reference observation |
| z_coordinate_type | int | z_coordinate_type:type | Type of z coordinate |
| observation_height_above_station_surface | numeric | | Height of sensor above local ground or sea surface. Positive values for above surface (e.g. sondes), negative for below (e.g. xbt). For visual observations, height of the visual observing platform. |
| observed_variable | int | observed_variable:variable | The variable being observed / measured |
| secondary_variable | int | secondary_variable:variable | Secondary variable required to understand observation, e.g. chemical constituent. Set to NA / missing if not applicable. |
| observation_value | numeric | | The observed value |

Continued on next page



Table 4 observations_table (cont.)

| element_name | kind | external_table | description |
|----------------------------|-------------|---|---|
| value_significance | int | observation_value_significance:significance | e.g. min, max, mean, sum |
| secondary_value | int | secondary_variable:value | value for the secondary variable. Set to NA or missing if not applicable. |
| units | int | units:units | Units for the observed variable |
| code_table | int | observation_code_table:code_table | Encode / decode table for variable (if encoded) |
| conversion_flag | int | conversion_flag:flag | Flag indicating whether original, converted or both values are available. |
| location_method | int | location_method:method | Method of determining location, |
| location_precision | numeric | | Precision to which location is reported (radius km) |
| z_coordinate_method | int | z_coordinate_method:method | Method of determining z coordinate |
| bbox_min_longitude | numeric | | Bounding box for observation, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observation, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observation, valid range given by CRS |
| bbox_max_latitude | numeric | | Bounding box for observation, valid range given by CRS |
| spatial_representativeness | int | spatial_representativeness:representativeness | Spatial representativeness of observation |
| quality_flag | int | quality_flag:flag | Quality flag for observation |
| numerical_precision | numeric | | Reporting precision of observation in units given by 'units' variable. E.g. 0.1 = reported to nearest tenth, 0.5 to nearest half etc. |
| sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor_configuration table. |
| reference_sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor_configuration table for reference sensor. |
| sensor_automation_status | int | automation_status:automation | Automated, manual, mixed or visual observation |

Continued on next page



Table 4 observations_table (cont.)

| element_name | kind | external_table | description |
|--------------------------------|-------------|--------------------------------------|---|
| exposure_of_sensor | int | instrument_exposure_quality:exposure | Whether the exposure of the instrument will impact on the quality of the measurement |
| original_precision | numeric | | Original reporting precision in units given by 'original_units' |
| original_units | int | units:units | Original units |
| original_code_table | int | observation_code_table:code_table | Encode / decode table for variable (if encoded) |
| original_value | numeric | | Original value as reported or recorded in log book. |
| conversion_method | int | conversion_method:method | Link to table describing conversion process |
| processing_code | int[]* | processing_code:code | e.g. TRC (temperature radiation corrections) etc. Encoded in table. |
| processing_level | int | processing_level:level | Level of processing applied to observation. |
| adjustment_id | varchar | adjustment:adjustment_id | Total adjustment applied to observation reported in observation value (observation_value = original + adjustment) |
| traceability | int | traceability:traceability | Whether observation can be traced to international standards. |
| advanced_qc | int | data_present:flag | Flag indicating whether advanced qc data are available |
| advanced_uncertainty | int | data_present:flag | Flag indicating whether uncertainty estimates are available |
| advanced_homogenisation | int | data_present:flag | Flag indicating whether advanced homogenisation information is available |
| advanced_assimilation_feedback | int | data_present:flag | Flag indicating whether assimilation feedback is available |
| source_id | varchar | source_configuration:source_id | Original source of data, link to external table |

End of table



Table 5: observations_optional definition

| element_name | kind | external_table | description |
|--------------|---------|-----------------------------------|--|
| report_id | varchar | observations_table:observation_id | Link to observation for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | header_fields:field_id | Field that this entry corresponds to |
| value | varchar | Kind | inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.3 Station configuration

Table 6: station_configuration definition

| element_name | type | external_table | description |
|----------------------|--------------|------------------|--|
| primary_id | varchar (pk) | | Primary (e.g. WMO) ID for station |
| primary_id_scheme | int | id_scheme:scheme | Scheme used for primary ID |
| record_number | int (pk) | | Record number for this station entry |
| secondary_id | varchar[]* | | Secondary (e.g. local) ID for station |
| secondary_id_scheme | int[]* | id_scheme:scheme | Scheme used for secondary ID |
| station_name | varchar | | Name of station (e.g. Tatenos) |
| station_abbreviation | varchar | | Abbreviation of station name (e.g. TAT) |
| alternative_name | varchar[]* | | Alternative name for station |
| station_crs | int | crs:crs | coordinate reference system used to report stations location |
| longitude | numeric | | Report position for station if stationary or NULL if mobile. If more than one estimate record best here and additional values using optional fields. |
| latitude | numeric | | Report position for station if stationary or NULL if mobile |

Continued on next page



Table 6 station_configuration (cont.)

| element_name | type | external_table | description |
|--------------------------|-------------|-------------------------------|--|
| local_gravity | numeric | | Local gravity at station location (units ms-2) |
| start_date | timestamp | | Date that the station first started reporting in this configuration |
| end_date | timestamp | | Last data the station reported in this configuration |
| station_type | int | station_type:type | Type of reporting station |
| platform_type | int | platform_type:type | Generic type of observing platform |
| platform_sub_type | int | platform_sub_type:sub_type | Specific type of observing platform |
| operating_institute | varchar | organisation:organisation_id | Institute operating the station (e.g. National Oceanography Centre) |
| operating_territory | int | sub_region:sub_region | Sub-region where station is located or country of registry for mobile station |
| city | varchar | | Nearest city / town to station location |
| contact | varchar[] | contact:contact_id | Contact for station |
| role | int[] | role:role | Role of contact |
| observing_frequency | int | observing_frequency:frequency | Typical frequency of observations for this station (reports per day). If irregular use reporting_time. |
| reporting_time | int[] | | Reporting hour(s) if non-standard / irregular hours used |
| telecommunication_method | int[] | communication_method:method | Method used to report observations |
| station_automation | int | automation_status:automation | Whether station is automated, manual or mixed |
| measuring_system_model | varchar[] | | Station / AWS model type |
| measuring_system_id | varchar[] | | ID or serial number of measuring system |
| observed_variables | int[] | observed_variable:variable | array indicating which variables are observed by this station |

Continued on next page



Table 6 station_configuration (cont.)

| element_name | type | external_table | description |
|-----------------------|-------------|-----------------------|--|
| comment | varchar | | Any other comments / footnotes |
| optional_data | int | data_present:flag | Flag indicating availability of additional data |
| bbox_min_longitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_max_latitude | numeric | | Bounding box for observation from this station, valid range given by CR |
| metadata_contact | varchar[] | | contact:contact_id contact for responsible for maintaing this record |
| metadata_contact_role | int[] | role:role | role of metadata_contact |

End of table

Table 7: station_configuration_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|---------------------------------------|--|
| station_primary_id | varchar | station_configuration:primary_id | Link to station for which this entry corresponds |
| record_number | int | station_configuration:record_number | Link to station for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | station_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.4 Profile configuration



Table 8: profile_configuration definition

| element_name | kind | external_table | description |
|----------------|--------------|--------------------|--|
| profile_id | varchar (pk) | | Unique ID for this profile entry |
| profile_type | int | profile_type:type | Type of profile (e.g. atmospheric or oceanic) |
| standard_time | int | standard_time:time | e.g. Standard / scheduled time for launch or report, e.g. 00, 06, 12, 18 UTC |
| actual_time | timestamp | | Actual report / launch time |
| profile_number | numeric | | e.g. Balloon Number |
| comments | varchar | | Any additional comments / footnotes |
| optional_data | int | data_present:flag | Flag indicating whether there is additional meta-data available |

End of table

Table 9: profile_configuration_optional definition

| element_name | kind | external_table | description |
|--------------|---------|---------------------------------------|--|
| profile_id | varchar | profile_configuration:profile_id | Link to profile for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | profile_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.5 Source configuration

Table 10: source_configuration definition

| element_name | type | external_table | description |
|--------------|--------------|----------------|------------------------------|
| source_id | varchar (pk) | | Unique record ID for dataset |
| product_id | varchar | | ID for product |

Continued on next page



Table 10 source_configuration (cont.)

| element_name | type | external_table | description |
|-----------------------|--------------------------|------------------------------|---|
| product_name | varchar | | Name of source, e.g. International Comprehensive Ocean Atmosphere Data Set, RS92 GRUAN Data Product |
| product_code | varchar | | Abbreviations / product code, e.g. ICOADS, RS92-GDP |
| product_version | varchar | | Version number for dataset, e.g. Release 3.0.0 |
| product_level | int | product_level:level | Level of product |
| product_uri | varchar | | URI for product, either to original source or to CDS |
| description | varchar | | Description of dataset / comments |
| product_references | varchar[] | | References describing the dataset |
| product_citation | varchar[] | | Citation to use when using this product |
| product_status | int | product_status:status | Status of product, draft, pre-release, release |
| source_format | int | source_format:format | Original format for data |
| source_format_version | varchar | | Version of original data format |
| source_file | varchar | | Filename for data from source |
| source_file_checksum | varchar | | Checksum of source datafile |
| data_centre | varchar | organisation:organisation_id | Data centre or organisation from which data sourced |
| data_centre_url | varchar | | URL for data centre |
| data_policy_licence | int | data_policy_licence:policy | Data policy / licence |
| contact | varchar[] | contact:contact_id | contact for data source with role specified by role element |
| contact_role | int[] | role:role | role of contact |
| history | varchar | | History of source |
| comments | varchar | | Additional comments / footnotes |
| timestamp | timestamp with time-zone | | Date record created / created |

Continued on next page



Table 10 source_configuration (cont.)

| element_name | type | external_table | description |
|----------------------------------|-------------|----------------------------|--|
| maintenance_and_update_frequency | int | update_frequency:frequency | Frequency with which modifications and deletions are made to the data after it is first produced |
| optional_data | int | data_present:flag | Flag indicating availability of additional data |
| bbox_min_longitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_max_latitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| metadata_contact | varchar[] | contact:contact_id | contact for responsible for maintaining this record |
| metadata_contact_role | int[] | role:role | role of metadata_contact |

End of table

Table 11: source_configuration_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|--------------------------------------|---|
| source_id | varchar | source_configuration:source_id | Link to source for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | source_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.6 Sensor configuration



Table 12: sensor_configuration definition

| element_name | type | external_table | description |
|--------------------|--------------|----------------------------|---|
| sensor_id | varchar (pk) | | Unique ID for this instrument |
| observing_method | int | observing_method:method | Method (instrumental, estimated / visual, computed) by which observation made |
| sampling_strategy | int | sampling_strategy:strategy | Sampling strategy used by instrument |
| calibration_status | int | calibration_status:status | Whether the sensor is in / out of calibration |
| calibration_date | timestamp | | Date of last calibration |
| comments | varchar | | additional comments for sensor not reportable elsewhere |
| date_start | timestamp | | start date for period of validity associated with this entry |
| date_end | timestamp | | end date for period of validity associated with this entry |
| optional_data | int | data_present:flag | Flag indicating if additional data available |

End of table

Table 13: sensor_configuration_optional definition

| element_name | kind | external_table | description |
|--------------|---------|--------------------------------------|---|
| sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | sensor_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

4.7 Quality control flags

A single QC flag is provided in the observations table for the observed value. Additional flags can be provided using the qc_table and by setting the advanced_qc flag to true in the observations_table.



Table 14: qc_table definition

| element_name | kind | external_table | description |
|----------------|---------|---------------------------------------|--|
| report_id | varchar | header_table:report_id | Link to report this entry is for |
| observation_id | varchar | observations_table :observation_id | Link to observation this entry is for. Set to NULL / NA if entry for report level QC |
| qc_method | int | qc_method:method | Link to table describing QC method used to set this flag |
| qc_flag | int | quality_flag:flag | E.g. 0 = good, 1 = inconsistent etc |

End of table

4.8 Uncertainty budget

A single standard uncertainty value is provided for each observed value in the observations table. Additional values can be provided using the uncertainty_table and by setting the advanced_uncertainty to true in the observations_table.

Table 15: uncertainty_table definition

| element_name | kind | external_table | description |
|--------------------|---------|---------------------------------------|---|
| observation_id | varchar | observations_table :observation_id | Link to observation this entry is for |
| uncertainty_type | int | uncertainty_type.type | Type of uncertainty described by this entry |
| uncertainty_method | int | uncertainty_method:method | Method used to estimate this uncertainty |
| uncertainty_value | numeric | | Expected error standard deviation due to specified uncertainty source |
| uncertainty_units | int | units:units | The units used to report the uncertainty. This may be different to the reporting units (e.g. %) |

End of table

4.9 Homogenisation data



Table 16: homogenisation_table definition

| element_name | kind | external_table | description |
|-------------------------------|---------|---------------------------------------|---|
| observation_id | varchar | observations_table :observation_id | Link to observation this entry is for |
| homogenisation_method | int | homogenisation_m ethod:method | Method used to ho- mogenise data |
| homogenisation_ adjustment | numeric | | Value applied to homogenise data (homogenised_value = original (+-/*) homogeni- sation_adjustment) |
| homogenisation_ _operator | int | homogenisation_op erator:operator | Operator (+-/*) used to apply adjustment |
| homogenisation_order | int | | Order in which the adjust- ments are applied. Set to NA or missing if not applicable |

End of table

5 References

- Freeman E., S. D. Woodruff, S. J. Worley, S. J. Lubker, E. C. Kent, W. E. Angel, D. I. Berry , P. Brohan, R. Eastman, L. Gates, W. Gloeden, Z. Ji, J. Lawrimore, N. A. Rayner, G. Rosenhagen, S. R. Smith, 2017: ICOADS Release 3.0: A Major Update to the Historical Marine Climate Record, International Journal of Climatology, 37, 2211 - 2232. doi:10.1002/joc.4775
- GCOS, 2016: The Global Observing System for Climate: Implementation Needs. GCOS-200 / GOOS-214, WMO, Geneva, 342pp.
- Hersbach, H., P. Poli and D. Dee, 2015: The observation feedback archive for ICOADS and ISPD datasets. ERA Report Series No. 18, ECMWF, Reading, UK, 31pp.
- Saarinén, S., 2004: ODB User guide (draft 1st edition), ECMWF, Reading, UK, 289pp.
- WMO, 2015a: Manual On Codes (WMO-No 306), Volume I.2, Part B - Binary Codes, WMO, Geneva.
- WMO, 2015b: Manual on the WMO Integrated Global Observing System: Annex VIII to the Technical Regulations (WMO-No 1160), WMO, Geneva.



6 Appendix

6.1 Table definitions

6.1.1 Data tables

Table 17: adjustment definition

| element_name | kind | external_table | description |
|---------------------|--------------|-----------------------|--|
| adjustment_id | varchar (pk) | | unique ID for adjustment record |
| observation_id | varchar | | link to observation that this entry is for |
| value | numeric | | adjustment value |
| reference | varchar | | reference describing adjustment |

End of table

Table 18: contact definition

| element_name | kind | external_table | description |
|---------------------|--------------|------------------------------|--|
| contact_id | varchar (pk) | | primary key |
| title | varchar | | Title of contact (e.g. Mr, Mrs, Dr. etc) |
| name | varchar | | Name of contact |
| organisation | varchar | organisation:organisation_id | Link to organisation that contact is associated with |
| telephone | varchar | | telephone number for contact |
| email | varchar | | email address for contact |
| url | varchar | | website for contact |

End of table

Table 19: header_table definition

| element_name | kind | external_table | description |
|---------------------|--------------|-----------------------|---|
| report_id | varchar (pk) | | Unique ID for report (unique ID given by combination of report_id and observation_id) |
| region | int | region:region | Region (WMO region / Ocean basin) |
| sub_region | int | sub_region:sub_region | Country / regional sea |

Continued on next page



Table 19 header_table (cont.)

| element_name | kind | external_table | description |
|---------------------------|-------------|---|--|
| application_area | int[] | application_area:application_area | WMO application area(s) |
| observing_programme | int[] | observing_programme:observing_programme | Observing programme, e.g. VOS |
| report_type | int | report_type:type | e.g. SYNOP, TEMP, CLIMAT, etc |
| station_name | varchar | | e.g. GRUAN station name, ship name, site name etc |
| station_type | int | station_type:type | Type of station, e.g. land station, sea station etc |
| platform_type | int | platform_type:type | Structure upon which sensor is mounted, e.g. ship, drifting buoy, tower etc |
| platform_sub_type | int | platform_sub_type:sub_type | Sub-type for platform, e.g. 3m discuss buoy |
| primary_station_id | varchar | station_configuration:primary_id | Primary station identifier, e.g. WIGOS ID |
| station_record_number | int | station_configuration:record_number | Together with primary_station_id this forms a link to the station configuration table. |
| primary_station_id_scheme | int | id_scheme:scheme | Scheme used for station ID |
| longitude | numeric | | Longitude of station, -180.0 to 180.0 (or other as defined by station_crs) |
| latitude | numeric | | Latitude of station, -90 to 90 (or other as defined by station_crs) |
| location_accuracy | numeric | | Accuracy to which station location recorded (radius in km) |
| location_method | int | location_method:method | Method by which location determined |
| location_quality | int | location_quality:quality | Quality flag for station location |
| crs | int | crs:crs | Coordinate reference scheme for station location |
| station_speed | numeric | | Station speed over ground if mobile (m/s) |
| station_course | numeric | | Station course over ground if mobile (degree true) |

Continued on next page



Table 19 header_table (cont.)

| element_name | kind | external_table | description |
|--|--------------------------|----------------------------------|--|
| station_heading | numeric | | Station heading if mobile |
| height_of_station_above_local_ground | numeric | | Height of station above local ground (m) |
| height_of_station_above_sea_level | numeric | | Height of station above mean sea level (m), negative values for below sea level. |
| height_of_station_above_sea_level_accuracy | numeric | | Accuracy to which height of station known (m) |
| sea_level_datum | int | sea_level_datum:datum | Datum used for sea level |
| report_meaning_of_timestamp | int | meaning_of_timestamp:meaning | Report time - beginning, middle or end of reporting period e.g. 1991-01-01 12:00:0.0+0 |
| report_timestamp | timestamp with time-zone | | |
| report_duration | int | duration:duration | Report duration |
| report_time_accuracy | numeric | | Precision to which time was recorded (s) |
| report_time_quality | int | time_quality:quality | Quality flag for report_timestamp |
| report_time_reference | int | time_reference:reference | Reference Time (e.g. referenced to time server, atomic clock, radio clock etc) |
| profile_id | varchar | profile_configuration:profile_id | Information on profile (atmospheric / oceanographic) configuration. Set to Record ID for profile data or missing (NULL) otherwise. |
| events_at_station | int[]* | events_at_station:event | e.g. ship hove to, crop burning etc. |
| report_quality | int | quality_flag:flag | Overall quality of report |
| duplicate_status | int | duplicate_status:status | E.g. no duplicates, best duplicate, duplicate, not checked. |
| duplicates | varchar[]* | header_table:report_id | Array of report_id's for duplicates |
| record_timestamp | timestamp with time-zone | | Timestamp of revision for this record |

Continued on next page



Table 19 header_table (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|--------------------------------|---|
| history | varchar | | Sequence of processing steps. Free text with timestamp 1 : history 1; timestamp 2 : history 2 etc. |
| processing_level | int | report_processing_level:level | Level of processing applied to this report |
| processing_codes | int[]* | report_processing_codes:code | Processing applied to this report |
| source_id | varchar | source_configuration:source_id | Original source of data, link to external table |
| source_record_id | varchar | | Record ID in source data, e.g. ID of event from GRUAN meta database |

End of table

Table 20: header_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|------------------------|---|
| report_id | varchar | header_table:report_id | Link to report for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | header_fields:field_id | Field that this entry corresponds to |
| value | varchar | Kind | inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 21: homogenisation_table definition

| element_name | kind | external_table | description |
|---------------------------|-------------|-----------------------------------|--|
| observation_id | varchar | observations_table:observation_id | Link to observation this entry is for |
| homogenisation_method | int | homogenisation_method:method | Method used to homogenise data |
| homogenisation_adjustment | numeric | | Value applied to homogenise data (homogenised_value = original (+-/*) homogenisation_adjustment) |

Continued on next page



Table 21 homogenisation_table (cont.)

| element_name | kind | external_table | description |
|-------------------------|-------------|----------------------------------|--|
| homogenisation_operator | int | homogenisation_operator:operator | Operator (+-/*) used to apply adjustment |
| homogenisation_order | int | | Order in which the adjustments are applied. Set to NA or missing if not applicable |

End of table

Table 22: observations_table definition

| element_name | kind | external_table | description |
|------------------------|--------------------------|------------------------------|--|
| observation_id | varchar (pk) | | unique ID for observation |
| report_id | varchar | header_table:report_id | Link to header information |
| data_policy_licence | int | data_policy_licence:policy | WMOessential, WMOadditional, WMOother |
| date_time | timestamp with time-zone | | timestamp for observation |
| date_time_meaning | int | meaning_of_timestamp:meaning | beginning, middle, end |
| observation_duration | int | duration:duration | Duration/period over which observation was made |
| longitude | numeric | | Longitude of the observed value, -180 to 180 (or other as defined by CRS). This may or may not be the same as the report location. |
| latitude | numeric | | Latitude of the observed value, -90 to 90 (or other as defined by CRS) |
| crs | int | crs:crs | Coordinate reference scheme use to encode location |
| z_coordinate | numeric | | z coordinate of observation |
| reference_z_coordinate | numeric | | z coordinate of reference observation |
| z_coordinate_type | int | z_coordinate_type:type | Type of z coordinate |

Continued on next page



Table 22 observations_table (cont.)

| element_name | kind | external_table | description |
|--|-------------|---|---|
| observation_height_above_station_surface | numeric | | Height of sensor above local ground or sea surface. Positive values for above surface (e.g. sondes), negative for below (e.g. xbt). For visual observations, height of the visual observing platform. |
| observed_variable | int | observed_variable:variable | The variable being observed / measured |
| secondary_variable | int | secondary_variable:variable | Secondary variable required to understand observation, e.g. chemical constituent. Set to NA / missing if not applicable. |
| observation_value | numeric | | The observed value |
| value_significance | int | observation_value_significance:significance | e.g. min, max, mean, sum |
| secondary_value | int | secondary_variable:value | value for the secondary variable. Set to NA or missing if not applicable. |
| units | int | units:units | Units for the observed variable |
| code_table | int | observation_code_table:code_table | Encode / decode table for variable (if encoded) |
| conversion_flag | int | conversion_flag:flag | Flag indicating whether original, converted or both values are available. |
| location_method | int | location_method:method | Method of determining location, |
| location_precision | numeric | | Precision to which location is reported (radius km) |
| z_coordinate_method | int | z_coordinate_method:method | Method of determining z coordinate |
| bbox_min_longitude | numeric | | Bounding box for observation, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observation, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observation, valid range given by CRS |

Continued on next page



Table 22 observations_table (cont.)

| element_name | kind | external_table | description |
|----------------------------|-------------|---|---|
| bbox_max_latitude | numeric | | Bounding box for observation, valid range given by CRS |
| spatial_representativeness | int | spatial_representativeness:representativeness | Spatial representativeness of observation |
| quality_flag | int | quality_flag:flag | Quality flag for observation |
| numerical_precision | numeric | | Reporting precision of observation in units given by 'units' variable. E.g. 0.1 = reported to nearest tenth, 0.5 to nearest half etc. |
| sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor_configuration table. |
| reference_sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor_configuration table for reference sensor. |
| sensor_automation_status | int | automation_status:automation | Automated, manual, mixed or visual observation |
| exposure_of_sensor | int | instrument_exposure_quality:exposure | Whether the exposure of the instrument will impact on the quality of the measurement |
| original_precision | numeric | | Original reporting precision in units given by 'original_units' |
| original_units | int | units:units | Original units |
| original_code_table | int | observation_code_table:code_table | Encode / decode table for variable (if encoded) |
| original_value | numeric | | Original value as reported or recorded in log book. |
| conversion_method | int | conversion_method:method | Link to table describing conversion process |
| processing_code | int[]* | processing_code:code | e.g. TRC (temperature radiation corrections) etc. Encoded in table. |
| processing_level | int | processing_level:level | Level of processing applied to observation. |
| adjustment_id | varchar | adjustment:adjustment_id | Total adjustment applied to observation reported in observation value (observation_value = original + adjustment) |

Continued on next page



Table 22 observations_table (cont.)

| element_name | kind | external_table | description |
|------------------------------------|-------------|------------------------------------|--|
| traceability | int | traceability:traceability | Whether observation can be traced to international standards. |
| advanced_qc | int | data_present:flag | Flag indicating whether advanced qc data are available |
| advanced_uncertainty | int | data_present:flag | Flag indicating whether uncertainty estimates are available |
| advanced_homo genisation | int | data_present:flag | Flag indicating whether advanced homogenisation information is available |
| advanced_assimila tion_feedback | int | data_present:flag | Flag indicating whether assimilation feedback is available |
| source_id | varchar | source_configurati on:source_id | Original source of data, link to external table |

End of table

Table 23: observations_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|---------------------------------------|--|
| report_id | varchar | observations_table :observation_id | Link to observation for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | header_fields:field_id | Field that this entry corresponds to |
| value | varchar | Kind | inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 24: organisation definition

| element_name | kind | external_table | description |
|---------------------|--------------|----------------------------------|--|
| organisation_id | varchar (pk) | | unique ID for organisation |
| parent_organisation | varchar | organisation:orga nisation_id | Link to parent organisation (or NA/NULL or none) |
| name | varchar | | Name of organisation |

Continued on next page



Table 24 organisation (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| abbreviation | varchar | | Abbreviated name (or NA/NULL) |
| address | varchar | | Road / building name |
| city | varchar | | City |
| admin_area | varchar | | County or admin region |
| region | int | region:region | WMO Region |
| country | int | sub_region:sub_region | Country |
| postal_code | varchar | | Postal / zip code |
| telephone | varchar | | Primary telephone number of organisation |
| url | varchar | | Link to organisation website |
| email | varchar | | Primary email contact for website |

End of table

Table 25: profile_configuration definition

| element_name | kind | external_table | description |
|---------------------|--------------|-----------------------|--|
| profile_id | varchar (pk) | | Unique ID for this profile entry |
| profile_type | int | profile_type:type | Type of profile (e.g. atmospheric or oceanic) |
| standard_time | int | standard_time:time | e.g. Standard / scheduled time for launch or report, e.g. 00, 06, 12, 18 UTC |
| actual_time | timestamp | | Actual report / launch time |
| profile_number | numeric | | e.g. Balloon Number |
| comments | varchar | | Any additional comments / footnotes |
| optional_data | int | data_present:flag | Flag indicating whether there is additional meta-data available |

End of table

Table 26: profile_configuration_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|----------------------------------|--|
| profile_id | varchar | profile_configuration:profile_id | Link to profile for which this entry corresponds |

Continued on next page



Table 26 profile_configuration_optional (cont.)

| element_name | kind | external_table | description |
|--------------|---------|---------------------------------------|--|
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | profile_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 27: qc_table definition

| element_name | kind | external_table | description |
|----------------|---------|-----------------------------------|--|
| report_id | varchar | header_table:report_id | Link to report this entry is for |
| observation_id | varchar | observations_table:observation_id | Link to observation this entry is for. Set to NULL / NA if entry for report level QC |
| qc_method | int | qc_method:method | Link to table describing QC method used to set this flag |
| qc_flag | int | quality_flag:flag | E.g. 0 = good, 1 = inconsistent etc |

End of table

Table 28: sensor_configuration definition

| element_name | type | external_table | description |
|--------------------|--------------|----------------------------|---|
| sensor_id | varchar (pk) | | Unique ID for this instrument |
| observing_method | int | observing_method:method | Method (instrumental, estimated / visual, computed) by which observation made |
| sampling_strategy | int | sampling_strategy:strategy | Sampling strategy used by instrument |
| calibration_status | int | calibration_status:status | Whether the sensor is in / out of calibration |
| calibration_date | timestamp | | Date of last calibration |
| comments | varchar | | additional comments for sensor not reportable elsewhere |
| date_start | timestamp | | start date for period of validity associated with this entry |
| date_end | timestamp | | end date for period of validity associated with this entry |

Continued on next page



Table 28 sensor_configuration (cont.)

| element_name | type | external_table | description |
|---------------|------|-------------------|--|
| optional_data | int | data_present:flag | Flag indicating if additional data available |

End of table

Table 29: sensor_configuration_optional definition

| element_name | kind | external_table | description |
|--------------|---------|--------------------------------------|---|
| sensor_id | varchar | sensor_configuration:sensor_id | Link to sensor for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | sensor_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 30: source_configuration definition

| element_name | type | external_table | description |
|--------------------|--------------|---------------------|---|
| source_id | varchar (pk) | | Unique record ID for dataset |
| product_id | varchar | | ID for product |
| product_name | varchar | | Name of source, e.g. International Comprehensive Ocean Atmosphere Data Set, RS92 GRUAN Data Product |
| product_code | varchar | | Abbreviations / product code, e.g. ICOADS, RS92-GDP |
| product_version | varchar | | Version number for dataset, e.g. Release 3.0.0 |
| product_level | int | product_level:level | Level of product |
| product_uri | varchar | | URI for product, either to original source or to CDS |
| description | varchar | | Description of dataset / comments |
| product_references | varchar[] | | References describing the dataset |
| product_citation | varchar[] | | Citation to use when using this product |

Continued on next page



Table 30 source_configuration (cont.)

| element_name | type | external_table | description |
|----------------------------------|--------------------------|------------------------------|--|
| product_status | int | product_status:status | Status of product, draft, pre-release, release |
| source_format | int | source_format:format | Original format for data |
| source_format_version | varchar | | Version of original data format |
| source_file | varchar | | Filename for data from source |
| source_file_checksum | varchar | | Checksum of source datafile |
| data_centre | varchar | organisation:organisation_id | Data centre or organisation from which data sourced |
| data_centre_url | varchar | | URL for data centre |
| data_policy_licence | int | data_policy_licence:policy | Data policy / licence |
| contact | varchar[] | contact:contact_id | contact for data source with role specified by role element |
| contact_role | int[] | role:role | role of contact |
| history | varchar | | History of source |
| comments | varchar | | Additional comments / footnotes |
| timestamp | timestamp with time-zone | | Date record created / created |
| maintenance_and_update_frequency | int | update_frequency:frequency | Frequency with which modifications and deletions are made to the data after it is first produced |
| optional_data | int | data_present:flag | Flag indicating availability of additional data |
| bbox_min_longitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |
| bbox_max_latitude | numeric | | Bounding box for observations contained in this source, valid range given by CRS |

Continued on next page



Table 30 source_configuration (cont.)

| element_name | type | external_table | description |
|-----------------------|-----------|--------------------|---|
| metadata_contact | varchar[] | contact:contact_id | contact for responsible for maintaing this record |
| metadata_contact_role | int[] | role:role | role of metadata_contact |

End of table

Table 31: source_configuration_optional definition

| element_name | kind | external_table | description |
|--------------|---------|--------------------------------------|---|
| source_id | varchar | source_configuration:source_id | Link to source for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |
| field | varchar | source_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 32: station_configuration definition

| element_name | type | external_table | description |
|----------------------|--------------|------------------|--|
| primary_id | varchar (pk) | | Primary (e.g. WMO) ID for station |
| primary_id_scheme | int | id_scheme:scheme | Scheme used for primary ID |
| record_number | int (pk) | | Record number for this station entry |
| secondary_id | varchar[]* | | Secondary (e.g. local) ID for station |
| secondary_id_scheme | int[]* | id_scheme:scheme | Scheme used for secondary ID |
| station_name | varchar | | Name of station (e.g. Tatenö) |
| station_abbreviation | varchar | | Abbreviation of station name (e.g. TAT) |
| alternative_name | varchar[]* | | Alternative name for station |
| station_crs | int | crs:crs | coordinate reference system used to report stations location |

Continued on next page



Table 32 station_configuration (cont.)

| element_name | type | external_table | description |
|--------------------------|-------------|-------------------------------|--|
| longitude | numeric | | Report position for station if stationary or NULL if mobile. If more than one estimate record best here and additional values using optional fields. |
| latitude | numeric | | Report position for station if stationary or NULL if mobile |
| local_gravity | numeric | | Local gravity at station location (units ms ⁻²) |
| start_date | timestamp | | Date that the station first started reporting in this configuration |
| end_date | timestamp | | Last data the station reported in this configuration |
| station_type | int | station_type:type | Type of reporting station |
| platform_type | int | platform_type:type | Generic type of observing platform |
| platform_sub_type | int | platform_sub_type:sub_type | Specific type of observing platform |
| operating_institute | varchar | organisation:organisation_id | Institute operating the station (e.g. National Oceanography Centre) |
| operating_territory | int | sub_region:sub_region | Sub-region where station is located or country of registry for mobile station |
| city | varchar | | Nearest city / town to station location |
| contact | varchar[] | contact:contact_id | Contact for station |
| role | int[] | role:role | Role of contact |
| observing_frequency | int | observing_frequency:frequency | Typical frequency of observations for this station (reports per day). If irregular use reporting_time. |
| reporting_time | int[] | | Reporting hour(s) if non-standard / irregular hours used |
| telecommunication_method | int[] | communication_method:method | Method used to report observations |

Continued on next page



Table 32 station_configuration (cont.)

| element_name | type | external_table | description |
|------------------------|-------------|----------------------------------|--|
| station_automation | int | automation_status :automation | Whether station is automated, manual or mixed |
| measuring_system_model | varchar[] | | Station / AWS model type |
| measuring_system_id | varchar[] | | ID or serial number of measuring system |
| observed_variables | int[] | observed_variable:variable | array indicating which variables are observed by this station |
| comment | varchar | | Any other comments / footnotes |
| optional_data | int | data_present:flag | Flag indicating availability of additional data |
| bbox_min_longitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_max_longitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_min_latitude | numeric | | Bounding box for observation from this station, valid range given by CRS |
| bbox_max_latitude | numeric | | Bounding box for observation from this station, valid range given by CR |
| metadata_contact | varchar[] | | contact:contact_id contact for responsible for maintaing this record |
| metadata_contact_role | int[] | role:role | role of metadata_contact |

End of table

Table 33: station_configuration_optional definition

| element_name | kind | external_table | description |
|---------------------|-------------|-------------------------------------|--|
| station_primary_id | varchar | station_configuration:primary_id | Link to station for which this entry corresponds |
| record_number | int | station_configuration:record_number | Link to station for which this entry corresponds |
| kind | int | kind:kind | Enumerated data type (numeric, int, etc) |

Continued on next page



Table 33 station_configuration_optional (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|---------------------------------------|--------------------------------------|
| field | varchar | station_configuration_fields:field_id | Field that this entry corresponds to |
| value | varchar | | Kind inherited from field |
| comments | varchar | | Any additional comments. |

End of table

Table 34: uncertainty_table definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------------------|---|
| observation_id | varchar | observations_table:observation_id | Link to observation this entry is for |
| uncertainty_type | int | uncertainty_type.type | Type of uncertainty described by this entry |
| uncertainty_method | int | uncertainty_method:method | Method used to estimate this uncertainty |
| uncertainty_value | numeric | | Expected error standard deviation due to specified uncertainty source |
| uncertainty_units | int | units:units | The units used to report the uncertainty. This may be different to the reporting units (e.g. %) |

End of table



6.1.2 Code tables

Table 35: application_area definition (WIGOS 2-01)

| element_name | kind | external_table | description |
|------------------|---------|----------------|---------------------------------|
| application_area | int(pk) | | Unique ID for code entry |
| description | varchar | | Description of application area |
| End of table | | | |

Table 36: automation_status definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| automation | int(pk) | | Unique ID for entry |
| description | varchar | | description of automation status (e.g. automatic observations, manual observation etc) |
| End of table | | | |

Table 37: calibration_status definition (WIGOS 5-08)

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| status | int(pk) | | unique ID for entry |
| description | varchar | | Description of calibration status (e.g. No changes - in calibration etc) |
| End of table | | | |

Table 38: communication_method definition (Various sources (WMO47, WIGOS, BUFR))

| elemet_name | kind | external_table | description |
|--------------|---------|----------------|--|
| method | int(pk) | | Primary key / unique ID for entry |
| description | varchar | | Decoded value / text description of communication method |
| End of table | | | |



Table 39: conversion_flag definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| flag | int(pk) | | primary key |
| description | varchar | | Description of whether the original value has been converted or decoded and is stored in the observed variable element |

End of table

Table 40: conversion_method definition

| element_name | kind | external_table | description |
|----------------|---------|----------------------------|--|
| method | int(pk) | | unique ID for entry (together with variable) |
| variable | int(pk) | observed_variable:variable | The variable to which this conversion method applies |
| description | varchar | | text description of conversion method |
| implementation | varchar | | details of implementation |
| reference | varchar | | reference / doi of document giving more details on conversion method |

End of table

Table 41: crs definition (BUFR 0 01 150)

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| crs | int(pk) | | primary key |
| description | varchar | | Decoded value / description of coordinate reference system |

End of table

Table 42: data_policy_licence definition (WIGOS 9-02)

| element_name | kind | external_table | description |
|--------------|----------|----------------|---------------------------|
| policy | int (pk) | | Primary key for table |
| name | varchar | | short name of data policy |

Continued on next page



Table 42 data_policy_licence (cont.)

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| description | varchar | | Description of data licence, usage rights and restrictions |

End of table

Table 43: data_present definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| flag | int(pk) | | Primary key for table |
| description | varchar | | Decoded value indicating presence of additional data |

End of table

Table 44: duplicate_status definition (Simplified version of duplicate status flags from IMMA (ICOADS))

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| status | int(pk) | | Primary key for table |
| description | varchar | | Decoded value / description of duplicate status (e.g. unique, best duplicate etc) |

End of table

Table 45: duration definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|-------------------------------|
| duration | int(pk) | | Primary key |
| description | varchar | | Text description of duration |
| period | int | | Duration converted to seconds |

End of table

Table 46: events_at_station definition (WIGOS 4-04)

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| event | int(pk) | | primary key for table |
| description | varchar | | Decoded value / description of events at the time of report / observation |

End of table



Table 47: feedback_method definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|------------------------------------|
| method | int (pk) | | primary key for table, coded value |
| description | varchar | | description of feedback method |
| End of table | | | |

Table 48: header_fields definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| field_id | varchar | | primary key |
| field_name | varchar | | Name of field described by this entry |
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |
| End of table | | | |

Table 49: homogenisation_method definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|-----------------------------|
| method | int (pk) | | Primary key for table |
| description | varchar | | Description of method |
| reference | varchar | | DOI or reference for method |
| End of table | | | |

Table 50: homogenisation_operator definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|---|
| operator | int (pk) | | Primary key for table |
| symbol | varchar | | symbol representation of operator, e.g. + |
| description | varchar | | text representation of operator, e.g. add |
| End of table | | | |



Table 51: id_scheme definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| scheme | int(pk) | | Primary key for table |
| description | varchar | | Decoded value / description of ID scheme used to report the station ID |

End of table

Table 52: instrument_exposure_quality definition (WIGOS 5-15)

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| exposure | int(pk) | | primary key for table |
| description | varchar | | decoded value / description of instrument exposure quality |

End of table

Table 53: kind definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|---------------------------------|
| kind | int(pk) | | primary key |
| description | varchar | | kind of data (int, numeric etc) |

End of table

Table 54: location_method definition (based on WIGOS 11-01 and BUFR 0 02 148)

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| method | int(pk) | | primary key for table |
| description | varchar | | decoded value / description of method by which the station location has been determined |

End of table



Table 55: location_quality definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| quality | int (pk) | | primary key for table |
| description | varchar | | decoded value / description of the quality of the location this indicator is for |

End of table

Table 56: meaning_of_time_stamp definition (Based on simplified version of WIGOS 11-03)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| meaning | int(pk) | | primary key |
| name | varchar | | abbreviation / simple name for meaning of time stamp |
| description | varchar | | definition of meaning of time stamp |

End of table

Table 57: method_of_estimating_uncertainty definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| method | int(pk) | | primary key for table |
| description | varchar | | decoded value / description of how the uncertainty has been determined |
| reference | varchar | | Reference or DOI describing method |

End of table

Table 58: observation_code_table definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---|
| code_table | int (pk) | | Primary key for table |
| code_table_scheme | varchar | | External scheme used for code table (e.g. BUFR) |
| code_table_id | varchar | | ID used to identify table within scheme (e.g. F XX YYY for BUFR tables) |
| code_table_name | varchar | | Name of code table |

Continued on next page



Table 58 observation_code_table (cont.)

| element_name | kind | external_table | description |
|--------------|----------|----------------|--|
| value | int (pk) | | coded value |
| description | varchar | | decoded value / meaning of decoded value |

End of table

Table 59: observation_value_significance definition (based on BUFR 0 08 023)

| element_name | kind | external_table | description |
|--------------|----------|----------------|--|
| significance | int (pk) | | Primary key for table |
| description | varchar | | decoded value / description of indicated significance (e.g. min over specified period) |

End of table

Table 60: observations_fields definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| field_id | varchar | | primary key |
| field_name | varchar | | Name of field described by this entry |
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |

End of table

Table 61: observed_variable definition

| element_name | kind | external_table | description |
|-----------------|---------|----------------|--|
| variable | int(pk) | | primary key for table |
| parameter_group | varchar | | parameter group (e.g. temperature, pressure) that this variable belongs to |

Continued on next page



Table 61 observed_variable (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| domain | varchar | | Observation domain (atmospheric, oceanic etc) that this variable is typically reported for |
| sub_domain | varchar | | Sub-domain (e.g. upper air, surface etc) |
| name | varchar | | common name for variable |
| units | varchar | | ASCII abbreviation of units |
| description | varchar | | Description / definition of variable |

End of table

Table 62: observing_frequency definition (WMO47 - 0602)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| frequency | int(pk) | | primary key for table |
| description | varchar | | decoded value / description of reporting frequency (e.g. once per day) |

End of table

Table 63: observing_method definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| method | int (pk) | | primary key for table |
| description | varchar | | decoded value indicating method of observing (e.g. measured, estimating or computed) |

End of table

Table 64: observing_programme definition (WIGOS 2-02)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---|
| observing_programme | int(pk) | | primary key for table |
| abbreviation | varchar | | Commonly used abbreviation for observing programme (e.g. VOS) |

Continued on next page



Table 64 observing_programme (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---|
| description | varchar | | Description or name of observing programme (e.g. Voluntary Observing Ships) |
| sponsor | varchar | | primary sponsor of observing programme (e.g. JCOMM) |

End of table

Table 65: platform_sub_type definition (based on WMO47, ICOADS, BUFR 0 02 149)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| sub_type | int (pk) | | primary key for table |
| platform_type | int | platform_type:type | platform type to which this sub-type belongs |
| abbreviation | varchar | | abbreviation used to indicate this platform sub-type |
| description | varchar | | description of observing platform sub-type (e.g. Container ship) |

End of table

Table 66: platform_type definition (IMMA (ICOADS) and BUFR 0 03 001 (0 - 31))

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| type | int (pk) | | primary key for table |
| description | varchar | | Description of class of observing platform |

End of table

Table 67: processing_code definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| code | int (pk) | | primary key for table |
| abbreviation | varchar | | abbreviation for processing code |
| description | varchar | | description / meaning of processing code |

End of table



Table 68: processing_level definition (WIGOS 7-06)

| element_name | kind | external_table | description |
|--------------|----------|----------------|--|
| level | int (pk) | | primary key for table |
| name | varchar | | Name commonly used to indicate level of processing |
| description | varchar | | Description of processing level |
| End of table | | | |

Table 69: product_level definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|--------------------------|
| level | int (pk) | | primary key for table |
| description | varchar | | Meaning of product level |
| End of table | | | |

Table 70: product_status definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| status | int(pk) | | primary key for table |
| abbreviation | varchar | | abbreviation used to indicate product status |
| description | varchar | | Meaning of product status |
| End of table | | | |

Table 71: profile_configuration_codes definition

| element_name | kind | external_table | description |
|------------------------|--------------|---------------------------------------|---|
| field_id | varchar (pk) | profile_configuration_fields:field_id | Link to field code is for |
| field_name | varchar | | Name of field |
| code_value | int (pk) | | Coded value. Together with field_id forms primary key |
| abbreviation | varchar | | Abbreviation used for coded value |
| description | varchar | | Decoded value / meaning of code |
| start_date | timestamp | | Start of validity period for indicated code |
| Continued on next page | | | |



Table 71 profile_configuration_codes (cont.)

| element_name | kind | external_table | description |
|--------------|-----------|----------------|---|
| end_date | timestamp | | End of validity period for indicated code |

End of table

Table 72: profile_configuration_fields definition

| element_name | kind | external_table | description |
|--------------|--------------|----------------|--|
| field_id | varchar (pk) | | primary key |
| field_name | varchar | | Name of field described by this entry |
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |

End of table

Table 73: profile_type definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|---|
| type | int (pk) | | primary key for table |
| description | varchar | | type of profile measurements (atmospheric, oceanographic etc) |

End of table

Table 74: qc_method definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|---|
| method | int (pk) | | Primary key for table |
| description | varchar | | Description of method |
| originator | varchar | | Originator (person / institute) of QC scheme / method |
| reference | varchar | | DOI or reference for method |
| domain | varchar | Domain | (land, air, sea) to which check applies |

Continued on next page



Table 74 qc_method (cont.)

| element_name | kind | external_table | description |
|------------------|---------|----------------|--|
| qualitychecktype | varchar | | Description of type of QC check, e.g. metadata, format, completeness etc |
| End of table | | | |

Table 75: quality_flag definition (BUFR 0 33 020)

| element_name | kind | external_table | description |
|--------------|----------|----------------|-------------------------|
| flag | int (pk) | | primary key for table |
| description | varchar | | meaning of quality flag |
| End of table | | | |

Table 76: region definition (WIGOS 3-01)

| element_name | kind | external_table | description |
|--------------|---------|----------------|-------------------------------------|
| region | int(pk) | | primary key for table |
| WMO_region | int | | WMO region that this corresponds to |
| description | varchar | | Definition of region |
| End of table | | | |

Table 77: report_processing_codes definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|---|
| code | int (pk) | | primary key for table |
| abbreviation | varchar | | abbreviation used to indicate processing code |
| description | varchar | | definition of processing code |
| End of table | | | |

Table 78: report_processing_level definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| level | int(pk) | | primary key for table |
| abbreviation | varchar | | abbreviation used to indicate processing level |
| description | varchar | | definition of processing level |
| End of table | | | |



Table 79: report_type definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| type | int(pk) | | primary key for table |
| abbreviation | varchar | | abbreviation used to indicate report type (e.g. SHIP) |
| description | varchar | | description of report type, e.g. routine weather report made by ship |

End of table

Table 80: role definition (ISOTC211/19115 CIRoleCode)

| element_name | kind | external_table | description |
|--------------|---------|----------------|-----------------------|
| role | int(pk) | | primary key for table |
| entry | varchar | | short name for role |
| description | varchar | | definition of role |

End of table

Table 81: sampling_strategy definition (WIGOS 6-03)

| element_name | kind | external_table | description |
|--------------|----------|----------------|---|
| strategy | int (pk) | | primary key for table |
| name | varchar | | name or abbreviation used to indicate sampling strategy |
| description | varchar | | definition of sampling strategy |

End of table

Table 82: sea_level_datum definition (BUFR 0 01 151)

| element_name | kind | external_table | description |
|--------------|---------|----------------|------------------------------|
| datum | int(pk) | | primary key for table |
| description | varchar | | Long name of sea level datum |

End of table



Table 83: secondary_variable definition

| element_name | kind | external_table | description |
|---------------|---------|----------------|--|
| variable | int(pk) | | part of primary key - indicator for secondary variable name |
| variable_name | varchar | | name / description of secondary variable |
| value | int(pk) | | coded value for secondary variable |
| symbol | varchar | | abbreviation or symbol used to represent decoded value, e.g. chemical symbol for atmospheric constituent |
| description | varchar | | Name or description of decoded value |

End of table

Table 84: sensor_configuration_codes definition

| element_name | kind | external_table | description |
|--------------|--------------|--------------------------------------|---|
| field_id | varchar (pk) | sensor_configuration_fields:field_id | Link to field code is for |
| field_name | varchar | | Name of field |
| parameter | varchar | | Which parameter this entry is valid for |
| code_value | int (pk) | | Coded value. Together with field_id forms primary key |
| abbreviation | varchar | | Abbreviation used for coded value |
| description | varchar | | Decoded value / meaning of code |

End of table

Table 85: sensor_configuration_fields definition

| element_name | kind | external_table | description |
|--------------|--------------|----------------|--|
| field_id | varchar (pk) | | primary key |
| field_name | varchar | | Name of field described by this entry |
| parameter | varchar | | Which parameter this entry is relevant for |

Continued on next page



Table 85 sensor_configuration_fields (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |

End of table

Table 86: source_configuration_codes definition

| element_name | kind | external_table | description |
|---------------------|--------------|--------------------------------------|---|
| field_id | varchar (pk) | source_configuration_fields:field_id | Link to field code is for |
| field_name | varchar | | Name of field |
| code_value | int (pk) | | Coded value. Together with field_id forms primary key |
| abbreviation | varchar | | Abbreviation used for coded value |
| description | varchar | | Decoded value / meaning of code |

End of table

Table 87: source_configuration_fields definition

| element_name | kind | external_table | description |
|---------------------|--------------|-----------------------|--|
| field_id | varchar (pk) | | primary key |
| field_name | varchar | | Name of field described by this entry |
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |

End of table

Table 88: source_format definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|-----------------------|
| format | int(pk) | | primary key for table |

Continued on next page



Table 88 source_format (cont.)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---|
| description | varchar | | description of data format, e.g. NetCDF |

End of table

Table 89: spatial_representativeness definition (WIGOS 1-05)

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---------------------------------------|
| representativeness | int (pk) | | primary key for table. coded value |
| description | varchar | | meaning / definition of decoded value |

End of table

Table 90: standard_time definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--------------------------------------|
| time | int(pk) | | primary key for table, encoded value |
| description | varchar | | decoded observing time, e.g. 12 UTC |

End of table

Table 91: station_configuration_codes definition

| element_name | kind | external_table | description |
|---------------------|--------------|--------------------------------------|---|
| field_id | varchar (pk) | station_configuration_codes:field_id | Link to field code is for |
| field_name | varchar | | Name of field |
| code_value | int (pk) | | Coded value. Together with field_id forms primary key |
| abbreviation | varchar | | Abbreviation used for coded value |
| description | varchar | | Decoded value / meaning of code |

End of table



Table 92: station_configuration_fields definition

| element_name | kind | external_table | description |
|--------------|--------------|----------------|--|
| field_id | varchar (pk) | | primary key |
| field_name | varchar | | Name of field described by this entry |
| type | int | kind:kind | The variable type used to store information on the indicated field |
| description | varchar | | Description of the indicated field |

End of table

Table 93: station_type definition (WIGOS 3-04)

| element_name | kind | external_table | description |
|--------------|----------|----------------|------------------------------------|
| type | int (pk) | | primary key for table, coded value |
| description | varchar | | decoded station type |

End of table

Table 94: sub_region definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|--|
| sub_region | int(pk) | | primary key |
| type | varchar | | type of sub region, e.g. country, regional sea etc |
| code | varchar | | abbreviation or character code |
| alpha_3_code | varchar | | ISO 3 character abbreviation of country |
| name | varchar | | decoded value |

End of table

Table 95: time_quality definition

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| quality | int(pk) | | primary key, coded value |
| description | varchar | | decoded value expressing quality of time / date information |

End of table



Table 96: time_reference definition (WIGOS: 7-10)

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| reference | int(pk) | | primary key, coded value |
| description | varchar | | decoded base time to which times referenced |

End of table

Table 97: traceability definition (WIGOS 8-05)

| element_name | kind | external_table | description |
|--------------|---------|----------------|---|
| traceability | int(pk) | | primary key, coded value |
| description | varchar | | definition of traceability of measurement |

End of table

Table 98: uncertainty_method definition

| element_name | kind | external_table | description |
|--------------|----------|----------------|-----------------------------|
| method | int (pk) | | Primary key for table |
| description | varchar | | Description of method |
| reference | varchar | | DOI or reference for method |

End of table

Table 99: uncertainty_type definition

| element_name | kind | external_table | description |
|------------------|----------|----------------|---|
| uncertainty_type | int (pk) | | Primary key |
| name | varchar | | short name describing uncertainty type (e.g. random uncertainty) |
| description | varchar | | description of uncertainty type (e.g. uncertainty in measurement / value due uncorrelated random errors) |
| reference | varchar | | documentation / reference for uncertainty definition |

End of table



Table 100: units definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|------------------------------------|
| units | int(pk) | | primary key |
| name | varchar | | name of units |
| abbreviation | varchar | | conventional abbreviation in ASCII |
| base_units | varchar | | definition in base units |

End of table

Table 101: update_frequency definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---------------------------------|
| frequency | int (pk) | | primary key |
| description | varchar | | Description of update frequency |

End of table

Table 102: z_coordinate_method definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|--|
| method | int (pk) | | primary key, coded value |
| description | varchar | | description of method used to determine z location |

End of table

Table 103: z_coordinate_type definition

| element_name | kind | external_table | description |
|---------------------|-------------|-----------------------|---|
| type | int(pk) | | primary key, coded value |
| description | varchar | | description of units / type of z coordinate |

End of table



6.2 Code tables

Table 104: application_area codes

| application_area | description |
|-------------------------|--|
| 1 | Global numerical weather prediction (GNWP) |
| 2 | High-resolution numerical weather prediction (HRNWP) |
| 3 | Nowcasting and very short range forecasting (NVSFRF) |
| 4 | Seasonal and inter-annual forecasting (SIAF) |
| 5 | General weather forecasting |
| 6 | Aeronautical meteorology |
| 7 | Ocean applications |
| 8 | Agricultural meteorology |
| 9 | Hydrology |
| 10 | Climate monitoring (as undertaken through the Global Climate Observing System, GCOS) |
| 11 | Climate applications |
| 12 | Space weather |
| 13 | Cryosphere applications |
| 14 | Energy sector |
| 15 | Transportation sector |
| 16 | Health sector |
| 17 | Terrestrial ecology |
| 18 | Operational air quality forecasting |
| 19 | Atmospheric composition forecasting |
| 20 | Atmospheric composition monitoring and analysis |
| 21 | Large urban complexes |

End of table

Table 105: automation_status codes

| automation | description |
|-------------------|---|
| 0 | Automatic observation. |
| 1 | Automatic, always supplemented by manual input. |
| 2 | Automatic, occasionally supplemented by manual input. |

Continued on next page



Table 105 automation_status (cont.)

| automation | description |
|-------------------|---|
| 3 | Automatic, supplemented by manual observations. |
| 4 | Manual observation. |
| 5 | Unknown. |
| 6 | Visual observation. |

End of table

Table 106: calibration_status codes

| status | description |
|---------------|-----------------------------------|
| 0 | No changes - in calibration. |
| 1 | No changes - out of calibration. |
| 2 | No changes - calibration unknown. |
| 3 | Recalibrated - in calibration. |

End of table

Table 107: communication_method codes

| method | description |
|---------------|---|
| 0 | Cellular (unspecified) |
| 1 | Meteosat DCP |
| 2 | Iridium (unspecified) |
| 3 | GOES DCP |
| 4 | VSAT (unspecified) |
| 5 | Landline telephone |
| 6 | Radio modem |
| 7 | E-mail (unspecified) |
| 8 | Voice (ship). The observation is sent to a NMS through the telephone network. The communication may use Inmarsat, Iridium, Vsat, VHF |
| 9 | Email (ship). The observation is sent to a NMS through an email. The WMO message is attached to this email. The satellite communication provider may be Inmarsat, Iridium, Vsat |

Continued on next page



Table 107 communication_method (cont.)

| method | description |
|--------|--|
| 10 | Web (ship). The observation is sent through the Web (example: TurboWeb). The satellite communication provider may be Inmarsat, Iridium, Vsat |
| 11 | Inmarsat-C (FM13, SAC41). Standard procedure used to report observations (FM13 messages) from conventional VOS for many years. Collect call system: the NMS which receives the observations pays the communication costs |
| 12 | Inmarsat-C (FM13, other SAC). FM13 messages are sent to a dedicated SAC (other than SAC41) established at one, or more LES. In general, communications are paid by the country who recruited the ship |
| 13 | Inmarsat-C (EUHC). Text messages containing compressed data (E-SURFMAR format) are sent ashore through Inmarsat-C to a dedicated SAC and LES. Communications are paid by the country who recruited the ship |
| 14 | Inmarsat-C (SEAS). SEAS binary messages sent through Inmarsat-C Data Mode to a dedicated SAC and LES. Communications are paid by NOAA/NWS |
| 15 | Automated Identification System (direct or through satellite) |
| 16 | Argos system |
| 17 | Cellular (Dial-up). Dial-up communication using terrestrial wireless networks (GSM, GPRS) |
| 18 | Cellular (SMS). SMS sent through terrestrial wireless networks (GSM, GPRS) |
| 19 | Globalstar communication system |
| 20 | GMS (DCP). Data Collecting Platform of Geostationary Meteorological Satellites |
| 21 | Iridium (SBD). Short Burst Data service of Iridium communication system |
| 22 | Iridium (Email). Email sent through Iridium (e.g. Easymail) |
| 23 | Iridium (Dial-up). Dial-up communication using Iridium |

Continued on next page



Table 107 communication_method (cont.)

| method | description |
|---------------|---|
| 24 | Inmarsat-C (Data Mode). Data Mode service of Inmarsat-C used by S-AWS. See above for SEAS which also uses this service for conventional VOS |
| 25 | Inmarsat-C (Email). Email sent through Inmarsat-C |
| 26 | Orbcomm communication system |
| 27 | Vsat (Email). Email sent through Vsat |
| 28 | Vsat (Dial-up). Dial-up communication using Vsat |
| 29 | Delayed Mode only |
| 30 | Other (specify in footnote). |

End of table

Table 108: conversion_flag codes

| flag | description |
|-------------|--|
| 0 | Both original (non SI) and converted (SI) values available, see conversion_method for details. |
| 1 | Only original value in non-SI units available, no conversion has been performed. See original_value field. |
| 2 | Original value in SI units available, no conversion required. |
| 3 | Value coded - see code_table for details. |

End of table



Table 109: conversion_method codes

| method | variable | description | implementation | reference |
|--------|----------|---|---|-----------|
| 1 | 36 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 37 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 41 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 56 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 85 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 86 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 87 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |

Continued on next page



Table 109 conversion_method (cont.)

| method | variable | description | implementation | reference |
|--------|----------|---|---|-----------|
| 1 | 88 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 89 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 90 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 91 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 92 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 93 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 94 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |

Continued on next page



Table 109 conversion_method (cont.)

| method | variable | description | implementation | reference |
|--------|----------|---|---|--|
| 1 | 95 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 113 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 1 | 116 | Temperature value in degrees Celsius converted to value in Kelvin | The original temperature value in degrees Celsius in converted by adding 273.15 to the original value | NA |
| 2 | 58 | Station pressure converted to sea level pressure | $\log_{10} \frac{p_0}{p_s} = \frac{K_p H_p}{T_{mv}}$ <p>where p_0 is the pressure reduced to sea level in hPa; p_s the station pressure in hPa; K_p the constant 0.0148275 K / gpm; H_p the station elevation in gpm; and T_{mv} the mean virtual temperature in K</p> | WMO, 2012: Guide to Meteorological Instruments and Methods of Observation. WMO-No 8, WMO, Geneva, 716 pp. (Equation 3.1, page I.3-21). |
| 3 | 107 | Wind speed value in Beaufort scale converted to metres per second (m/s) | $W = 0.836 * F^{\frac{3}{2}}$ <p>where F = Wind speed in Beaufort scale; W = wind speed in m/s.</p> | NA |

Continued on next page



Table 109 conversion_method (cont.)

| method | variable | description | implementation | reference |
|--------|----------|---|---|-----------|
| 3 | 108 | Wind speed value in Beaufort scale converted to metres per second (m/s) | $W = 0.836 * F^{\frac{3}{2}}$ <p>where F = Wind speed in Beaufort scale; W = wind speed in m/s.</p> | NA |
| 3 | 109 | Wind speed value in Beaufort scale converted to metres per second (m/s) | $W = 0.836 * F^{\frac{3}{2}}$ <p>where F = Wind speed in Beaufort scale; W = wind speed in m/s.</p> | NA |
| 4 | 106 | Wind direction from 32 point compass | <p>where F = Wind speed in Beaufort scale; W = wind speed in m/s.</p> <p>Wind direction converted from 32 point compass, mid point used (see observation_code_table 1, GLAMOD wind32)</p> | NA |
| 5 | 107 | Knots to m/s | Wind speed converted from knots to m/s, wind_ms = wspd_knot * 0.5144 | NA |
| 6 | 53 | Conversion of mm to cm | $SD = SD_{orig} * 0.1$ <p>where SD is the converted snow depth and</p> SD_{orig} <p>the original value.</p> | NA |
| 7 | 58 | Conversion from hPa to Pa | $P = P_{orig} * 100$ | NA |

Continued on next page



Table 109 conversion_method (cont.)

| method | variable | description | implementation | reference |
|--------|----------|---------------------------|----------------------|-----------|
| 7 | 57 | Conversion from hPa to Pa | $P = P_{orig} * 100$ | NA |

End of table



Table 110: crs codes

| crs | description |
|------------|--|
| 0 | WGS84 |
| 1 | ETRS89 |
| 2 | NAD83 |
| 3 | DHDN |
| 4 | Ellipsoidal datum using International Reference Meridian maintained by the International Earth Rotation and Reference System Services (IERS) |

End of table

Table 111: data_policy_licence codes

| policy | name | description |
|---------------|----------------|--|
| 0 | Open | Data in public domain and freely available (no cost and unrestricted). |
| 1 | WMO essential | WMO Essential Data: free and unrestricted international exchange of basic data and products. |
| 2 | WMO additional | WMO Additional Data: free and unrestricted access to data and products exchanged under the auspices of WMO to the research and education communities for non-commercial activities. A more precise definition of the data policy may be additionally supplied within the metadata. In all cases it shall be the responsibility of the data consumer to ensure that they understand the data policy specified by the data provider – which may necessitate dialogue with the data publisher for confirmation of terms and conditions. |

Continued on next page



Table 111 data_policy_licence (cont.)

| policy | name | description |
|---------------|-------------------|--|
| 3 | WMO other | Data identified for global distribution via WMO infrastructure (GTS / WIS) that is not covered by WMO Resolution 25 neither WMO Resolution 40 e.g. aviation OPMET data. Data marked with “WMOOther” data policy shall be treated like “WMOAdditional” where a more precise definition of the data policy may be additionally supplied within the metadata. In all cases it shall be the responsibility of the data consumer to ensure that they understand the data policy specified by the data provider – which may necessitate dialogue with the data publisher for confirmation of terms and conditions. |
| 4 | Restricted data | The use of this data are restricted and cannot be used without permission or granted licence from the original data provider |
| 5 | Attribution CC BY | Creative Commons (CC) Licence:Attribution. You are free to Share, copy and redistribute the material in any medium or format Adapt, remix, transform, and build upon the material for any purpose, even commercially.Under the following terms:You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.(https://creativecommons.org/licenses/by/4.0/) |

Continued on next page



Table 111 data_policy_licence (cont.)

| policy | name | description |
|---------------|-------------------------------|--|
| 6 | ShareAlike CC BY-SA | Creative Commons (CC) Licence: ShareAlike, You are free to Share, copy and redistribute the material in any medium or format Adapt,remix, transform, and build upon the material for any purpose, even commercially.Under the following terms:You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.(https://creativecommons.org/licenses/by-sa/4.0/) |
| 7 | Attribution-NoDerivs CC BY-ND | Creative Commons (CC) Licence: Attribution-NoDerivatives. You are free to Share, copy and redistribute the material in any medium or format for any purpose, even commercially. You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. If you remix, transform, or build upon the material, you may not distribute the modified material.You may not apply legal terms or technological measures that legally restrict others from doing anything the license permit. (https://creativecommons.org/licenses/by-nd/4.0/) |

Continued on next page



Table 111 data_policy_licence (cont.)

| policy | name | description |
|---------------|---|---|
| 8 | Attribution-NonCommercial CC BY-NC | Creative Commons (CC) Licence:Attribution-NonCommercial.You are free to Share, copy and redistribute the material in any medium or format Adapt, remix, transform, and build upon the material.Under the following terms:You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.You may not use the material for commercial purposes.You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. (https://creativecommons.org/licenses/by-nc/4.0/) |
| 9 | Attribution-NonCommercial-ShareAlike CC BY-NC-SA | Creative Commons (CC) Licence: Attribution-NonCommercial-ShareAlike. You are free to Share,copy and redistribute the material in any medium or format Adapt, remix, transform, and build upon the material.Under the following terms: You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.You may not use the material for commercial purposes.If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.(https://creativecommons.org/licenses/by-nc-sa/4.0/) |

Continued on next page



Table 111 data_policy_licence (cont.)

| policy | name | description |
|---------------|---|---|
| 10 | Attribution-NonCommercial-NoDerivs CC BY-NC-ND | Creative Commons (CC) Licence: Attribution-NonCommercial-NoDerivs. CC BY-NC-ND. You are free to Share, copy and redistribute the material in any medium or format. Under the following terms: You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. You may not use the material for commercial purposes. If you remix, transform, or build upon the material, you may not distribute the modified material. You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits |
| 11 | Other | Specified by the data provider |
| 12 | Mixed data policy | Source contains more than one data policy |

End of table

Table 112: data_present codes

| flag | description |
|-------------|---------------------------------|
| 0 | Indicated data is not available |
| 1 | Indicated data available |

End of table

Table 113: duplicate_status codes

| status | description |
|---------------|---|
| 0 | Unique observation, no known duplicates |
| 1 | Best duplicate |
| 2 | Duplicate |
| 3 | Worst duplicate |
| 4 | Unchecked |

End of table



Table 114: duration codes

| duration | description | period |
|-----------------|--------------------|---------------|
| 0 | instantaneous | 0 |
| 1 | 2 seconds | 2 |
| 2 | 5 seconds | 5 |
| 3 | 10 seconds | 10 |
| 4 | 30 seconds | 30 |
| 5 | 1 minute | 60 |
| 6 | 2 minutes | 120 |
| 7 | 5 minutes | 300 |
| 8 | 10 minutes | 600 |
| 9 | 1 hour | 3600 |
| 10 | 3 hours | 10800 |
| 11 | 6 hours | 21600 |
| 12 | 12 hours | 43200 |
| 13 | 1 day | 86400 |
| 14 | monthly | NA |
| 15 | mixed frequency | NA |
| 16 | pentad | 432000 |
| 17 | weekly | 604800 |

End of table

Table 115: events_at_station codes

| event | description |
|--------------|------------------------|
| 1 | Grass-cutting |
| 2 | Snow clearing |
| 3 | Tree removal |
| 4 | Construction activity |
| 5 | Road work |
| 6 | Biomass burning |
| 7 | Dust storm |
| 8 | Storm damage |
| 9 | Wind storm |
| 10 | Flood |
| 11 | Fire |
| 12 | Earthquake |
| 13 | Land slide |
| 14 | Storm surge or tsunami |
| 15 | Lightning |
| 16 | Vandalism |

Continued on next page



Table 115 events_at_station (cont.)

| event | description |
|-------|-------------|
|-------|-------------|

End of table

Table 116: feedback_method codes

| type | description |
|------|-------------|
|------|-------------|

0 online

1 offline

End of table

Table 117: header_fields codes

| field_id | field_name | kind | description |
|----------|--------------------------------|------|--|
| 1 | PI Website | 2 | URL (e.g. Internet path for SHADOZ archive) |
| 2 | data repro- cessed flag | 2 | "Yes" if data reprocessed |
| 3 | reference model | 2 | Model ID where applicable |
| 4 | ozone reference total ozone | 1 | Daily value of total column ozone amount (in DU) defined as the "best representative value". Typically in the order of DS, ZS and FM |
| 5 | ozone reference utc mean | 3 | The mean time of observations |
| 6 | utc begin | 3 | The starting time of observations |
| 7 | utc end | 3 | The ending time of observations |
| 8 | utc mean | 3 | The mean time of observations |

End of table

Table 118: homogenisation_method codes

| method | description | reference |
|--------|--|--------------------|
| 1 | Post-processing radiation correction | Dirksen et al 2014 |
| 2 | Post-processing adjustment due to intercomparison with GRUAN | Dirksen et al 2014 |
| 3 | Post-processing adjustment due to intercomparison with WMO/CIMO 2010 dataset | Nash et al. 2010 |

Continued on next page



Table 118 homogenisation_method (cont.)

| method | description | reference |
|--------|-----------------------------------|-------------------------------------|
| 4 | Radiosonde HARMo-nization (RHARM) | Madonna et al. 2019 |
| 11 | RASE v1.72 approach | Haimberger et al. 2020 (ERA5 -1978) |
| 12 | RISE v1.51 approach | Haimberger et al. 2020 (ERA5 1979-) |
| 13 | RASE v1.8 approach | (TBD) |
| 14 | RISE v1.8 approach | (TBD) |
| 15 | RASE v2.0 approach | (TBD) |
| 16 | RISE v2.0 approach | (TBD) |

End of table

Table 119: homogenisation_operator codes

| operator | symbol | description |
|----------|--------|-------------|
| 1 | + | add |
| 2 | - | minus |
| 3 | * | multiply |
| 4 | / | divide |

End of table

Table 120: id_scheme codes

| scheme | description |
|--------|---------------------------------------|
| 0 | WIGOS ID |
| 1 | GRUAN ID |
| 2 | IMO Number |
| 3 | National ID |
| 4 | WMO buoy / station number |
| 5 | Ship / platform callsign |
| 6 | Generic ID (e.g. SHIP, PLAT etc) |
| 7 | Station name |
| 8 | ICODS other |
| 9 | ICODS unknown |
| 10 | ICODS composite |
| 11 | Oceangraphic platform / cruise number |
| 12 | Other buoy number (e.g. Argo) |
| 13 | C3S 311a Lot 2 Internal |

End of table



Table 121: instrument_exposure_quality codes

| exposure | description |
|-----------------|--|
| 1 | Class 1 - Exposure of instrument allows reference level measurements |
| 2 | Class 2 - Exposure of instrument has small or infrequent influence on measurement |
| 3 | Class 3 - Exposure of instrument leads to increased uncertainty or occasional invalid measurements |
| 4 | Class 4 - Exposure of instrument leads to high uncertainty or regular invalid measurements |
| 5 | Class 5 - Exposure of instrument leads to invalid measurements |

End of table

Table 122: kind codes

| kind | description |
|-------------|-------------------------|
| 0 | int |
| 1 | numeric |
| 2 | varchar |
| 3 | timestamp with timezone |

End of table

Table 123: location_method codes

| method | description |
|---------------|--------------------|
| 0 | Argos |
| 1 | ARGOS DOPPLER |
| 2 | ARGOS Kalman |
| 3 | Argos-3 |
| 4 | Argos-4 |
| 5 | From map |
| 6 | GALILEO |
| 7 | GOES DCP |
| 8 | GPS |
| 9 | INMARSAT |
| 10 | Iridium |
| 11 | Iridium and GPS |
| 12 | IRIDIUM DOPPLER |

Continued on next page



Table 123 location_method (cont.)

| method | description |
|--------|--------------|
| 13 | LORAN |
| 14 | Meteosat DCP |
| 15 | Orbcomm |
| 16 | Surveyed |

End of table

Table 124: location_quality codes

| quality | description |
|---------|---|
| 0 | Good - location consistent with other reports from this station |
| 1 | Doubtful |
| 2 | Bad - Track check failed |
| 3 | Unchecked |

End of table

Table 125: meaning_of_time_stamp codes

| meaning | name | description |
|---------|-----------|---|
| 1 | beginning | Date / time specified indicates the start of the period over which the observation was made. |
| 2 | end | Date / time specified indicates the end of the period over which the observation was made. |
| 3 | middle | Date / time specified indicates the middle of the period over which the observation was made. |

End of table

Table 126: method_of_estimating_uncertainty codes

| method | description | reference |
|--------|-------------|-----------|
| 0 | NA | NA |

End of table



Table 127: observation_code_table codes

| code_table | code_table_ scheme | code_table_id | code_table _name | value | description |
|------------|-----------------------|---------------|---------------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 0 | Cloud development not observed or not observable |
| 0 | BUFR | 0 20 003 | Present weather | 1 | Clouds generally dissolving or becoming less developed |
| 0 | BUFR | 0 20 003 | Present weather | 2 | State of sky on the whole unchanged |
| 0 | BUFR | 0 20 003 | Present weather | 3 | Clouds generally forming or developing |
| 0 | BUFR | 0 20 003 | Present weather | 4 | Visibility reduced by smoke, e.g. veldt or forest fires, industrial smoke or volcanic ashes |
| 0 | BUFR | 0 20 003 | Present weather | 5 | Haze |
| 0 | BUFR | 0 20 003 | Present weather | 6 | Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 7 | 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 duststorm or sandstorm seen; or, in the case of sea stations and coastal stations, blowing spray at the station |
| 0 | BUFR | 0 20 003 | Present weather | 8 | Well-developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the same time of observation, but no duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 9 | Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour |
| 0 | BUFR | 0 20 003 | Present weather | 10 | Mist |
| 0 | BUFR | 0 20 003 | Present weather | 11 | Patches |
| 0 | BUFR | 0 20 003 | Present weather | 12 | More or less continuous |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|-----------------|-------|--|
| 0 | BUFR | 0 20 003 | Present weather | 13 | Lightning visible, no thunder heard |
| 0 | BUFR | 0 20 003 | Present weather | 14 | Precipitation within sight, not reaching the ground or the surface of the sea |
| 0 | BUFR | 0 20 003 | Present weather | 15 | 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 |
| 0 | BUFR | 0 20 003 | Present weather | 16 | Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station |
| 0 | BUFR | 0 20 003 | Present weather | 17 | Thunderstorm, but no precipitation at the time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 18 | Squalls |
| 0 | BUFR | 0 20 003 | Present weather | 19 | Funnel cloud(s) |
| 0 | BUFR | 0 20 003 | Present weather | 20 | Drizzle (not freezing) or snow grains |
| 0 | BUFR | 0 20 003 | Present weather | 21 | Rain (not freezing) |
| 0 | BUFR | 0 20 003 | Present weather | 22 | Snow |
| 0 | BUFR | 0 20 003 | Present weather | 23 | Rain and snow or ice pellets |
| 0 | BUFR | 0 20 003 | Present weather | 24 | Freezing drizzle or freezing rain |
| 0 | BUFR | 0 20 003 | Present weather | 25 | Shower(s) of rain |
| 0 | BUFR | 0 20 003 | Present weather | 26 | Shower(s) of snow, or of rain and snow |
| 0 | BUFR | 0 20 003 | Present weather | 27 | Shower(s) of hail*, or of rain and hail* |
| 0 | BUFR | 0 20 003 | Present weather | 28 | Fog or ice fog |
| 0 | BUFR | 0 20 003 | Present weather | 29 | Thunderstorm (with or without precipitation) |
| 0 | BUFR | 0 20 003 | Present weather | 30 | Slight or moderate duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 31 | Slight or moderate duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 32 | Slight or moderate duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 33 | Severe duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 34 | Severe duststorm or sandstorm |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_ scheme | code_table_id | code_table _name | value | description |
|------------|-----------------------|---------------|---------------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 35 | Severe duststorm or sandstorm |
| 0 | BUFR | 0 20 003 | Present weather | 36 | Slight or moderate drifting snow |
| 0 | BUFR | 0 20 003 | Present weather | 37 | Heavy drifting snow |
| 0 | BUFR | 0 20 003 | Present weather | 38 | Slight or moderate blowing snow |
| 0 | BUFR | 0 20 003 | Present weather | 39 | Heavy blowing snow |
| 0 | BUFR | 0 20 003 | Present weather | 40 | 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 |
| 0 | BUFR | 0 20 003 | Present weather | 41 | Fog or ice fog in patches |
| 0 | BUFR | 0 20 003 | Present weather | 42 | Fog or ice fog, sky visible |
| 0 | BUFR | 0 20 003 | Present weather | 43 | Fog or ice fog, sky invisible |
| 0 | BUFR | 0 20 003 | Present weather | 44 | Fog or ice fog, sky visible |
| 0 | BUFR | 0 20 003 | Present weather | 45 | Fog or ice fog, sky invisible |
| 0 | BUFR | 0 20 003 | Present weather | 46 | Fog or ice fog, sky visible |
| 0 | BUFR | 0 20 003 | Present weather | 47 | Fog or ice fog, sky invisible |
| 0 | BUFR | 0 20 003 | Present weather | 48 | Fog, depositing rime, sky visible |
| 0 | BUFR | 0 20 003 | Present weather | 49 | Fog, depositing rime, sky invisible |
| 0 | BUFR | 0 20 003 | Present weather | 50 | Drizzle, not freezing, intermittent |
| 0 | BUFR | 0 20 003 | Present weather | 51 | Drizzle, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 52 | Drizzle, not freezing, intermittent |
| 0 | BUFR | 0 20 003 | Present weather | 53 | Drizzle, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 54 | Drizzle, not freezing, intermittent |
| 0 | BUFR | 0 20 003 | Present weather | 55 | Drizzle, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 56 | Drizzle, freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 57 | Drizzle, freezing, moderate or heavy (dense) |
| 0 | BUFR | 0 20 003 | Present weather | 58 | Drizzle and rain, slight |
| 0 | BUFR | 0 20 003 | Present weather | 59 | Drizzle and rain, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 60 | Rain, not freezing, intermittent |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_ scheme | code_table_id | code_table _name | value | description |
|------------|-----------------------|---------------|---------------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 61 | Rain, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 62 | Rain, not freezing, intermittent |
| 0 | BUFR | 0 20 003 | Present weather | 63 | Rain, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 64 | Rain, not freezing, intermittent |
| 0 | BUFR | 0 20 003 | Present weather | 65 | Rain, not freezing, continuous |
| 0 | BUFR | 0 20 003 | Present weather | 66 | Rain, freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 67 | Rain, freezing, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 68 | Rain or drizzle and snow, slight |
| 0 | BUFR | 0 20 003 | Present weather | 69 | Rain or drizzle and snow, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 70 | Intermittent fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 71 | Continuous fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 72 | Intermittent fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 73 | Continuous fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 74 | Intermittent fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 75 | Continuous fall of snowflakes |
| 0 | BUFR | 0 20 003 | Present weather | 76 | Diamond dust (with or without fog) |
| 0 | BUFR | 0 20 003 | Present weather | 77 | Snow grains (with or without fog) |
| 0 | BUFR | 0 20 003 | Present weather | 78 | Isolated star-like snow crystals (with or without fog) |
| 0 | BUFR | 0 20 003 | Present weather | 79 | Ice pellets |
| 0 | BUFR | 0 20 003 | Present weather | 80 | Rain shower(s), slight |
| 0 | BUFR | 0 20 003 | Present weather | 81 | Rain shower(s), moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 82 | Rain shower(s), violent |
| 0 | BUFR | 0 20 003 | Present weather | 83 | Shower(s) of rain and snow mixed, slight |
| 0 | BUFR | 0 20 003 | Present weather | 84 | Shower(s) of rain and snow mixed, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 85 | Snow shower(s), slight |
| 0 | BUFR | 0 20 003 | Present weather | 86 | Snow shower(s), moderate or heavy |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table scheme | code_table_ code_table_id | code_table _name | value | description |
|----------------------|------------------------------|---------------------|-----------------|--|
| 0 | BUFR | 0 20 003 | Present weather | 87 Shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed |
| 0 | BUFR | 0 20 003 | Present weather | 88 Shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed |
| 0 | BUFR | 0 20 003 | Present weather | 89 Shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder |
| 0 | BUFR | 0 20 003 | Present weather | 90 Shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder |
| 0 | BUFR | 0 20 003 | Present weather | 91 Slight rain at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 92 Moderate or heavy rain at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 93 Slight snow, or rain and snow mixed or hail* at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 94 Moderate or heavy snow, or rain and snow mixed or hail* at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 95 Thunderstorm, slight or moderate, without hail*, but with rain and/or snow at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 96 Thunderstorm, slight or moderate, with hail* at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 97 Thunderstorm, heavy, without hail*, but with rain and/or snow at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 98 Thunderstorm combined with duststorm or sandstorm at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 99 Thunderstorm, heavy, with hail* at time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 100 No significant weather observed |
| 0 | BUFR | 0 20 003 | Present weather | 101 Clouds generally dissolving or becoming less developed during the past hour |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|-----------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 102 | State of sky on the whole unchanged during the past hour |
| 0 | BUFR | 0 20 003 | Present weather | 103 | Clouds generally forming or developing during the past hour |
| 0 | BUFR | 0 20 003 | Present weather | 104 | Haze or smoke, or dust in suspension in the air, visibility equal to, or greater than, 1 km |
| 0 | BUFR | 0 20 003 | Present weather | 105 | Haze or smoke, or dust in suspension in the air, visibility less than 1 km |
| 0 | BUFR | 0 20 003 | Present weather | 110 | Mist |
| 0 | BUFR | 0 20 003 | Present weather | 111 | Diamond dust |
| 0 | BUFR | 0 20 003 | Present weather | 112 | Distant lightning |
| 0 | BUFR | 0 20 003 | Present weather | 118 | Squalls |
| 0 | BUFR | 0 20 003 | Present weather | 119 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 120 | Fog |
| 0 | BUFR | 0 20 003 | Present weather | 121 | PRECIPITATION |
| 0 | BUFR | 0 20 003 | Present weather | 122 | Drizzle (not freezing) or snow grains |
| 0 | BUFR | 0 20 003 | Present weather | 123 | Rain (not freezing) |
| 0 | BUFR | 0 20 003 | Present weather | 124 | Snow |
| 0 | BUFR | 0 20 003 | Present weather | 125 | Freezing drizzle or freezing rain |
| 0 | BUFR | 0 20 003 | Present weather | 126 | Thunderstorm (with or without precipitation) |
| 0 | BUFR | 0 20 003 | Present weather | 127 | BLOWING OR DRIFTING SNOW OR SAND |
| 0 | BUFR | 0 20 003 | Present weather | 128 | Blowing or drifting snow or sand, visibility equal to, or greater than, 1 km |
| 0 | BUFR | 0 20 003 | Present weather | 129 | Blowing or drifting snow or sand, visibility less than 1 km |
| 0 | BUFR | 0 20 003 | Present weather | 130 | FOG |
| 0 | BUFR | 0 20 003 | Present weather | 131 | Fog or ice fog in patches |
| 0 | BUFR | 0 20 003 | Present weather | 132 | Fog or ice fog, has become thinner during the past hour |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_ scheme | code_table_ id | code_table _name | value | description |
|------------|-----------------------|-------------------|---------------------|-------|--|
| 0 | BUFR | 0 20 003 | Present weather | 133 | Fog or ice fog, no appreciable change during the past hour |
| 0 | BUFR | 0 20 003 | Present weather | 134 | Fog or ice fog, has begun or become thicker during the past hour |
| 0 | BUFR | 0 20 003 | Present weather | 135 | Fog, depositing rime |
| 0 | BUFR | 0 20 003 | Present weather | 140 | PRECIPITATION |
| 0 | BUFR | 0 20 003 | Present weather | 141 | Precipitation, slight or moderate |
| 0 | BUFR | 0 20 003 | Present weather | 142 | Precipitation, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 143 | Liquid precipitation, slight or moderate |
| 0 | BUFR | 0 20 003 | Present weather | 144 | Liquid precipitation, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 145 | Solid precipitation, slight or moderate |
| 0 | BUFR | 0 20 003 | Present weather | 146 | Solid precipitation, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 147 | Freezing precipitation, slight or moderate |
| 0 | BUFR | 0 20 003 | Present weather | 148 | Freezing precipitation, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 149 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 150 | DRIZZLE |
| 0 | BUFR | 0 20 003 | Present weather | 151 | Drizzle, not freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 152 | Drizzle, not freezing, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 153 | Drizzle, not freezing, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 154 | Drizzle, freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 155 | Drizzle, freezing, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 156 | Drizzle, freezing, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 157 | Drizzle and rain, slight |
| 0 | BUFR | 0 20 003 | Present weather | 158 | Drizzle and rain, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 159 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 160 | RAIN |
| 0 | BUFR | 0 20 003 | Present weather | 161 | Rain, not freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 162 | Rain, not freezing, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 163 | Rain, not freezing, heavy |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_ scheme | code_table_ id | code_table _name | value | description |
|------------|-----------------------|-------------------|---------------------|-------|--|
| 0 | BUFR | 0 20 003 | Present weather | 164 | Rain, freezing, slight |
| 0 | BUFR | 0 20 003 | Present weather | 165 | Rain, freezing, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 166 | Rain, freezing, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 167 | Rain (or drizzle) and snow, slight |
| 0 | BUFR | 0 20 003 | Present weather | 168 | Rain (or drizzle) and snow, moderate or heavy |
| 0 | BUFR | 0 20 003 | Present weather | 169 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 170 | SNOW |
| 0 | BUFR | 0 20 003 | Present weather | 171 | Snow, slight |
| 0 | BUFR | 0 20 003 | Present weather | 172 | Snow, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 173 | Snow, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 174 | Ice pellets, slight |
| 0 | BUFR | 0 20 003 | Present weather | 175 | Ice pellets, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 176 | Ice pellets, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 177 | Snow grains |
| 0 | BUFR | 0 20 003 | Present weather | 178 | Ice crystals |
| 0 | BUFR | 0 20 003 | Present weather | 179 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 180 | SHOWER(S) OR INTERMIT- TENT PRECIPITATION |
| 0 | BUFR | 0 20 003 | Present weather | 181 | Rain shower(s) or intermittent rain, slight |
| 0 | BUFR | 0 20 003 | Present weather | 182 | Rain shower(s) or intermit- tent rain, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 183 | Rain shower(s) or intermittent rain, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 184 | Rain shower(s) or intermittent rain, violent |
| 0 | BUFR | 0 20 003 | Present weather | 185 | Snow shower(s) or intermittent snow, slight |
| 0 | BUFR | 0 20 003 | Present weather | 186 | Snow shower(s) or intermit- tent snow, moderate |
| 0 | BUFR | 0 20 003 | Present weather | 187 | Snow shower(s) or intermittent snow, heavy |
| 0 | BUFR | 0 20 003 | Present weather | 188 | Reserved |
| 0 | BUFR | 0 20 003 | Present weather | 189 | Hail |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|-----------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 190 | THUNDERSTORM |
| 0 | BUFR | 0 20 003 | Present weather | 191 | Thunderstorm, slight or moderate, with no precipitation |
| 0 | BUFR | 0 20 003 | Present weather | 192 | Thunderstorm, slight or moderate, with rain showers and/or snow showers |
| 0 | BUFR | 0 20 003 | Present weather | 193 | Thunderstorm, slight or moderate, with hail |
| 0 | BUFR | 0 20 003 | Present weather | 194 | Thunderstorm, heavy, with no precipitation |
| 0 | BUFR | 0 20 003 | Present weather | 195 | Thunderstorm, heavy, with rain showers and/or snow showers |
| 0 | BUFR | 0 20 003 | Present weather | 196 | Thunderstorm, heavy, with hail |
| 0 | BUFR | 0 20 003 | Present weather | 199 | Tornado |
| 0 | BUFR | 0 20 003 | Present weather | 204 | Volcanic ash suspended in the air aloft |
| 0 | BUFR | 0 20 003 | Present weather | 205 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 206 | Thick dust haze, visibility less than 1 km |
| 0 | BUFR | 0 20 003 | Present weather | 207 | Blowing spray at the station |
| 0 | BUFR | 0 20 003 | Present weather | 208 | Drifting dust (sand) |
| 0 | BUFR | 0 20 003 | Present weather | 209 | Wall of dust or sand in distance (like haboob) |
| 0 | BUFR | 0 20 003 | Present weather | 210 | Snow haze |
| 0 | BUFR | 0 20 003 | Present weather | 211 | Whiteout |
| 0 | BUFR | 0 20 003 | Present weather | 212 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 213 | Lightning, cloud to surface |
| 0 | BUFR | 0 20 003 | Present weather | 217 | Dry thunderstorm |
| 0 | BUFR | 0 20 003 | Present weather | 218 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 219 | Tornado cloud (destructive) at or within sight of the station during preceding hour or at the time of observation |
| 0 | BUFR | 0 20 003 | Present weather | 220 | Deposition of volcanic ash |
| 0 | BUFR | 0 20 003 | Present weather | 221 | Deposition of dust or sand |
| 0 | BUFR | 0 20 003 | Present weather | 222 | Deposition of dew |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_ scheme | code_table_id | code_table _name | value | description |
|------------|-----------------------|---------------|---------------------|-------|--|
| 0 | BUFR | 0 20 003 | Present weather | 223 | Deposition of wet snow |
| 0 | BUFR | 0 20 003 | Present weather | 224 | Deposition of soft rime |
| 0 | BUFR | 0 20 003 | Present weather | 225 | Deposition of hard rime |
| 0 | BUFR | 0 20 003 | Present weather | 226 | Deposition of hoar frost |
| 0 | BUFR | 0 20 003 | Present weather | 227 | Deposition of glaze |
| 0 | BUFR | 0 20 003 | Present weather | 228 | Deposition of ice crust (ice slick) |
| 0 | BUFR | 0 20 003 | Present weather | 229 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 230 | Duststorm or sandstorm with temperature below 0 -∞C |
| 0 | BUFR | 0 20 003 | Present weather | 239 | Blowing snow, impossible to determine whether snow is falling or not |
| 0 | BUFR | 0 20 003 | Present weather | 240 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 241 | Fog on sea |
| 0 | BUFR | 0 20 003 | Present weather | 242 | Fog in valleys |
| 0 | BUFR | 0 20 003 | Present weather | 243 | Arctic or Antarctic sea smoke |
| 0 | BUFR | 0 20 003 | Present weather | 244 | Steam fog (sea, lake or river) |
| 0 | BUFR | 0 20 003 | Present weather | 245 | Steam fog (land) |
| 0 | BUFR | 0 20 003 | Present weather | 246 | Fog over ice or snow cover |
| 0 | BUFR | 0 20 003 | Present weather | 247 | Dense fog, visibility 60-90 m |
| 0 | BUFR | 0 20 003 | Present weather | 248 | Dense fog, visibility 30-60 m |
| 0 | BUFR | 0 20 003 | Present weather | 249 | Dense fog, visibility less than 30 m |
| 0 | BUFR | 0 20 003 | Present weather | 250 | Drizzle, rate of fall - less than 0.10 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 251 | Drizzle, rate of fall - 0.10-0.19 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 252 | Drizzle, rate of fall - 0.20-0.39 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 253 | Drizzle, rate of fall - 0.40-0.79 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 254 | Drizzle, rate of fall - 0.80-1.59 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 255 | Drizzle, rate of fall - 1.60-3.19 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 256 | Drizzle, rate of fall - 3.20-6.39 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 257 | Drizzle, rate of fall - 6.4 mm h-1 or more |

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Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|-----------------|-------|--|
| 0 | BUFR | 0 20 003 | Present weather | 258 | Not used |
| 0 | BUFR | 0 20 003 | Present weather | 259 | Drizzle and snow |
| 0 | BUFR | 0 20 003 | Present weather | 260 | Rain, rate of fall - less than 1.0 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 261 | Rain, rate of fall - 1.0-1.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 262 | Rain, rate of fall - 2.0-3.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 263 | Rain, rate of fall - 4.0-7.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 264 | Rain, rate of fall - 8.0-15.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 265 | Rain, rate of fall - 16.0-31.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 266 | Rain, rate of fall - 32.0-63.9 mm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 267 | Rain, rate of fall - 64.0 mm h-1 or more |
| 0 | BUFR | 0 20 003 | Present weather | 270 | Snow, rate of fall - less than 1.0 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 271 | Snow, rate of fall - 1.0-1.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 272 | Snow, rate of fall - 2.0-3.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 273 | Snow, rate of fall - 4.0-7.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 274 | Snow, rate of fall - 8.0-15.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 275 | Snow, rate of fall - 16.0-31.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 276 | Snow, rate of fall - 32.0-63.9 cm h-1 |
| 0 | BUFR | 0 20 003 | Present weather | 277 | Snow, rate of fall - 64.0 cm h-1 or more |
| 0 | BUFR | 0 20 003 | Present weather | 278 | Snow or ice crystal precipitation from a clear sky |
| 0 | BUFR | 0 20 003 | Present weather | 279 | Wet snow, freezing on contact |
| 0 | BUFR | 0 20 003 | Present weather | 280 | Precipitation of rain |
| 0 | BUFR | 0 20 003 | Present weather | 281 | Precipitation of rain, freezing |
| 0 | BUFR | 0 20 003 | Present weather | 282 | Precipitation of rain and snow mixed |
| 0 | BUFR | 0 20 003 | Present weather | 283 | Precipitation of snow |
| 0 | BUFR | 0 20 003 | Present weather | 284 | Precipitation of snow pellets or small hail |
| 0 | BUFR | 0 20 003 | Present weather | 285 | Precipitation of snow pellets or small hail, with rain |

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Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|---------------------------------------|-------|---|
| 0 | BUFR | 0 20 003 | Present weather | 286 | Precipitation of snow pellets or small hail, with rain and snow mixed |
| 0 | BUFR | 0 20 003 | Present weather | 287 | Precipitation of snow pellets or small hail, with snow |
| 0 | BUFR | 0 20 003 | Present weather | 288 | Precipitation of hail |
| 0 | BUFR | 0 20 003 | Present weather | 289 | Precipitation of hail, with rain |
| 0 | BUFR | 0 20 003 | Present weather | 290 | Precipitation of hail, with rain and snow mixed |
| 0 | BUFR | 0 20 003 | Present weather | 291 | Precipitation of hail, with snow |
| 0 | BUFR | 0 20 003 | Present weather | 292 | Shower(s) or thunderstorm over sea |
| 0 | BUFR | 0 20 003 | Present weather | 293 | Shower(s) or thunderstorm over mountains |
| 0 | BUFR | 0 20 003 | Present weather | 508 | No significant phenomenon to report, present and past weather omitted |
| 0 | BUFR | 0 20 003 | Present weather | 509 | No observation, data not available, present and past weather omitted |
| 0 | BUFR | 0 20 003 | Present weather | 510 | Present and past weather missing, but expected |
| 0 | BUFR | 0 20 003 | Present weather | 511 | Missing value |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 0 | Still, no wind |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 1 | (5.625 to 16.875 degrees true; 11.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 2 | NNE (16.875 to 28.125 degrees true; 22.5) |

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Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|---------------------------------------|-------|--|
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 3 | (28.125 to 39.375 degrees true; 33.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 4 | NE (39.375 to 50.625 degrees true; 45) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 5 | (50.625 to 61.875 degrees true; 56.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 6 | ENE (61.875 to 73.125 degrees true; 67.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 7 | (73.125 to 84.375 degrees true; 78.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 8 | E (84.375 to 95.625 degrees true; 90) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 9 | (95.625 to 106.875 degrees true; 101.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 10 | ESE (106.875 to 118.125 degrees true; 112.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 11 | (118.125 to 129.375 degrees true; 123.75) |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|---------------------------------------|-------|--|
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 12 | SE (129.375 to 140.625 degrees true; 135) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 13 | (140.625 to 151.875 degrees true; 146.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 14 | SSE (151.875 to 163.125 degrees true; 157.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 15 | (163.125 to 174.375 degrees true; 168.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 16 | S (174.375 to 185.625 degrees true; 180) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 17 | (185.625 to 196.875 degrees true; 191.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 18 | SSW (196.875 to 208.125 degrees true; 202.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 19 | (208.125 to 219.375 degrees true; 213.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 20 | SW (219.375 to 230.625 degrees true; 225) |

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Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|---------------------------------------|-------|--|
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 21 | (230.625 to 241.875 degrees true; 236.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 22 | WSW (241.875 to 253.125 degrees true; 247.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 23 | (253.125 to 264.375 degrees true; 258.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 24 | W (264.375 to 275.625 degrees true; 270) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 25 | (275.625 to 286.875 degrees true; 281.25) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 26 | WNW (286.875 to 298.125 degrees true; 292.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 27 | (298.125 to 309.375 degrees true; 303.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 28 | NW (309.375 to 320.625 degrees true; 315) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 29 | (320.625 to 331.875 degrees true; 326.25) |

Continued on next page



Table 127 observation_code_table (cont.)

| code_table | code_table_scheme | code_table_id | code_table_name | value | description |
|------------|-------------------|---------------|---------------------------------------|-------|--|
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 30 | NNW (331.875 to 343.125 degrees true; 337.5) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 31 | (343.125 to 354.375 degrees true; 348.75) |
| 1 | GLAMOD | wind32 | Wind direction using 32 point compass | 32 | N (354.375 to 365.625 degrees true; 360) |
| | | | | | End of table |



Table 128: observation_value_significance codes

| significance | description |
|---------------------|--|
| 0 | Maximum value over indicated period |
| 1 | Minimum value over indicated period |
| 2 | Mean value over indicated period |
| 3 | Median value over indicated period |
| 4 | Modal value over indicated period |
| 5 | Mean absolute error over indicated period |
| 6 | Best estimate of standard deviation (N-1) of observed parameter over indicated period |
| 7 | Standard deviation (N) of observed parameter over indicated period |
| 8 | Harmonic mean of observed parameter over indicated period |
| 9 | Root mean square vector error of observed parameter over indicated period |
| 10 | root mean square of observed parameter over indicated period |
| 11 | Vector mean of observed parameter over indicated period |
| 12 | Instantaneous value of observed parameter |
| 13 | Accumulation over specified period |
| 14 | Not applicable |
| 15 | Daytime ensemble mean |
| 16 | Nighttime ensemble mean |
| 100 | Maximum difference between observed and reference (obs - ref) values over indicated period |
| 101 | Minimum difference between observed and reference (obs - ref) values over indicated period |
| 102 | Mean difference between observed and reference (obs - ref) values over indicated period |
| 103 | Median difference between observed and reference (obs - ref) values over indicated period |
| 104 | Modal difference between observed and reference (obs - ref) values over indicated period |

Continued on next page



Table 128 observation_value_significance (cont.)

| significance | description |
|---------------------|--|
| 105 | Mean absolute error of differences between observed and reference (obs - ref) values over indicated period |
| 106 | Best estimate of standard deviation (N-1) of differences between observed and reference (obs - ref) values over indicated period |
| 107 | Standard deviation (N) of differences between observed and reference (obs - ref) values over indicated period |
| 108 | Harmonic mean of differences between observed and reference (obs - ref) values over indicated period |
| 109 | Root mean square vector error of differences between observed and reference (obs - ref) values over indicated period |
| 110 | root mean square of differences between observed and reference (obs - ref) values over indicated period |
| 111 | Vector mean of differences between observed and reference (obs - ref) values over indicated period |
| 112 | Instantaneous difference between observed and reference (obs - ref) value |
| 113 | Accumulated difference between observed and reference (obs - ref) values over specified period |
| 115 | Daytime ensemble mean difference between observed and reference (obs - ref) values |
| 116 | Nighttime ensemble mean difference between observed and reference (obs - ref) values |

End of table



Table 129: observations_fields codes

| field_id | field_name | kind | description |
|----------|--------------------------------------|------|---|
| 1 | geometric pressure offset correction | 2 | "Yes" if the correction was applied. |
| 2 | pressure sensor offset | 2 | Offset value applied (Pa). |
| 3 | ozone reference number | 2 | Identifier number for the ozonesonde. |
| 4 | KI solution content | 2 | Details of the KI solution content. |
| 5 | preflight summary solution volume | 2 | Volume of cathode solution (cm3 or cc). |
| 6 | cathode soln volume correction | 2 | "Yes" if the correction was applied. |
| 7 | preflight summary pump flow rate | 2 | The pump flow rate (ml/sec), measured during the conditioning procedures, is approx. constant up to 100 hPa and decreases steadily to the top of the atmosphere due to instrumental degradation at low pressures. |
| 8 | flowrate correction | 2 | Flowrate correction in (|
| 9 | pump temperature correction | 2 | "Yes" if the pump temperature correction was applied. |
| 10 | sampling method type ozone free air | 2 | The background current (A) is the residual current measured by the sonde when sampling ozone-free air. |
| 11 | applied pump efficiency factors | 2 | Reference for the applied pump efficiency factors. |
| 12 | conversion transfer function | 2 | Transfer function used to convert measurements made with any of the various combinations to one of the two WMO recommended standard preparations (1.0 for SP and 0.5 |
| 13 | sample temperature | 2 | Measured ozonesonde pump temperature in degrees Celsius (C). |
| 14 | sonde current | 2 | Measured ozonesonde cell current (A). |

Continued on next page



Table 129 observations_fields (cont.)

| field_id | field_name | kind | description |
|----------|--------------------|------|--|
| 15 | pump motor current | 2 | Electrical current (mA) measured through the pump motor. |
| 16 | pump motor voltage | 2 | Applied voltage (V) measured across the pump motor. |
| 17 | wl code | 2 | WCode to designate the wavelength pair(s) used for total ozone measurement. |
| 18 | obs code | 2 | Code to designate the type of total ozone measurement. |
| 19 | m mu | 2 | The harmonic mean of the relative slant path through the ozone layer at 22Km for each of the observations used to compute the daily value. |

End of table

Table 130: observed_variable codes

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|--------|------------|----------------------------------|--------------------|---|
| 0 | aerosols | | | aerosol absorption optical depth | Dimensionless | Vertical column integral of spectral aerosol absorption coefficient: $AAOD = \exp(-K \cdot Dz)$ where K is the absorption coefficient [km ⁻¹] and Dz the vertical path [km] |
| 1 | aerosols | | | aerosol column burden | g m ⁻² | 2D field of the column burden of condensed particles in the atmosphere |
| 2 | aerosols | | | aerosol dust concentration | g kg ⁻¹ | 3-D field of concentration of dust or sand in the atmosphere |

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Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|--------|------------|-------------------------------------|---------------------------|--|
| 3 | aerosols | | | aerosol effective radius | micro m | 3D field of mean aerosol particle size, defined as the ratio of the third and second moments of the number size distribution of aerosol particles. Requested in the troposphere (assumed height: 12 km) and as columnar average. |
| 4 | aerosols | | | aerosol extinction coefficient | m-1 | 3D field of spectral volumetric extinction cross-section of aerosol particles. |
| 5 | aerosols | | | aerosol mass mixing ratio | g kg-1 | 3D field of the mass mixing ratio of condensed particles in the atmosphere |
| 6 | aerosols | | | aerosol optical depth | Dimensionless | The AOD is the effective depth of the aerosol column from the viewpoint of radiation propagation: Vertical column integral of spectral aerosol extinction coefficient $AOD = \exp(-K \cdot Dz)$ where K is the extinction coefficient [km^{-1}] and Dz the vertical path [km] |
| 7 | aerosols | | | aerosol species mole fraction | moles per mole of dry air | 3D field of the mole fraction of condensed-phase chemical species (e.g., sulfate, nitrate, ammonium, elemental carbon, organic carbon), in the atmosphere |
| 8 | aerosols | | | aerosol species total column burden | moles m^{-2} | 2D field of the total column burden concentration of condensed-phase chemical species (e.g., sulfate, nitrate, ammonium, elemental carbon, organic carbon), in the atmosphere |

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Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|--------|------------|------------------------------------|---------|---|
| 9 | aerosols | | | aerosol type | coded | Selection, out of a pre-defined set of aerosol classes, that best fits an input data set (observed or modeled). The pre-defined set of aerosol classes includes specification of the particle composition, mixing state, complex refractive index, and shape as a function of particle size. The definition of aerosol type includes specification of all the classes as well as the algorithm used to choose the best fit to the input data. |
| 10 | aerosols | | | aerosol vol-canic ash | g kg-1 | 3D field of mass mixing ratio of volcanic ash |
| 11 | aerosols | | | total column aerosol vol-canic ash | g m-2 | Field of total column mass of volcanic ash |
| 12 | aerosols | | | air conductivity | km | TBD |
| 13 | albedo | | | blue ice and snow albedo | percent | TBD |
| 14 | albedo | | | blue ice bidirectional reflectance | sr-1 | TBD |
| 15 | albedo | | | clean glacier ice albedo | percent | TBD |
| 16 | albedo | | | dirty glacier ice albedo | percent | TBD |
| 17 | albedo | | | earth surface albedo | percent | Hemispherically integrated reflectance of the Earth surface in the range 0.4 - 0.7 micro-m |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|------------|--------------------------------|-----------------|---|
| 18 | albedo | | | snow bidirectional reflectance | sr-1 | TBD |
| 19 | cloud | atmospheric | upper-air | cloud base height | m | cloud base height (hb) |
| 20 | cloud | atmospheric | upper-air | cloud base lowest height | coded | Height above surface of the base of the lowest cloud seen (coded 0-9) |
| 21 | cloud | atmospheric | upper-air | cloud cover | Okta or percent | 3D field of fraction of sky filled by clouds. |
| 22 | cloud | atmospheric | upper-air | cloud genus | Coded | Genus of cloud (0 - Cirrus to 9 - Cumulo-Nimbus) |
| 23 | cloud | atmospheric | upper-air | cloud genus base height | Coded or m | Height of base of cloud whose genus is c |
| 24 | cloud | atmospheric | upper-air | high cloud type | coded | type of high clouds (ch) |
| 25 | cloud | atmospheric | upper-air | low cloud type | coded | type of low clouds (cl) |
| 26 | cloud | atmospheric | upper-air | lowest cloud amount | Okta | low or (if low clouds don't exist) middle cloud amount |
| 27 | cloud | atmospheric | upper-air | middle cloud type | coded | type of middle clouds (cm) |
| 28 | cloud | atmospheric | upper-air | total cloud amount | Okta | total amount of clouds |
| 29 | evaporation | atmospheric | | evaporation | mm | TBD |
| 30 | evaporation | atmospheric | | evaporation | kg m-2 s-1 | TBD |
| 31 | evaporation | atmospheric | | potential evapotranspiration | mm day-1 | Quantity of water evaporated from the soil and plants when the ground is at its natural moisture content. |

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Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|--------------------|--------------------------|----------|--|
| 32 | evaporation | atmospheric | | real evapo-transpiration | mm day-1 | TBD |
| 33 | humidity | atmospheric | | absolute humidity | g m-3 | measure of water vapor (moisture) in the air, regardless of temperature |
| 34 | humidity | atmospheric | surface; upper-air | dew point depression | K | Dew point depression is also called dew point deficit. It is the amount by which the air temperature exceeds its dew point temperature. Dew point temperature is the temperature at which a parcel of air reaches saturation upon being cooled at constant pressure and specific humidity. |
| 36 | humidity | atmospheric | surface; upper-air | dew point temperature | K | Dew point temperature is the temperature at which a parcel of air reaches saturation upon being cooled at constant pressure and specific humidity. |
| 37 | humidity | atmospheric | surface; upper-air | ice bulb temperature | K | TBD |
| 38 | humidity | atmospheric | surface; upper-air | relative humidity | percent | TBD |
| 39 | humidity | atmospheric | surface; upper-air | specific humidity | g kg-1 | specific means per unit mass. Specific humidity is the mass fraction of water vapor in (moist) air. |
| 40 | humidity | atmospheric | | water vapour pressure | hPa | TBD |
| 41 | humidity | atmospheric | surface; upper-air | wet bulb temperature | K | TBD |
| 43 | ice | | | ice thickness | m | Thickness of the ice sheet. It is related to sea-ice elevation and ice density |

Continued on next page



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|-------------|------------|---------------------------------------|-----------------------------------|--|
| 44 | precipitation | atmospheric | | accumulated precipitation | mm | accumulated precipitation over specified period |
| 45 | precipitation | atmospheric | | fresh snow | mm | TBD |
| 46 | precipitation | atmospheric | | hydrometeor type | Code table | 3D field of the predominant form of condensed water in a volume of free atmosphere, including liquid cloud, rain, ice crystals, snow, graupel and hail. (This variable replaces "precipitation type"). |
| 47 | precipitation | atmospheric | | precipitation | g m ⁻² s ⁻¹ | Precipitation (liquid or solid) |
| 48 | precipitation | atmospheric | | precipitation intensity liquid | mm h ⁻¹ | Precipitation intensity at sur- face (liquid or solid) |
| 49 | precipitation | atmospheric | | precipitation intensity solid | mm h ⁻¹ | Precipitation intensity at surface (solid) |
| 50 | precipitation | atmospheric | | precipitation type | coded | Liquid, snow, hail, fog |
| 51 | precipitation | atmospheric | | rainy days | Days | TBD |
| 52 | precipitation | atmospheric | | snow cover | percent | Fraction of a given area which is covered by snow |
| 53 | precipitation | atmospheric | | snow depth | cm | Vertical distance from the snow surface to the underlying surface (ground, glacier ice or sea ice). |
| 54 | precipitation | atmospheric | | snow status | coded | Wet or dry |
| 55 | precipitation | atmospheric | | snow water equivalent | mm | Surface snow amount |
| 56 | pressure | atmospheric | surface | adjunct tem- perature barometer | K | temperature of the adjunct thermometer to the barometer to reduce pressure to 0 degC |

Continued on next page



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|-------------|------------|--|-------|---|
| 57 | pressure | atmospheric | surface | air pressure | Pa | pressure of air column at specified height |
| 58 | pressure | atmospheric | surface | air pressure at sea level | Pa | sea level means mean sea level, which is close to the geoid in sea areas. Air pressure at sea level is the quantity often abbreviated as MSLP or PMSL. |
| 59 | pressure | atmospheric | surface | pressure ten- dency | Pa | pressure tendency |
| 60 | pressure | atmospheric | surface | pressure ten- dency char- acteristics | coded | characteristic of pressure tendency (used in synoptic maps) |
| 61 | radiation | atmospheric | | diffuse ra- diation | W m-2 | TBD |
| 62 | radiation | atmospheric | | downward longwave ir- radiance at earth surface | W m-2 | Flux density of radiation emitted by the gases, aerosols and clouds of the atmosphere to the Earth's surface |
| 63 | radiation | atmospheric | | downward shortwave irradiance at earth surface | W m-2 | Flux density of the solar radia- tion at the Earth surface |
| 64 | radiation | atmospheric | | downward shortwave irradiance at toa | W m-2 | Flux density of the solar radiation at the top of the atmosphere |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|------------|---|---------|--|
| 65 | radiation | atmospheric | | earth surface shortwave bidirectional reflectance | percent | Reflectance of the Earth surface as a function of the viewing angle and the illumination angle in the range 0.4-0.7 micro m . The distribution of this variable is represented by the Bidirectional Reflectance Distribution Function (BRDF) |
| 66 | radiation | atmospheric | | fraction of absorbed par | percent | Fraction of PAR absorbed by vegetation (land or marine) for photosynthesis processes (generally around the 'red') |
| 67 | radiation | atmospheric | | global radiation | W m-2 | TBD |
| 68 | radiation | atmospheric | | longwave earth surface emissivity | percent | TBD |
| 69 | radiation | atmospheric | | longwave radiation | W m-2 | TBD |
| 70 | radiation | atmospheric | | meteorological optical range | m | Meteorological optical range at surface |
| 71 | radiation | atmospheric | | photosynthetically active radiation | W m-2 | Flux of downwelling photons of wavelength 0.4-0.7 micro m |
| 72 | radiation | atmospheric | | shortwave cloud reflectance | percent | Reflectance of the solar radiation from clouds |
| 73 | radiation | atmospheric | | shortwave radiation | W m-2 | TBD |
| 74 | radiation | atmospheric | | solar gamma ray flux | W m-2 | Radiative flux integrated over the gamma-ray domain. |
| 75 | radiation | atmospheric | | solar UV flux | W m-2 | Integrated UV flux over the solar disk. |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|----------------------|--|---|---|
| 76 | radiation | atmospheric | | solar VIS flux | W m ⁻² | Integrated VIS flux over the solar disk |
| 77 | radiation | atmospheric | | solar X ray flux | W m ⁻² | Integrated X-ray flux over the solar disk |
| 78 | radiation | atmospheric | | sunshine duration | h | TBD |
| 79 | radiation | atmospheric | | upward long-wave irradiance at Earth surface | W m ⁻² | Flux density of terrestrial radiation emitted by the Earth surface |
| 80 | radiation | atmospheric | | upward long-wave irradiance at TOA | W m ⁻² | Flux density of terrestrial radiation emitted by the Earth surface and the gases, aerosols and clouds of the atmosphere at the top of the atmosphere |
| 81 | radiation | atmospheric | | upward shortwave irradiance at TOA | W m ⁻² | Flux density of solar radiation, reflected by the Earth surface and atmosphere, emitted to space at the top of the atmosphere |
| 82 | radiation | atmospheric | | upward spectral radiance at TOA | W m ⁻² nm ⁻¹ sr ⁻¹ | Upward radiant power measured at the top of the atmosphere per area unit, per solid angle, and per wavelength interval. Spectral range 0.2-200 micro m. |
| 83 | salinity | oceanic | surface; sub-surface | salinity | psu | ocean salinity (PSU) |
| 85 | temperature | atmospheric | surface; upper-air | air temperature | K | Air temperature is the bulk temperature of the air, not the surface (skin) temperature. |
| 86 | temperature | atmospheric | | daily maximum air temperature | K | TBD |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|----------------------|--|-------|--|
| 87 | temperature | atmospheric | | daily maximum air temperature with direct sun exposure | K | TBD |
| 88 | temperature | atmospheric | | daily maximum grass temperature | K | Grass maximum thermometer is 5 cm above ground |
| 89 | temperature | atmospheric | | daily minimum air temperature | K | TBD |
| 90 | temperature | atmospheric | | daily minimum air temperature with direct sun exposure | K | TBD |
| 91 | temperature | atmospheric | | daily minimum grass temperature | K | Grass minimum thermometer is 5 cm above ground |
| 92 | temperature | atmospheric | | days with ground frost | Days | TBD |
| 93 | temperature | atmospheric | | snow temperature | K | TBD |
| 94 | temperature | atmospheric | | soil temperature | K | Lot 1 is using Ts - WMO abbrev. |
| 95 | temperature | oceanic | surface; sub-surface | water temperature | K | Water (sea, river, lake) temperature at depth indicated |
| 96 | visibility | atmospheric | surface | horizontal visibility in air | m | The visibility is the distance at which something can be seen. |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|--------------------|-------------------------------|------------------------|---|
| 97 | weather | | | lightning detection | deg (lat, lon) and UTC | Detection of the time and location (latitude, longitude) of lightning events. Accuracy expressed in terms of Hit Rate and False Alarm Rate, which requires predetermination of a specific distance and time tolerance . |
| 98 | weather | | | lightning duration | s | TBD |
| 99 | weather | | | lightning horizontal distance | Km | TBD |
| 100 | weather | atmospheric | surface | past weather 1 | coded | past weather 1 - most extreme phenomenon (w) |
| 101 | weather | atmospheric | surface | past weather 2 | coded | past weather 2 - most frequent phenomenon (used in synoptic maps) |
| 102 | weather | atmospheric | surface | present weather | coded | present weather (ww) |
| 103 | weather | | | Total lightning density | Dimensionless | Total number of detected flashes in the corresponding time interval and the space unit. The space unit (grid box) should be equal to the horizontal resolution and the accumulation time to the observing cycle |
| 104 | wind | atmospheric | surface; upper-air | eastward wind speed | m s-1 | Eastward indicates a vector component which is positive when directed eastward (negative westward). Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.) |

Continued on next page



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|-------------|-----------------------|-------------------------|--------|---|
| 105 | wind | atmospheric | surface; upper-air | northward wind speed | m s-1 | Northward indicates a vector component which is positive when directed northward (negative southward). Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.) |
| 106 | wind | atmospheric | surface; upper-air | wind from direction | degree | direction from which the wind is blowing Lot 1 uses dd - WMO abbrev. |
| 107 | wind | atmospheric | surface; upper-air | wind speed | m s-1 | Speed is the magnitude of velocity. Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.) The wind speed is the magnitude of the wind velocity. Lot 1 uses ff - WMO abbrev. |

Continued on next page



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|------------------------|---------------------|-------------|------------|--|--------|---|
| 108 | wind | atmospheric | surface | wind speed of gust | m s-1 | Speed is the magnitude of velocity. Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.) The wind speed is the magnitude of the wind velocity. A gust is a sudden brief period of high wind speed. In an observed timeseries of wind speed, the gust wind speed can be indicated by a cell methods of maximum for the time-interval. In an atmospheric model which has a parametrised calculation of gustiness, the gust wind speed may be separately diagnosed from the wind speed. Lot 1 uses fx - WMO abbrev. |
| 109 | wind | atmospheric | | wind speed max | m s-1 | Maximum observed wind speed over specified period Lot 1 uses fm - WMO abbrev. |
| 110 | | | | turbulence | J m-3 | TBD |
| 111 | | | | precipitable water column | kg m-2 | TBD |
| 112 | | | | tropopause height | m | TBD |
| 113 | | | | tropopause temperature | K | TBD |
| 114 | | | | tropopause pressure | Pa | TBD |
| 115 | | | | tropopause potential temperature | K | TBD |
| Continued on next page | | | | | | |



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|-------------|-------------------------|---|------------|---|
| 116 | | | | frost point temperature | K | TBD |
| 117 | pressure | atmospheric | surface; up- per air | geopotential height | m | height of a standard or significant pressure level in meters |
| 118 | pressure | atmospheric | surface; up- per air | geopotential height de- cameters | decametres | height of a standard or significant pressure level in decameters |
| 119 | temperature | atmospheric | surface; up- per air | vertical gra- dient of tem- perature | K m-1 | vertical variation of temperature |
| 120 | temperature | atmospheric | surface; up- per air | vertical gra- dient of po- tential tem- perature | K m-1 | vertical variation of potential temperature |
| 121 | temperature | atmospheric | surface; up- per air | equivalent potential temperature | K | temperature a parcel of air would reach if all the water vapor in the parcel were to condense, releasing its latent heat, and the parcel was brought adiabatically to a standard reference pressure, usually 1000 hPa |
| 122 | wind | atmospheric | surface; up- per air | vertical speed of ra- diosonde | m s-1 | vertical speed of radiosonde ascent |
| 123 | humidity | atmospheric | upper air | water vapour mixing ratio | mol mol-1 | Volume mixing ratio (mol/mol) of water vapor calculated using Hyland, R. W. and A. Wexler, Formulations for the Thermodynamic Properties of the saturated Phases of H2O from 173.15K to 473.15K, ASHRAE Trans, 89(2A), 500-519, 1983 |

Continued on next page



Table 130 observed_variable (cont.)

| variable | parameter_group | domain | sub_domain | name | units | description |
|----------|-----------------|-------------|--------------------|---|-------------------|---|
| 124 | humidity | atmospheric | upper air | air relative humidity effective vertical resolution | s | Resolution (defined by 1 / cut off frequency) of the relative humidity in terms of time |
| 125 | pressure | atmospheric | upper-air | altitude | m | Altitude |
| 126 | temperature | atmospheric | surface; upper air | air temperature | K | Air temperature (from profile measurement) |
| 137 | humidity | atmospheric | surface; upper air | air dewpoint | K | Dewpoint measurement (from profile measurement) |
| 138 | humidity | atmospheric | surface; upper air | relative humidity | 1 | Relative humidity (from profile measurement) |
| 139 | wind | atmospheric | surface; upper air | eastward wind speed | m s ⁻¹ | Eastward wind speed (from profile measurement) |
| 140 | wind | atmospheric | surface; upper air | northward wind speed | m s ⁻¹ | Northward wind speed (from profile measurement) |
| 141 | radiation | atmospheric | surface; upper air | Solar zenith angle | degrees | solar zenith angle |
| 142 | pressure | atmospheric | upper air | pressure | Pa | pressure |
| 143 | | | | time since launch | s | Time since launch of radiosonde |
| 144 | | atmospheric | upper-air | monthly total ozone column | DU | Monthly value of total column ozone amount |
| 145 | | atmospheric | upper-air | monthly standard deviation ozone | | Standard deviation of daily total column ozone |

Continued on next page



Table 130 observed_variable (cont.)

| variable | paramete r_group | domain | sub_domain | name | units | description |
|----------|---------------------|-------------|------------|--|-------|---|
| 146 | | | | monthly total ozone col- umn number of points | count | The number of points (typically this is the number of daily averages) used to estimate the monthly mean ozone value |
| 147 | | atmospheric | upper-air | standard de- viation ozone | | Estimated population standard deviation of the total column ozone measurements used for the daily value. |
| 148 | | | | number of points | | Number of observations used to calculate the total column ozone value |
| 149 | | atmospheric | upper-air | column sul- phur dioxide | DU | The daily total column sulphur dioxide (SO ₂) amount calculated as the mean of the individual SO ₂ amounts |
| 150 | | atmospheric | upper-air | ozone partial pressure | Pa | Level partial pressure of ozone in milli-Pascals (mPa) |
| 151 | | atmospheric | upper-air | ozone con- centration | ppmv | Level mixing ratio of ozone in ppmv |
| 152 | | atmospheric | upper-air | total ozone column | DU | Ozone (DU) integrated up to the current altitude level |
| 153 | | atmospheric | upper-air | flight sum- mary inte- grated O ₃ | DU | Ozone amount integrated over the whole balloon profile. |
| 154 | | | | sampling method burst ozone pressure | Pa | Atmospheric pressure when balloon burst in hPa. |
| | | | | | | End of table |



Table 131: observing_frequency codes

| frequency | description |
|-----------|--|
| 0 | One observation per day (24 hour intervals). |
| 1 | Two observations per day (12 hour intervals). |
| 2 | Four observations per day (6 hour intervals). |
| 3 | Eight observations per day (3 hour intervals). |
| 4 | Hourly observations. |
| 5 | Irregular observations. |

End of table

Table 132: observing_method codes

| method | description |
|--------|-------------|
| 0 | Measured |
| 1 | Estimated |
| 2 | Computed |

End of table

Table 133: observing_programme codes

| observing_programme | abbreviation | description | sponsor |
|---------------------|--------------|--|---------|
| 1 | AMDAR | Global Aircraft Meteorological Data Relay | WMO/GOS |
| 2 | EPA | Environmental Protection Agency | NA |
| 3 | EUMETNET | Grouping of European National Meteorological Services | WMO/GOS |
| 4 | WMO/GAW | World Meteorological Organization/Global Atmospheric Watch | NA |
| 5 | GCOS | Global Climate Observing System | NA |
| 6 | GCW | Global Cryosphere Watch | NA |

Continued on next page



Table 133 observing_programme (cont.)

| observing_programme | abbreviation | description | sponsor |
|----------------------------|---------------------|--|------------------|
| 7 | GOOS | Global Ocean Observing System | NA |
| 8 | IPA | International Permafrost Association | NA |
| 9 | JCOMM | Joint Technical Commission for Oceanography and Marine Meteorology | WMO/GOS |
| 10 | WMO/GOS | World Meteorological Organization/Global Observing System | NA |
| 11 | GTOS | Global Terrestrial Observing System | NA |
| 12 | IAGOS | In-service Aircraft for a Global Observing System | NA |
| 13 | WHYCOS | World Hydrological Cycle Observing System | NA |
| 14 | WMO/CLW | World Meteorological Office/Climate and Water Department | NA |
| 15 | ADNET | Asian dust and aerosol lidar observation network | GALION ; WMO/GAW |
| 16 | Aeronet | AEROSOL ROBOTIC NETWORK | NASA? |
| 17 | ANTON | Antarctic Observing Network | WMO/GOS |
| 18 | ASAP | Automated Ship-board Aerological Program | WMO/GOS |
| 19 | BSRN | Baseline Surface Radiation Network | WMO/GAW & GCOS |

Continued on next page



Table 133 observing_programme (cont.)

| observing_programme | abbreviation | description | sponsor |
|----------------------------|---------------------|--|-----------------------------------|
| 20 | CASTNET | Clean Air Status and Trends Network | (National - USA) |
| 21 | CIS-LiNet | Lidar network for monitoring atmosphere over CIS regions | GALION ; WMO/GAW |
| 22 | CLN | CREST Lidar Network | GALION ; WMO/GAW |
| 23 | DART | Deep-ocean Assessment and Reporting of Tsunamis | NOAA Centre for Tsunamis Research |
| 24 | E-AMDAR | European - Aircraft Meteorological Data Relay | EUMETNET ; WMO/GOS |
| 25 | E-ASAP | European - Automated Ship-board Aerological Program | EUMETNET ; WMO/GOS |
| 26 | E-GVAP | European - GNSS water vapour programme | EUMETNET ; WMO/GOS |
| 27 | E-PROFILE | European - wind profiles from radar | EUMETNET ; WMO/GOS |
| 28 | E-SURFMAR | European - Surface Marine Operational Service | EUMETNET ; WMO/GOS |
| 29 | EARLINET | European Aerosol Research Lidar Network | GALION ; WMO/GAW |
| 30 | GALION | GAW Aerosol Lidar Observation Network | WMO/GAW |
| 31 | GAW-PFR | GAW-Precision Filter Radiometers | WMO/GAW |
| 32 | German AOD Network | German Aerosol Optical Depth Network | WMO/GAW |

Continued on next page



Table 133 observing_programme (cont.)

| observing_programme | abbreviation | description | sponsor |
|----------------------------|---------------------|---|-----------------------|
| 33 | GLOSS | Global Sea Level Observing System | JCOMM ; WMO/GOS |
| 34 | GRUAN | GCOS Reference Upper Air Network | GCOS |
| 35 | GSN | GCOS Surface Network | GCOS |
| 36 | GTN-G | Global Terrestrial Network - Glaciers | GCOS |
| 37 | GTN-H | Global Terrestrial Network - Hydrology | WMO/CLW ; GCOS ; GTOS |
| 38 | GTN-P | Global Terrestrial Network - Permafrost | IPA ; GCOS ; GTOS |
| 39 | GUAN | GCOS Upper Air Network | GCOS |
| 40 | IAGOS-MOZAIC | Measurement of Ozone and Water Vapour on Airbus in-service Aircraft | IAGOS |
| 41 | LALINET | Latin America Lidar Network | GALION; WMO/GAW |
| 42 | MPLNET | Micro Pulse Lidar Network | GALION; WMO/GAW |
| 43 | NDACC | Network for the Detection of Atmospheric Composition Change | GALION; WMO/GAW |
| 44 | OPERA | European Weather Radar Project | EUMETNET; (WMO/GOS) |
| 45 | PIRATA | Prediction and Research Moored Array in the Atlantic | GOOS; WMO/GOS |
| 46 | PolarAOD | Polar Aerosol Optical Depth Measurement Network Project | WMO/GAW |

Continued on next page



Table 133 observing_programme (cont.)

| observing_pr ogramme | abbreviation | description | sponsor |
|---------------------------------|---------------------|---|------------------|
| 47 | RAMA | Research Moored Array for African- Asian-Australian Monsoon Analysis and Prediction | NOAA |
| 48 | RBCN | Regional Basic Climatological Network | WMO/GOS |
| 49 | RBON | Regional Basic Ob- serving Network | WMO/GOS |
| 50 | RBSN | Regional Basic Synoptic Network | WMO/GOS |
| 51 | TAO | Tropical At- mosphere and Ocean Array | NOAA; GCOS |
| 52 | SKYNET | Aerosol -cloud- radiation interac- tion in the atmo- sphere project | WMO/GAW |
| 53 | SibRad | NA | WMO/GAW |
| 54 | SOOP | Ship of Op- portunity | JCOMM ; WMO/GOS |
| 55 | U.S. IOOS | United States In- tegrated Ocean Observing System | (National - USA) |
| 56 | VOS | Voluntary Ob- serving Fleet | JCOMM ; WMO/GOS |
| 57 | VOSCLIM | Voluntary Observ- ing Fleet (VOS) Climate Project | JCOMM ; WMO/GOS |
| 58 | WRAP | Worldwide Recur- ring ASAP Project | JCOMM ; WMO/GOS |

End of table

Table 134: platform_sub_type codes

| sub_type | platform_type | abbreviation | description |
|-----------------|----------------------|---------------------|--------------------|
| 0 | 2 | BA | Barge |
| 1 | 2 | BC | Bulk Carrier |

Continued on next page



Table 134 platform_sub_type (cont.)

| sub_type | platform_type | abbreviation | description |
|----------|---------------|--------------|---|
| 2 | 2 | CA | Cable ship |
| 3 | 2 | CG | Coast Guard Ship |
| 4 | 2 | CS | Container Ship |
| 5 | 2 | DR | Dredger |
| 6 | 2 | FE | Passenger ferries |
| 7 | 2 | FP | Floating production and storage units |
| 8 | 2 | FV | Other Fishing Vessel |
| 9 | 2 | GC | General Cargo |
| 10 | 2 | GT | Gas Tanker |
| 11 | 2 | IC | Icebreaking vessel |
| 12 | 2 | IF | Inshore Fishing Vessel |
| 13 | 2 | LC | Livestock carrier |
| 14 | 2 | LT | Liquid Tanker |
| 15 | 2 | LV | Light Vessel |
| 16 | 2 | MI | Mobile installation including mobile offshore drill ships, jack-up rigs and semi-submersibles |
| 17 | 2 | MS | Military Ship |
| 18 | 2 | OT | Other |
| 19 | 2 | MW | Ocean Weather Ship |
| 20 | 2 | PI | Pipe layer |
| 21 | 2 | PS | Passenger ships and cruise liners |
| 22 | 2 | RF | Ro/Ro Ferry |
| 23 | 2 | RR | Ro/Ro Cargo |
| 24 | 2 | RS | Refrigerated cargo ships including banana ships |
| 25 | 2 | RV | Research Vessel |
| 26 | 2 | SA | Large sailing vessels |
| 27 | 2 | SV | Support Vessel |
| 28 | 2 | TR | Trawler |
| 29 | 2 | TU | Tug |
| 30 | 2 | VC | Vehicle carriers |
| 31 | 2 | YA | Yacht / Pleasure Craft |
| 32 | 2 | HP | Hospital ship |
| 33 | 2 | MD | MARID (U.K. Fisheries) |
| 34 | 2 | RC | North sea traders |
| 35 | 2 | TS | Training ship |
| 36 | 2 | WH | Whaler |
| 63 | 0 | | Synoptic network |
| 64 | 7 | | Local Network |

Continued on next page



Table 134 platform_sub_type (cont.)

| sub_type | platform_type | abbreviation | description |
|----------|---------------|--------------|--|
| 65 | 2 | | Ocean Weather Ship (on station) |
| 66 | 2 | | Ocean Weather Ship (off station) |
| 67 | 43 | | Other |
| 68 | 43 | | Coastal-Marine Automated Network (C-MAN) (NDBC operated) |
| 69 | 5 | | Unspecified drifting buoy |
| 70 | 5 | | Standard Lagrangian drifter (Global Drifter Programme) |
| 71 | 5 | | Standard FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| 72 | 5 | | Wind measuring FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy) |
| 73 | 6 | | Ice drifter |
| 74 | 5 | | SVPG Standard Lagrangian drifter with GPS |
| 75 | 5 | | SVP-HR drifter with high-resolution temperature or thermistor string |
| 76 | 37 | | Unspecified subsurface float |
| 77 | 36 | | SOFAR |
| 78 | 36 | | ALACE |
| 79 | 36 | | MARVOR |
| 80 | 36 | | RAFOS |
| 81 | 36 | | PROVOR |
| 82 | 36 | | SOLO |
| 83 | 36 | | APEX |
| 84 | 4 | | Unspecified moored buoy |
| 85 | 4 | | Nomad |
| 86 | 4 | | 3-metre discus |
| 87 | 4 | | 10-12-metre discus |
| 88 | 4 | | ODAS 30 series |
| 89 | 4 | | ATLAS (e.g. TAO area) |
| 90 | 4 | | TRITON buoy |
| 91 | 4 | | FLEX mooring (e.g. TIP area) |
| 92 | 4 | | Omnidirectional waverider |
| 93 | 4 | | Directional waverider |
| 94 | 36 | | Subsurface ARGO float |
| 95 | 36 | | PALACE |
| 96 | 36 | | NEMO |
| 97 | 36 | | NINJA |
| 98 | 6 | | Ice buoy/float (POPS or ITP) |

Continued on next page



Table 134 platform_sub_type (cont.)

| sub_type | platform_type | abbreviation | description |
|----------|---------------|--------------|--|
| 99 | 4 | | Mooring oceanographic |
| 100 | 4 | | Mooring meteorological |
| 101 | 4 | | Mooring multidisciplinary (OceanSITES) |
| 102 | 4 | | Mooring tide gauge or tsunami buoy |
| 103 | 6 | | Ice beacon |
| 104 | 6 | | Ice mass balance buoy |
| 105 | 2 | | Bark or barque |
| 106 | 2 | | Barkentine or barquentine |
| 107 | 2 | | Brigantine |
| 108 | 2 | | Schooner |
| 109 | 2 | | Frigate |
| 110 | 2 | | Brig |
| 111 | 2 | | Corvet |
| 112 | 2 | | Cutter |
| 113 | 2 | | Dispatch boat |
| 114 | 2 | | East Indiaman |
| 115 | 2 | | Fluyt |
| 116 | 2 | | Packetship |
| 117 | 2 | | Sloop |
| 118 | 2 | | Snauw |
| 119 | 2 | | Steam frigate |
| 120 | 2 | | Steam ship |
| 121 | 2 | | Store ship |
| 122 | 2 | | Transport ship |
| 123 | 2 | | Troop ship |
| 124 | 2 | | 2nd rate UK naval ship |
| 125 | 2 | | 3rd rate UK naval ship |
| 126 | 2 | | 4th rate UK naval ship |
| 127 | 2 | | 5th rate UK naval ship |
| 128 | 2 | | 6th rate UK naval ship |
| 129 | 2 | | 7th rate UK naval ship |
| 130 | 2 | | 8th rate UK naval ship |
| 131 | 2 | | Ship of the line |
| 132 | 2 | | Balandra (Canaries) / trawler |
| 133 | 2 | | Falucho |
| 134 | 2 | | Galley |
| 135 | 2 | | Hoeker |
| 136 | 2 | | Mistico |
| 137 | 2 | | Pink |
| 138 | 2 | | Polacca |

Continued on next page



Table 134 platform_sub_type (cont.)

| sub_type | platform_type | abbreviation | description |
|----------|---------------|--------------|------------------------------|
| 139 | 2 | | Whaler (18th/ 19th century) |
| 140 | 2 | | Dutch warship (18th century) |
| 141 | 2 | | Scow (Gabarre) |
| 142 | 2 | | Clipper |
| 143 | 2 | | Pilot boat |

End of table

Table 135: platform_type codes

| type | description |
|------|---|
| 0 | Land station (synoptic network) |
| 1 | Shallow water station (fixed to sea / lake floor) |
| 2 | Ship |
| 3 | Rig / platform |
| 4 | Moored buoy |
| 5 | Drifting buoy (of drifter) |
| 6 | Ice buoy |
| 7 | Land station (local network) |
| 8 | Land vehicle |
| 9 | Autonomous marine vehicle |
| 32 | Ice station |
| 33 | Lightship |
| 34 | Mechanical / digital / micro bathythermograph (MBT) |
| 35 | Oceanographic station data (bottle and low resolution CTD / XCTD data) |
| 36 | Profiling float |
| 37 | Subsurface float (moving) |
| 38 | Tide gauge |
| 39 | Underwater platform |
| 40 | Undulating oceanographic recorder |
| 41 | Aircraft |
| 42 | Autonomous pinneped bathythermograph |
| 43 | Coastal / Island |
| 44 | Expendable bathythermograph (XBT) |
| 45 | Glider |
| 46 | High-resolution Conductivity-Temperature-Depth (CTD) / Expendable CTD(XCTD) |

End of table



Table 136: processing_code codes

| index | processing_code | abbreviation | description |
|-------|---------------------|--------------|---|
| 1 | non_pressure_levels | | is the data source code for non-pressure levels in the sounding. These include levels whose vertical coordinate is only identified by height as well as surface levels without either pressure or height. |
| 2 | pressure_levels | | is the data source code for pressure levels in the sounding |

End of table

Table 137: processing_level codes

| level | name | description |
|-------|----------|--|
| 0 | Unknown | NA |
| 1 | Raw | NA |
| 2 | Level 0 | Analogue/digital electric signals |
| 3 | Level I | Level I data (Primary Data): in general, are instrument readings expressed in appropriate physical units, and referred to Earth geographical coordinates. They require conversion to the normal meteorological variables (identified in Part I, Chapter 1). Level I data themselves are in many cases obtained from the processing of electrical signals such as voltages, referred to as raw data. Examples of these data are satellite radiances and water-vapour pressure, positions of constant-level balloons, etc. but not raw telemetry signals. Level I data still require conversion to the meteorological parameters specified in the data requirements. |
| 4 | Level II | Level II Data (Meteorological parameters). They may be obtained directly from many kinds of simple instruments, or derived from Level I data. For example, a sensor cannot measure visibility, which is a Level II quantity; instead, sensors measure the extinction coefficient, which is a Level I quantity. |

Continued on next page



Table 137 processing_level (cont.)

| level | name | description |
|-------|-----------|---|
| 5 | Level III | Level III (Initial state parameters) are internally consistent data sets, generally in gridpoint form obtained from level II data by applying established initialization procedures. NOTE: Data exchanged internationally are level II or level III data. |
| 6 | Level IV | NA |

End of table

Table 138: product_level codes

| level | description |
|-------|-------------|
| 0 | NA |

End of table

Table 139: product_status codes

| status | description | extended_description |
|--------|-------------|----------------------|
| 0 | NA | NA |

End of table



Table 140: profile_configuration_codes codes

| field_id | field_name | code_value | abbreviation | description | start_date | end_date |
|----------|-----------------|------------|--------------|--|------------|--------------|
| 0 | include descent | 0 | NA | Descent excluded | NA | NA |
| 0 | include descent | 1 | NA | Descent included | NA | NA |
| 1 | processing code | 0 | cc | Calibration correction (of humidity sensors) | NA | NA |
| 1 | processing code | 1 | HRC | Humidity radiation correction | NA | NA |
| 1 | processing code | 2 | or | Outlier removal (remove temperature spikes) | NA | NA |
| 1 | processing code | 3 | pGPS | Combination of pressure and GPS | NA | NA |
| 1 | processing code | 4 | TL | Time-lag correction | NA | NA |
| 1 | processing code | 5 | TRC | Temperature radiation correction | NA | NA |
| | | | | | | End of table |



Table 141: profile_configuration_fields codes

| field_id | field_name | type | description |
|----------|---|------|---|
| 0 | include descent | 0 | See profile_configuration_codes |
| 1 | processing code | 0 | See profile_configuration_codes |
| 2 | unwinder type | 2 | NA |
| 3 | burstpoint altitude | 1 | NA |
| 4 | burstpoint pressure | 1 | NA |
| 5 | filling weight | 1 | NA |
| 6 | gross weight | 1 | NA |
| 7 | payload | 1 | NA |
| 8 | unwinder length | 1 | NA |
| 9 | ascent rate | 1 | Rate of ascent / descent for profile (+ve values indicate ascent, -ve descent)(m/s) |
| B002016 | radiosonde configuration | 0 | See profile_configuration_codes |
| B002003 | type of measuring equipment used | 0 | See profile_configuration_codes |
| B002011 | radiosonde sounding system | 0 | See profile_configuration_codes |
| B002013 | solar and infrared radiation correction | 0 | See profile_configuration_codes |
| B002014 | tracking technique | 0 | See profile_configuration_codes |
| B002015 | radiosonde completeness | 0 | See profile_configuration_codes |
| B002017 | humidity correction algorithm | 0 | See profile_configuration_codes |
| B002066 | radiosonde ground receiving system | 0 | See profile_configuration_codes |
| B002080 | balloon manufacturer | 0 | See profile_configuration_codes |
| B002081 | balloon type | 0 | See profile_configuration_codes |
| B002083 | type of balloon shelter | 0 | See profile_configuration_codes |
| B002084 | type of gas used in balloon | 0 | See profile_configuration_codes |
| B002095 | type of pressure sensor | 0 | See profile_configuration_codes |
| B002191 | geopotential height calculation | 0 | See profile_configuration_codes |

Continued on next page



Table 141 profile_configuration_fields (cont.)

| field_id | field_name | type | description |
|----------|--|------|---------------------------------|
| B003011 | method of depth calculation | 0 | See profile_configuration_codes |
| B022056 | profile direction | 0 | See profile_configuration_codes |
| B022067 | instrument type for water temperature salinity profile | 0 | See profile_configuration_codes |
| B022068 | water temperature profile recorder type | 0 | See profile_configuration_codes |
| B022178 | XBT launcher type | 0 | See profile_configuration_codes |
| B035035 | reason for termination | 0 | See profile_configuration_codes |

End of table

Table 142: profile_type codes

| type | description |
|------|---------------|
| 0 | Atmospheric |
| 1 | Oceanographic |
| 2 | Soil |
| 3 | Snow |

End of table

Table 143: qc_method codes

| method | description | originator | reference | domain | quality_check_type |
|--------|---|----------------|---|--------|----------------------|
| 0 | statistical outliers (threshold proportional to interquartile range) | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | climatic outliers |
| 1 | value exceeds a fixed threshold | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | out of range |
| 2 | consecutive identical values | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | repetition |
| 3 | transcription error in which the same data column (or row) has been keyed twice | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | duplicate columns |
| 4 | date appears more than once (for daily data) | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | duplicate dates |
| 5 | time stamp appears more than once | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | duplicate times |
| 6 | values outside 0-100 for variables bounded to that range (e.g., rh) | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | impossible values |
| 7 | consistency between pair of variables (e.g., Tx>Tn) | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | internal consistency |
| 8 | simple visual check of the time series | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | plot |
| 9 | significant weekly cycle in daily precipitation after a binomial test | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | weekly cycle |

Continued on next page

Table 143 qc_method (cont.)

| method | description | originator | reference | domain | quality_check_type |
|--------|--|----------------|---|--------|----------------------|
| 10 | difference between consecutive days exceeds a fixed threshold (for daily data) | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | temporal coherence |
| 11 | value exceeds thresholds recommended by WMO guidelines | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | wmo gross errors |
| 12 | difference between consecutive observations exceeds thresholds recommended by WMO guidelines | C3S 311a Lot 1 | https://cran.r-project.org/package=dataresqc | land | wmo time consistency |
| | | | | | End of table |



Table 144: quality_flag codes

| flag | description |
|------|---|
| 0 | Passed |
| 1 | Failed |
| 2 | Not checked |
| 3 | Missing |
| 4 | Observed value updated and changed (manual correction) |
| 5 | Observed value updated and changed (automatic correction) |

End of table

Table 145: region codes

| region | WMO_region | description |
|--------|------------|---|
| 0 | NA | Reserved |
| 1 | 1 | Africa |
| 2 | 2 | Asia |
| 3 | 3 | South America |
| 4 | 4 | North America, Central America, Caribbean |
| 5 | 5 | South-West Pacific |
| 6 | 6 | Europe |
| 7 | 7 | Antarctica |

End of table

Table 146: report_processing_codes codes

| code | abbreviation | description |
|------|--------------|-------------|
| 0 | TBD | TBD |

End of table

Table 147: report_processing_level codes

| level | abbreviation | description |
|-------|--------------|-------------|
| 0 | TBD | TBD |

End of table



Table 148: report_type codes

| type | abbreviation | description |
|------|-----------------------|--|
| 0 | Sub daily | Hourly observations |
| 1 | Radiosonde | Radiosonde profile |
| 2 | Monthly | Monthly summary statistics |
| 3 | Daily | Daily summary statistics |
| 4 | METAR | Meteorological aerodrome report |
| 5 | Monthly radiosonde | Monthly radiosonde profile summary |
| 6 | Radiosonde difference | Difference between (quasi-)coincident / multi-rig radiosonde instruments |

End of table

Table 149: role codes

| role | description |
|------|--|
| 0 | author the individual or organization whose name should appear first in the citation for the resource (for names that come after the first use co-author). while it is possible to have an author and principle investigator be the same individual or organization, author is not the same as nor synonymous with principle investigator. applicable mainly to documents, reports, memos, etc. |
| 1 | custodian the individual or organization that has accountability and responsibility for the data and ensures appropriate care and maintenance of the resource. |
| 2 | distributor the organization that is responsible for providing the PARR required access to the data. |
| 3 | originator the name of the individual or organization who is responsible for the data at the point when the data was first created. applicable for data sets that are an aggregation of two or more data sets or if the data set is the first instance of the signal having been converted into data. |
| 4 | owner the individual or organization that has ownership of the resource. |

Continued on next page



Table 149 role (cont.)

| role | description |
|-------------|--|
| 5 | pointOfContact the individual or organization who is responsible for the initial triage of and answering questions related to the resource. |
| 6 | principalInvestigator the individual or individuals who are the lead researchers for a grant (i.e. head of the laboratory, research group leader, etc.). if there are co-principal investigators then this field will repeat for each principle investigator. while it is possible to have a principal investigator and author be the same individual or organization, principal investigator is not the same nor synonymous with author. |
| 7 | processor the name of the individual or organization who has processed the data in a manner such that the resource has been modified. |
| 8 | publisher the individual or organization who prepares and issues the resource. |
| 9 | resourceProvider the individual or organization that supplies or allocates the resource for another entity. |
| 10 | sponsor the individual or organization who is providing sponsorship for the resource. |
| 11 | user the individuals or organizations who are the intended consumers of the resource. |
| 12 | coAuthor the individual(s) or organization(s) who name(s) should appear after the first name in a citation for the resource (use author to denote the first name in the citation). while it is possible to have a co-author and principal investigator/collaborator be the same individual or organization, co-author is no the same as nor synonymous with principle investigator or collaborator |
| 13 | collaborator party who assists with the generation of the resource other than the principal investigator |

Continued on next page



Table 149 role (cont.)

| role | description |
|-------------|--|
| 14 | contributor the individuals or organizations whose contributions deserve recognition in the citation. contributor is mutually exclusive from author, co-author, principal investigator, and collaborator. use ISO MD_Identification credit field to identify individual or organizations that should be given acknowledgement only. |
| 15 | editor the individual who has made a corrective or editorial change to the resource as part of a systematic revision process. |
| 16 | funder the individual or organization which has provided all or part of the finances associated with the resource. |
| 17 | mediator a class of entity that mediates access to the resource and for whom the resource is intended or useful |
| 18 | rightsHolder the individual or organization who has ownership of the legal right to the resource. |
| 19 | stakeholder an individual or organization who has an interest in the resource and/or is affected by or affects the actions of the resource |

End of table

Table 150: sampling_strategy codes

| strategy | name | description |
|-----------------|-------------|---|
| 1 | Continuous | Sampling is done continuously, but not necessarily at regular time intervals. Sampling is integrating, i.e., none of the medium escapes observations. |
| 2 | Discrete | Sampling is done at regular time intervals for certain sampling periods that are smaller than the time interval. Sampling is not integrating, i.e., parts of the medium escape observation. |
| 3 | Event | Sampling is done at irregular time intervals. |

End of table



Table 151: sea_level_datum codes

| datum | description |
|-------|--------------------------------|
| 0 | Earth Gravitational Model 1996 |
| 1 | Baltic height system 1977 |

End of table



Table 152: secondary_variable codes

| variable | variable_name | value | symbol | description |
|----------|--------------------------|-------|--------|--------------------|
| 0 | atmospheric con-stituent | 0 | BrO | Bromine monoxide |
| 0 | atmospheric con-stituent | 1 | C10H16 | 3-Carene |
| 0 | atmospheric con-stituent | 2 | C10H16 | Alpha pinene |
| 0 | atmospheric con-stituent | 3 | C10H16 | Beta pinene |
| 0 | atmospheric con-stituent | 4 | C10H16 | Limonene |
| 0 | atmospheric con-stituent | 5 | C2H2 | Ethyne (Acetylene) |
| 0 | atmospheric con-stituent | 6 | C2H5OH | Ethanol |
| 0 | atmospheric con-stituent | 7 | C2H6 | Propene |
| 0 | atmospheric con-stituent | 8 | C2H6S | Ethanethiol |
| 0 | atmospheric con-stituent | 9 | C3H6O | Acetone |
| 0 | atmospheric con-stituent | 10 | C4H10 | Methylpropane |
| 0 | atmospheric con-stituent | 11 | C4H10 | n-butane |
| 0 | atmospheric con-stituent | 12 | C5H12 | 2-Methylbutane |
| 0 | atmospheric con-stituent | 13 | C5H12 | n-Pentane |

Continued on next page



Table 152 secondary_variable (cont.)

| variable | variable_name | value | symbol | description |
|----------|--------------------------|-------|--------|-------------------|
| 0 | atmospheric con-stituent | 14 | C5H8 | Isoprene |
| 0 | atmospheric con-stituent | 15 | C6H6 | Benzene |
| 0 | atmospheric con-stituent | 16 | C7H8 | Toluene |
| 0 | atmospheric con-stituent | 17 | CFC-11 | CFC-11 |
| 0 | atmospheric con-stituent | 18 | CFC-12 | CFC-12 |
| 0 | atmospheric con-stituent | 19 | CH3CN | Acetonitrile |
| 0 | atmospheric con-stituent | 20 | CH3OH | Methanol |
| 0 | atmospheric con-stituent | 21 | CH4 | Methane |
| 0 | atmospheric con-stituent | 22 | ClO | Chlorine monoxide |
| 0 | atmospheric con-stituent | 23 | ClONO2 | Chlorine nitrate |
| 0 | atmospheric con-stituent | 24 | CO | Carbon monoxide |
| 0 | atmospheric con-stituent | 25 | CO2 | Carbon dioxide |
| 0 | atmospheric con-stituent | 26 | COS | Carbonyl sulfide |
| 0 | atmospheric con-stituent | 27 | H2O | Water vapour |
| 0 | atmospheric con-stituent | 28 | HCHO | Formaldehyde |

Continued on next page



Table 152 secondary_variable (cont.)

| variable | variable_name | value | symbol | description |
|----------|------------------------------|-------|----------------|---------------------------------|
| 0 | atmospheric con- stituent | 29 | HCHO | Formaldehyde (Total Column) |
| 0 | atmospheric con- stituent | 30 | HCl | Hydrogen chloride |
| 0 | atmospheric con- stituent | 31 | HDO | ??? |
| 0 | atmospheric con- stituent | 32 | HNO3 | Nitric acid |
| 0 | atmospheric con- stituent | 33 | N2O | Nitrous oxide |
| 0 | atmospheric con- stituent | 34 | N2O5 | Dinitrogen pentoxide |
| 0 | atmospheric con- stituent | 35 | NO | Nitrogen monoxide |
| 0 | atmospheric con- stituent | 36 | NO2 | Nitrogen dioxide |
| 0 | atmospheric con- stituent | 37 | NO2 | Nitrogen dioxide (Total column) |
| 0 | atmospheric con- stituent | 38 | O3 | Ozone |
| 0 | atmospheric con- stituent | 39 | O3 | Ozone (Total column) |
| 0 | atmospheric con- stituent | 40 | OH | ??? |
| 0 | atmospheric con- stituent | 41 | PAN | ??? |
| 0 | atmospheric con- stituent | 42 | PSC occurrence | ??? |
| 0 | atmospheric con- stituent | 43 | SF6 | Sulphur hexafluoride |

Continued on next page



Table 152 secondary_variable (cont.)

| variable | variable_name | value | symbol | description |
|--------------|--------------------------|-------|--------|--------------------------------|
| 0 | atmospheric con-stituent | 44 | SO2 | Sulphur dioxide |
| 0 | atmospheric con-stituent | 45 | SO2 | Sulphur dioxide (Total column) |
| End of table | | | | |



Table 153: sensor_configuration_codes codes

| field_id | field_name | parameter | code_value | abbreviation | description |
|----------|-------------------------|----------------|------------|--------------|---|
| BARG | sensor type - barograph | pressure trend | 0 | | Open Scale barograph with 1 day clock. |
| BARG | sensor type - barograph | pressure trend | 1 | | Open Scale barograph with 2 day clock. |
| BARG | sensor type - barograph | pressure trend | 2 | | Open Scale barograph with 3 day clock. |
| BARG | sensor type - barograph | pressure trend | 3 | | Open Scale barograph with 4 day clock. |
| BARG | sensor type - barograph | pressure trend | 4 | | Open Scale barograph with 5 day clock. |
| BARG | sensor type - barograph | pressure trend | 5 | | Open Scale barograph with 6 day clock. |
| BARG | sensor type - barograph | pressure trend | 6 | | Open Scale barograph with 7 day clock. |
| BARG | sensor type - barograph | pressure trend | 7 | | Open Scale barograph with 8 day clock. |
| BARG | sensor type - barograph | pressure trend | 8 | | Open Scale barograph with 9 day clock. |
| BARG | sensor type - barograph | pressure trend | 9 | | Open Scale barograph. |
| BARG | sensor type - barograph | pressure trend | 10 | | Other (specify in footnote). |
| BARG | sensor type - barograph | pressure trend | 11 | | Small Scale barograph. |
| BARG | sensor type - barograph | pressure trend | 12 | | Tendency obtained from an electronic digital barometer. |
| BARM | sensor type - barometer | pressure | 0 | | Aneroid barometer (issued by the PMO or a NMS). |

Continued on next page



Table 153 sensor_configuration_codes (cont.)

| field_id | field_name | parameter | code_value | abbreviation | description |
|----------|-------------------------|-----------|------------|--------------|--|
| BARM | sensor type - barometer | pressure | 1 | | Digital aneroid barometer (aka Precision Aneroid Barometer). |
| BARM | sensor type - barometer | pressure | 2 | | Electronic digital barometer (consisting of one or more pressure transducers). |
| BARM | sensor type - barometer | pressure | 3 | | Mercury barometer. |
| BARM | sensor type - barometer | pressure | 4 | | Other |
| BARM | sensor type - barometer | pressure | 5 | | Ship's aneroid barometer. |
| IBS | ice bulb status | humidity | 0 | | Ice bulb |
| IBS | ice bulb status | humidity | 1 | | Wet bulb |
| MANU | manufacturer | all | 0 | | Vaisala |
| SLOC | sensor location - ship | all | 0 | | Aft mast. |
| SLOC | sensor location - ship | all | 1 | | Bridge wing |
| SLOC | sensor location - ship | all | 2 | | Foremast yardarm |
| SLOC | sensor location - ship | all | 3 | | Foremast. |
| SLOC | sensor location - ship | all | 4 | | Handheld. |
| SLOC | sensor location - ship | all | 5 | | Main deck |
| SLOC | sensor location - ship | all | 6 | | Mainmast yardarm |
| SLOC | sensor location - ship | all | 7 | | Mainmast. |

Continued on next page



Table 153 sensor_configuration_codes (cont.)

| field_id | field_name | parameter | code_value | abbreviation | description |
|----------|------------------------|-----------|------------|--------------|--|
| SLOC | sensor location - ship | all | 8 | | Mast on wheelhouse top yardarm |
| SLOC | sensor location - ship | all | 9 | | Mast on wheelhouse top. |
| SLOC | sensor location - ship | all | 10 | | Meteorological mast. |
| SLOC | sensor location - ship | all | 11 | | Not fitted. |
| SLOC | sensor location - ship | all | 12 | | Other |
| SLOC | sensor location - ship | all | 13 | | Pressurised wheelhouse (closed and not vented to the outside). |
| SLOC | sensor location - ship | all | 14 | | Wheelhouse |
| SLOC | sensor location - ship | all | 15 | | Wheelhouse, not pressurised (vented to the outside). |
| SSIDE | sensor side - ship | all | 0 | | Center |
| SSIDE | sensor side - ship | all | 1 | | Port |
| SSIDE | sensor side - ship | all | 2 | | Starboard |
| SSIDE | sensor side - ship | all | 3 | | Windward side |
| SWV | sensor type - waves | waves | 0 | | buoy |
| SWV | sensor type - waves | waves | 1 | | other |
| SWV | sensor type - waves | waves | 2 | | shipborne wave recorder |

Continued on next page



Table 153 sensor_configuration_codes (cont.)

| field_id | field_name | parameter | code_value | abbreviation | description |
|--------------|-------------------------------------|--------------------|------------|--------------|--|
| SWW | sensor type - present weather | present weather | 0 | | Automatic, included (using WMO Codes 4677 and 4561) |
| SWW | sensor type - present weather | present weather | 1 | | Automatic, included (using WMO codes 4680 and 4531) |
| SWW | sensor type - present weather | present weather | 2 | | Automatic, omitted (no observa- tion, data not available) |
| SWW | sensor type - present weather | present weather | 3 | | Automatic, omitted (no significant phenomenon to report) |
| SWW | sensor type - present weather | present weather | 4 | | Manned, included |
| SWW | sensor type - present weather | present weather | 5 | | Manned, omitted (no observa- tion, data not available) |
| SWW | sensor type - present weather | present weather | 6 | | Manned, omitted (no significant phenomenon to report) |
| End of table | | | | | |



Table 154: sensor_configuration_fields codes

| field_id | field_name | parameter | type | description |
|----------|--------------------------------------|-------------------|------|--|
| SACC | sensor accuracy | all | 1 | Reported accuracy (trueness) of sensor in units of measurement. |
| SPRE | sensor precision | all | 1 | Reported precision (repeatability) of sensor in units of measurement |
| B002033 | sensor type - salinity | salinity | 0 | NA |
| B002038 | sensor type - water temperature | water temperature | 0 | NA |
| B002051 | sensor type - extremes | air temperature | 0 | NA |
| B002096 | sensor type - air temperature | air temperature | 0 | NA |
| B002097 | sensor type - humidity | humidity | 0 | NA |
| B002169 | sensor type - wind speed | wind speed | 0 | NA |
| B002185 | sensor type - evaporation | evaporation | 0 | NA |
| B003003 | sensor housing - type | all | 0 | NA |
| B003004 | sensor housing - radiation shielding | all | 0 | NA |
| B003008 | sensor housing - ventilation | all | 0 | NA |
| B003020 | sensor housing - material | all | 0 | NA |
| B003021 | sensor housing - heating | all | 0 | NA |
| B003022 | sensor owner | all | 0 | NA |

Continued on next page



Table 154 sensor_configuration_fields (cont.)

| field_id | field_name | parameter | type | description |
|----------|---|----------------|------|--|
| B003023 | sensor housing - configuration | all | 0 | NA |
| BARG | sensor type - barograph | pressure trend | 0 | NA |
| BARM | sensor type - barometer | pressure | 0 | NA |
| CALINT | calibration interval | all | 1 | Maximum number of months recommended between calibrations. |
| CALMETH | calibration method | all | 0 | Method used to calibrate instrument |
| CALREF | calibration reference | all | 2 | Reference instrument (make, model and serial number) used to perform calibration |
| CALDEV | calibration chamber | all | 2 | Calibration chamber (or device) used to perform the calibration |
| CALPRTY | calibration party | all | 2 | Who performed the calibration |
| CALRES | calibration result | all | 2 | Result of the calibration |
| CALCERT | calibration certificate | all | 2 | Certificate number of calibration certificate |
| FREQ | sampling frequency | all | 1 | time period (s) between successive measurements from sensor |
| IBS | ice bulb status | humidity | 0 | NA |
| LDCL | sensor location - distance from center line | wind speed | 1 | NA |
| LDFB | sensor location - distance from bow | wind speed | 1 | NA |
| LHAD | sensor location - height above deck | wind speed | 1 | NA |
| MANU | manufacturer | all | 0 | NA |
| QCPROC | quality control procedure | all | 0 | Procedure used to quality control the observation and set quality flag |

Continued on next page



Table 154 sensor_configuration_fields (cont.)

| field_id | field_name | parameter | type | description |
|----------|-----------------------------------|-----------------|------|---|
| SERIAL | serial number | all | 2 | NA |
| SHVR | sensor housing - ventilation rate | all | 1 | NA |
| SLOC | sensor location - ship | all | 0 | NA |
| SMAX | sensor range - max | all | 1 | Maximum observable value with sensor in reported units of measurement |
| SMIN | sensor range - min | all | 1 | Minimum observable value with sensor in reported units of measurement |
| SMOD | sensor model | all | 2 | NA |
| SOFT | software_version | all | 2 | NA |
| SPROC | sampling procedure | all | 0 | how the sample was obtained |
| SRES | sensor resolution | all | 1 | NA |
| SRESP | sensor response time | all | 1 | Time (s) for sensor to change from previous state to current state |
| SRR | sensor type - precipitation | precipitation | 0 | NA |
| SSIDE | sensor side - ship | all | 0 | NA |
| STAB | sensor stability | all | 1 | Reported stability of sensor in reported units of measurement per year. |
| SWV | sensor type - waves | waves | 0 | NA |
| SWW | sensor type - present weather | present weather | 0 | NA |
| STREAT | sample treatment | all | 0 | treatment of the sample prior to analysis |
| TSONDE | telemetry_sonde | sonde | 0 | NA |
| WGHT | weight | sonde | 1 | NA |
| STIME | sample times | all | 3 | time of the samples used to calculate statistics |
| INSTDATE | installation date | all | 3 | Date when sensor was installed |

Continued on next page



Table 154 sensor_configuration_fields (cont.)

| field_id | field_name | parameter | type | description |
|----------|----------------------|-----------|------|--|
| MNTDATE | maintenance date | all | 3 | Date when maintenance performed (use MTNCE to summarise activities undertaken) |
| MNTMETH | maintenance | all | 2 | Summary of maintenance performed |
| MNTPRTY | maintenance party | all | 2 | Who performed the maintenance |
| MNTINT | maintenance interval | all | 1 | Maximum number of months recommended between maintenance activities |
| | | | | End of table |



Table 155: source_configuration_codes codes

| field_id | field_name | code_value | abbreviation | description |
|----------|------------------------|------------|---|-------------|
| 0 | delayed mode format | 0 | IMMT version just prior to version number being included | NA |
| 0 | delayed mode format | 1 | IMMT-1 (in effect from 2 Nov. 1994) | NA |
| 0 | delayed mode format | 2 | IMMT-2 (in effect from Jan. 2003) | NA |
| 0 | delayed mode format | 3 | IMMT-3 (in effect from Jan. 2007) | NA |
| 0 | delayed mode format | 4 | IMMT-4 (in effect from Jan. 2011) | NA |
| 0 | delayed mode format | 5 | IMMT-5 (in effect from June 2012) | NA |
| 1 | metadata source | 0 | COAPS | NA |
| 1 | metadata source | 1 | WMO Publication 47 | NA |
| 2 | metadata source format | 1 | Output from digitisation project, semi-colon delimited format (1955) | NA |
| 2 | metadata source format | 2 | Output from digitisation project, semi-colon delimited format (1956) | NA |
| 2 | metadata source format | 3 | Output from digitisation project, semi-colon delimited format (1957 - 1967) | NA |

Continued on next page



Table 155 source_configuration_codes (cont.)

| field_id | field_name | code_value | abbreviation | description |
|----------|-------------------------|------------|---|-------------|
| 2 | metadata source format | 4 | Output from digitisation project, semi-colon delimited format (1968 - 1969) | NA |
| 2 | metadata source format | 5 | Fixed format (1970 - 1004) | NA |
| 2 | metadata source format | 6 | Semi-colon delimited format (1995 - 2001) | NA |
| 2 | metadata source format | 7 | Semi-colon delimited format (2002 - 2007 q1) | NA |
| 2 | metadata source format | 8 | Semi-colon delimited format (2007 - 2008) | NA |
| 2 | metadata source format | 9 | Semi-colon delimited format (2009 - 2014) | NA |
| 3 | observation source type | 0 | unknown | NA |
| 3 | observation source type | 1 | delayed mode - logbook (paper) | NA |
| 3 | observation source type | 2 | real time - national telecommunication channels | NA |
| 3 | observation source type | 3 | delayed mode - national publications | NA |
| 3 | observation source type | 4 | delayed mode - logbook (electronic) | NA |

Continued on next page



Table 155 source_configuration_codes (cont.)

| field_id | field_name | code_value | abbreviation | description |
|----------|----------------------------|------------|---|-------------|
| 3 | observation source type | 5 | real time - global telecommunication system (GTS) | NA |
| 3 | observation source type | 6 | delayed mode - International publications | NA |
| 4 | real time format | 0 | previous to FM24-V | NA |
| 4 | real time format | 1 | FM 24-V | NA |
| 4 | real time format | 2 | FM 24-VI Ext. | NA |
| 4 | real time format | 3 | FM 13-VII | NA |
| 4 | real time format | 4 | FM 13-VIII | NA |
| 4 | real time format | 5 | FM 13-VIII Ext. | NA |
| 4 | real time format | 6 | FM 12-IX | NA |
| 4 | real time format | 7 | FM 13-IX Ext. | NA |
| 4 | real time format | 8 | FM 13-X | NA |
| 4 | real time format | 9 | FM 13-XI | NA |
| 4 | real time format | 10 | FM 13-XII Ext. | NA |
| 4 | real time format | 11 | FM 13-XIII | NA |
| 4 | real time format | 12 | FM 13-XIV Ext. | NA |
| 5 | source format | 0 | IMMA - Version 0 | NA |
| 5 | source format | 1 | IMMA - Version 1 | NA |

End of table



Table 156: source_configuration_fields codes

| field_id | field_name | kind | description |
|----------|----------------------------------|------|-------------|
| 0 | delayed mode format | 0 | NA |
| 1 | metadata source | 0 | NA |
| 2 | metadata source format | 0 | NA |
| 3 | observation source type | 0 | NA |
| 4 | real time format | 0 | NA |
| 5 | source format | 0 | NA |
| 6 | source deck | 0 | NA |
| 7 | source id | 0 | NA |
| 10 | product original time resolution | 1 | NA |

End of table

Table 157: source_format codes

| format | description |
|--------|--------------------------------|
| 0 | ASCII (comma separated values) |
| 1 | IMMA |
| 2 | WMO BUFR |
| 3 | WMO TAC |
| 4 | CF-compliant NetCDF |

End of table

Table 158: spatial_representativeness codes

| representativeness | description |
|--------------------|---|
| 0 | Nil reason - None of the codes in the table is applicable in the context of the observed quantity or unknown, or not available information. |
| 1 | Microscale - An area or volume less than 100 m horizontal extent (for example, evaporation) |
| 2 | Toposcale, local scale - An area or volume of 100 m to 3 km horizontal extent (for example, air pollution, tornadoes) |

Continued on next page



Table 158 spatial_representativeness (cont.)

| representativeness | description |
|---------------------------|---|
| 3 | Mesoscale - An area or volume of 3 km to 100 km horizontal extent (for example, thunderstorms, sea and mountain breezes) |
| 4 | Large scale- An area or volume of 100 km to 3000 km horizontal extent (for example, fronts, various cyclones, cloud clusters) |
| 5 | Planetary scale - An area or volume of more than 3000 km horizontal extent (for example, long upper tropospheric waves) |
| 6 | Drainage area - An area (also known as 'catchment') having a common outlet for its surface runoff, in km ² |

End of table

Table 159: standard_time codes

| time | description |
|-------------|--------------------|
| 0 | 00 UTC |
| 1 | 06 UTC |
| 2 | 12 UTC |
| 3 | 18 UTC |

End of table



Table 160: station_configuration_codes codes

| field_id | field_name | code_value | abbreviation | description |
|----------|-------------------|------------|--------------|---|
| 16 | Other instruments | 0 | BAT | Bathythermometer. |
| 16 | Other instruments | 1 | BT | Bathythermograph (towed). |
| 16 | Other instruments | 2 | FLM | Fluorometer. |
| 16 | Other instruments | 3 | LWR | Long wave radiation. |
| 16 | Other instruments | 4 | MAX | Maximum thermometer. |
| 16 | Other instruments | 5 | MIN | Minimum thermometer. |
| 16 | Other instruments | 6 | NTE | Nitrate sensor. |
| 16 | Other instruments | 7 | NTT | Nutrient sensor. |
| 16 | Other instruments | 8 | P | Pilot balloon equipment. |
| 16 | Other instruments | 9 | CO2 | pCO2 system. |
| 16 | Other instruments | 10 | PLK | Plankton recorder. |
| 16 | Other instruments | 11 | PRS | Photosynthetic radiation sensor. |
| 16 | Other instruments | 12 | PYG | Pyrogeometer. |
| 16 | Other instruments | 13 | R | Radiosonde equipment. |
| 16 | Other instruments | 14 | RG | Rain gauge. |
| 16 | Other instruments | 15 | RSD | Radar storm and meteorological phenomena detection. |
| 16 | Other instruments | 16 | RT | Reversing thermometer. |
| 16 | Other instruments | 17 | SKY | Sky camera. |
| 16 | Other instruments | 18 | SLM | Solarimeter. |
| 16 | Other instruments | 19 | ST | Sea thermograph. |
| 16 | Other instruments | 20 | SWR | Short wave radiation. |
| 16 | Other instruments | 21 | TSD | Temperature/salinity/depth probe. |
| 16 | Other instruments | 22 | TUR | Turbidity sensor. |
| 16 | Other instruments | 23 | W | Radiowind or radarwind equipment. |
| 16 | Other instruments | 24 | WR | Wave Recorder |
| 16 | Other instruments | 25 | XBT | Expendable bathythermograph. |
| 16 | Other instruments | 26 | OT | Other (specify in footnote). |
| 17 | Station status | 1 | | Planned |

Continued on next page



Table 160 station_configuration_codes (cont.)

| field_id | field_name | code_value | abbreviation | description |
|----------|---------------------------------------|------------|--------------|-----------------------------------|
| 17 | Station status | 2 | | Pre-operational |
| 17 | Station status | 3 | | Operational / Reporting |
| 17 | Station status | 4 | | Partly reporting |
| 17 | Station status | 5 | | Temporarily suspended |
| 17 | Station status | 6 | | Closed |
| 18 | Type of meteorological reporting ship | 0 | 70 | Auxiliary ship |
| 18 | Type of meteorological reporting ship | 1 | 75 | Auxiliary ship (AWS) |
| 18 | Type of meteorological reporting ship | 2 | 10 | Selected |
| 18 | Type of meteorological reporting ship | 3 | 15 | Selected (AWS) |
| 18 | Type of meteorological reporting ship | 4 | 40 | Supplementary |
| 18 | Type of meteorological reporting ship | 5 | 45 | Supplementary (AWS) |
| 18 | Type of meteorological reporting ship | 6 | 80 | Third party |
| 18 | Type of meteorological reporting ship | 7 | 85 | Third party (AWS) |
| 18 | Type of meteorological reporting ship | 8 | 99 | Unknown |
| 18 | Type of meteorological reporting ship | 9 | 30 | VOSClim - VOS Climate |
| 18 | Type of meteorological reporting ship | 10 | 35 | VOSClim (AWS) - VOS Climate (AWS) |
| 30 | Hull material | 0 | | Unknown |
| 30 | Hull material | 1 | | Wood |
| 30 | Hull material | 2 | | Iron |

Continued on next page



Table 160 station_configuration_codes (cont.)

| field_id | field_name | code_value | abbreviation | description |
|----------|-------------------|------------|--------------|-------------|
| 30 | Hull material | 3 | | Composite |
| 31 | Vessel propulsion | 0 | | Unknown |
| 31 | Vessel propulsion | 1 | | Screw |
| 31 | Vessel propulsion | 2 | | Paddle |
| 31 | Vessel propulsion | 3 | | Sail |

End of table



Table 161: station_configuration_fields codes

| field_id | field_name | kind | description |
|----------|--|------|---------------------------------|
| 0 | AWS Entry and Display Software | 0 | See station_configuration_codes |
| 1 | AWS Entry and Display Software Version | 0 | See station_configuration_codes |
| 2 | AWS Model | 0 | See station_configuration_codes |
| 3 | AWS Model Version | 0 | See station_configuration_codes |
| 4 | AWS Software | 0 | See station_configuration_codes |
| 5 | AWS Software version | 0 | See station_configuration_codes |
| 6 | Cargo height | 1 | Height of cargo above deck (m) |
| 7 | Distance of bridge from bow | 1 | (m) |
| 8 | Draught | 1 | (m) |
| 9 | Drogue type | 0 | See station_configuration_codes |
| 10 | Freeboard | 1 | NA |
| 11 | Lagrangian drifter drogue status | 0 | See station_configuration_codes |
| 12 | Length overall of the ship, ignoring bulbous bow | 1 | NA |
| 13 | LogBook software and version | 0 | See station_configuration_codes |
| 14 | Maximum operating speed on normal service | 1 | NA |
| 15 | Moulded breadth | 1 | NA |
| 16 | Other instruments | 0 | See station_configuration_codes |
| 17 | Station status | 0 | See station_configuration_codes |
| 18 | Type of meteorological reporting ship | 0 | See station_configuration_codes |
| 19 | Surface cover | 0 | See station_configuration_codes |
| 20 | Surface cover scheme | 0 | See station_configuration_codes |
| 21 | Topography | 0 | See station_configuration_codes |
| 22 | Topography scheme | 0 | See station_configuration_codes |

Continued on next page



Table 161 station_configuration_fields (cont.)

| field_id | field_name | kind | description |
|----------|--------------------------|------|--|
| 23 | Soil type | 0 | See station_configuration_codes |
| 24 | Land use | 0 | See station_configuration_codes |
| 25 | Alternate longitude | 1 | NA |
| 26 | Alternate latitude | 1 | NA |
| 27 | Distance from road | 1 | Distance from nearest road (in km) |
| 28 | Distance from water body | 1 | Distance from nearest water body (in km) |
| 29 | Alternative elevation | 1 | Alternative elevation above sea level (m) |
| 30 | Hull material | 0 | Hull material, e.g. wood, iron etc |
| 31 | Vessel propulsion | 0 | Method of propulsion (screw, paddle, sail). Primarily used for late 19th and early 20th century vessels. |

End of table

Table 162: station_type codes

| type | description |
|------|---------------------|
| 1 | Land station |
| 2 | Sea station |
| 3 | Aircraft |
| 4 | Satellite |
| 5 | Underwater platform |

End of table



Table 163: sub_region codes

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|------------------------|
| 0 | country | AD | AND | ANDORRA |
| 1 | country | AE | ARE | UNITED ARAB EMIRATES |
| 2 | country | AF | AFG | AFGHANISTAN |
| 3 | country | AG | ATG | ANTIGUA AND BARBUDA |
| 4 | country | AI | AIA | ANGUILLA |
| 5 | country | AL | ALB | ALBANIA |
| 6 | country | AM | ARM | ARMENIA |
| 7 | country | AN | | NETHERLANDS ANTILLES |
| 8 | country | AO | AGO | ANGOLA |
| 9 | country | AQ | ATA | ANTARCTICA |
| 10 | country | AR | ARG | ARGENTINA |
| 11 | country | AS | ASM | AMERICAN SAMOA |
| 12 | country | AT | AUT | AUSTRIA |
| 13 | country | AU | AUS | AUSTRALIA |
| 14 | country | AW | ABW | ARUBA |
| 15 | country | AX | ALA | ALAND ISLANDS |
| 16 | country | AZ | AZE | AZERBAIJAN |
| 17 | country | BA | BIH | BOSNIA AND HERZEGOVINA |
| 18 | country | BB | BRB | BARBADOS |
| 19 | country | BD | BGD | BANGLADESH |
| 20 | country | BE | BEL | BELGIUM |
| 21 | country | BF | BFA | BURKINA FASO |
| 22 | country | BG | BGR | BULGARIA |
| 23 | country | BH | BHR | BAHRAIN |
| 24 | country | BI | BDI | BURUNDI |
| 25 | country | BJ | BEN | BENIN |
| 26 | country | BL | BLM | SAINT BARTHELEMY |
| 27 | country | BM | BMU | BERMUDA |
| 28 | country | BN | BRN | BRUNEI DARUSSALAM |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--|
| 29 | country | BO | BOL | BOLIVIA (PLURINATIONAL STATE OF) |
| 30 | country | BR | BRA | BRAZIL |
| 31 | country | BS | BHS | BAHAMAS |
| 32 | country | BT | BTN | BHUTAN |
| 33 | country | BV | BVT | BOUVET ISLAND |
| 34 | country | BW | BWA | BOTSWANA |
| 35 | country | BY | BLR | BELARUS |
| 36 | country | BZ | BLZ | BELIZE |
| 37 | country | CA | CAN | CANADA |
| 38 | country | CC | CCK | COCOS (KEELING) ISLANDS |
| 39 | country | CD | COD | CONGO, THE DEMOCRATIC REPUBLIC OF THE |
| 40 | country | CF | CAF | CENTRAL AFRICAN REPUBLIC |
| 41 | country | CG | COG | CONGO |
| 42 | country | CH | CHE | SWITZERLAND |
| 43 | country | CI | CIV | COTE D'IVOIRE |
| 44 | country | CK | COK | COOK ISLANDS |
| 45 | country | CL | CHL | CHILE |
| 46 | country | CM | CMR | CAMEROON |
| 47 | country | CN | CHN | CHINA |
| 48 | country | CO | COL | COLOMBIA |
| 49 | country | CR | CRI | COSTA RICA |
| 50 | country | CU | CUB | CUBA |
| 51 | country | CV | CPV | CAPE VERDE |
| 52 | country | CX | CXV | CHRISTMAS ISLAND |
| 53 | country | CY | CYP | CYPRUS |
| 54 | country | CZ | CZE | CZECHIA |
| 55 | country | DD | | GERMAN DEMOCRATIC RE-PUBLIC (OBSOLETE) |
| 56 | country | DE | DEU | GERMANY |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|---|
| 57 | country | DJ | DJI | DJIBOUTI |
| 58 | country | DK | DNK | DENMARK |
| 59 | country | DM | DMA | DOMINICA |
| 60 | country | DO | DOM | DOMINICAN REPUBLIC |
| 61 | country | DZ | DZA | ALGERIA |
| 62 | country | EC | ECU | ECUADOR |
| 63 | country | EE | EST | ESTONIA |
| 64 | country | EG | EGY | EGYPT |
| 65 | country | EH | ESH | WESTERN SAHARA |
| 66 | country | ER | ERI | ERITREA |
| 67 | country | ES | ESP | SPAIN |
| 68 | country | ET | ETH | ETHIOPIA |
| 69 | country | FI | FIN | FINLAND |
| 70 | country | FJ | FJI | FIJI |
| 71 | country | FK | FLK | FALKLAND ISLANDS (MALVINAS) |
| 72 | country | FM | FSM | MICRONESIA, FEDERATED STATES OF |
| 73 | country | FO | FRO | FAROE ISLANDS |
| 74 | country | FR | FRA | FRANCE |
| 75 | country | GA | GAB | GABON |
| 76 | country | GB | GBR | UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND |
| 77 | country | GD | GRD | GRENADA |
| 78 | country | GE | GEO | GEORGIA |
| 79 | country | GF | GUF | FRENCH GUIANA |
| 80 | country | GG | GGY | GUERNSEY |
| 81 | country | GH | GHA | GHANA |
| 82 | country | GI | GIB | GIBALTAR |
| 83 | country | GL | GRL | GREENLAND |
| 84 | country | GM | GMB | GAMBIA |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--|
| 85 | country | GN | GIN | GUINEA |
| 86 | country | GP | GLP | GUADELOUPE |
| 87 | country | GQ | GNQ | EQUATORIAL GUINEA |
| 88 | country | GR | GRC | GREECE |
| 89 | country | GS | SGS | SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS |
| 90 | country | GT | GTM | GUATEMALA |
| 91 | country | GU | GUM | GUAM |
| 92 | country | GW | GNB | GUINEA-BISSAU |
| 93 | country | GY | GUY | GUYANA |
| 94 | country | HK | HKG | HONG KONG |
| 95 | country | HM | HMD | HEARD ISLAND AND MCDONALD ISLANDS |
| 96 | country | HN | HND | HONDURAS |
| 97 | country | HR | HRV | CROATIA |
| 98 | country | HT | HTI | HAITI |
| 99 | country | HU | HUN | HUNGARY |
| 100 | country | ID | IDN | INDONESIA |
| 101 | country | IE | IRL | IRELAND |
| 102 | country | IL | ISR | ISRAEL |
| 103 | country | IM | IMN | ISLE OF MAN |
| 104 | country | IN | IND | INDIA |
| 105 | country | IO | IOT | BRITISH INDIAN OCEAN TERRITORY |
| 106 | country | IQ | IRQ | IRAQ |
| 107 | country | IR | IRN | IRAN, ISLAMIC REPUBLIC OF |
| 108 | country | IS | ISL | ICELAND |
| 109 | country | IT | ITA | ITALY |
| 110 | country | JE | JEY | JERSEY |
| 111 | country | JM | JAM | JAMAICA |
| 112 | country | JO | JOR | JORDAN |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--|
| 113 | country | JP | JPN | JAPAN |
| 114 | country | KE | KEN | KENYA |
| 115 | country | KG | KGZ | KYRGYZSTAN |
| 116 | country | KH | KHM | CAMBODIA |
| 117 | country | KI | KIR | KIRIBATI |
| 118 | country | KM | COM | COMOROS |
| 119 | country | KN | KNA | SAINT KITTS AND NEVIS |
| 120 | country | KP | PRK | KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF |
| 121 | country | KR | KOR | KOREA, REPUBLIC OF |
| 122 | country | KW | KWT | KUWAIT |
| 123 | country | KY | CYM | CAYMAN ISLANDS |
| 124 | country | KZ | KAZ | KAZAKHSTAN |
| 125 | country | LA | LAO | LAO PEOPLE'S DEMOCRATIC REPUBLIC |
| 126 | country | LB | LBN | LEBANON |
| 127 | country | LC | LCA | SAINT LUCIA |
| 128 | country | LI | LIE | LIECHTENSTEIN |
| 129 | country | LK | LKA | SRI LANKA |
| 130 | country | LR | LBR | LIBERIA |
| 131 | country | LS | LSO | LESOTHO |
| 132 | country | LT | LTU | LITHUANIA |
| 133 | country | LU | LUX | LUXEMBOURG |
| 134 | country | LV | LVA | LATVIA |
| 135 | country | LY | LYB | LIBYA |
| 136 | country | MA | MAR | MOROCCO |
| 137 | country | MC | MCO | MONACO |
| 138 | country | MD | MDA | MOLDOVA, REPUBLIC OF |
| 139 | country | ME | MNE | MONTENEGRO |
| 140 | country | MF | MAF | SAINT MARTIN, FRENCH PART |
| 141 | country | MG | MDG | MADAGASCAR |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|---|
| 142 | country | MH | MHL | MARSHALL ISLANDS |
| 143 | country | MK | MKD | MACEDONIA, THE FORMER YU-GOSLAV REPUBLIC OF |
| 144 | country | ML | MLI | MALI |
| 145 | country | MM | MMR | MYANMAR |
| 146 | country | MN | MNG | MONGOLIA |
| 147 | country | MO | MAC | MACAO |
| 148 | country | MP | MNP | NORTHERN MARIANA ISLANDS |
| 149 | country | MQ | MTQ | MARTINIQUE |
| 150 | country | MR | MRT | MAURITANIA |
| 151 | country | MS | MSR | MONTserrat |
| 152 | country | MT | MLT | MALTA |
| 153 | country | MU | MUS | MAURITIUS |
| 154 | country | MV | MDV | MALDIVES |
| 155 | country | MW | MWI | MALAWI |
| 156 | country | MX | MEX | MEXICO |
| 157 | country | MY | MYS | MALAYSIA |
| 158 | country | MZ | MOZ | MOZAMBIQUE |
| 159 | country | NA | NAM | NAMIBIA |
| 160 | country | NC | NCL | NEW CALEDONIA |
| 161 | country | NE | NER | NIGER |
| 162 | country | NF | NFK | NORFOLK ISLAND |
| 163 | country | NG | NGA | NIGERIA |
| 164 | country | NI | NIC | NICARAGUA |
| 165 | country | NL | NLD | NETHERLANDS |
| 166 | country | NO | NOR | NORWAY |
| 167 | country | NP | NPL | NEPAL |
| 168 | country | NR | NRU | NAURU |
| 169 | country | NU | NIU | NIUE |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|---------------------------|
| 170 | country | NZ | NZL | NEW ZEALAND |
| 171 | country | OM | OMN | OMAN |
| 172 | country | PA | PAN | PANAMA |
| 173 | country | PE | PER | PERU |
| 174 | country | PF | PYF | FRENCH POLYNESIA |
| 175 | country | PG | PNG | PAPUA NEW GUINEA |
| 176 | country | PH | PHL | PHILIPPINES |
| 177 | country | PK | PAK | PAKISTAN |
| 178 | country | PL | POL | POLAND |
| 179 | country | PM | SPM | SAINT PIERRE AND MIQUELON |
| 180 | country | PN | PCN | PITCAIRN |
| 181 | country | PR | PRI | PUERTO RICO |
| 182 | country | PS | PSE | STATE OF PALESTINE |
| 183 | country | PT | PRT | PORTUGAL |
| 184 | country | PW | PLW | PALAU |
| 185 | country | PY | PRY | PARAGUAY |
| 186 | country | QA | QAT | QATAR |
| 187 | country | RE | REU | REUNION |
| 188 | country | RO | ROU | ROMANIA |
| 189 | country | RS | SRB | SERBIA |
| 190 | country | RU | RUS | RUSSIAN FEDERATION |
| 191 | country | RW | RWA | RWANDA |
| 192 | country | SA | SAU | SAUDI ARABIA |
| 193 | country | SB | SLB | SOLOMON ISLANDS |
| 194 | country | SC | SYC | SEYCHELLES |
| 195 | country | SD | SDN | SUDAN |
| 196 | country | SE | SWE | SWEDEN |
| 197 | country | SG | SGP | SINGAPORE |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--|
| 198 | country | SH | SHN | SAINT HELENA, ASCENSION AND TRISTAN DA CUNHA |
| 199 | country | SI | SVN | SLOVENIA |
| 200 | country | SJ | SJM | SVALBARD AND JAN MAYEN |
| 201 | country | SK | SVK | SLOVAKIA |
| 202 | country | SL | SLE | SIERRA LEONE |
| 203 | country | SM | SMR | SAN MARINO |
| 204 | country | SN | SEN | SENEGAL |
| 205 | country | SO | SOM | SOMALIA |
| 206 | country | SR | SUR | SURINAME |
| 207 | country | ST | STP | SAO TOME AND PRINCIPE |
| 208 | country | SU | | USSR (OBSOLETE) |
| 209 | country | SV | SLV | EL SALVADOR |
| 210 | country | SY | SYR | SYRIAN ARAB REPUBLIC |
| 211 | country | SZ | SWZ | SWAZILAND |
| 212 | country | TC | TCA | TURKS AND CAICOS ISLANDS |
| 213 | country | TD | TCD | CHAD |
| 214 | country | TF | ATF | FRENCH SOUTHERN TERRITORIES |
| 215 | country | TG | TGO | TOGO |
| 216 | country | TH | THA | THAILAND |
| 217 | country | TJ | TJK | TAJIKISTAN |
| 218 | country | TK | TKL | TOKELAU |
| 219 | country | TL | TLS | TIMOR-LESTE |
| 220 | country | TM | TKM | TURKMENISTAN |
| 221 | country | TN | TUN | TUNISIA |
| 222 | country | TO | TON | TONGA |
| 223 | country | TR | TUR | TURKEY |
| 224 | country | TT | TTO | TRINIDAD AND TOBAGO |
| 225 | country | TV | TUV | TUVALU |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--------------------------------------|
| 226 | country | TW | TWN | TAIWAN, PROVINCE OF CHINA |
| 227 | country | TZ | TZA | TANZANIA, UNITED REPUBLIC OF |
| 228 | country | UA | UKR | UKRAINE |
| 229 | country | UG | UGA | UGANDA |
| 230 | country | UM | UMI | UNITED STATES MINOR OUTLYING ISLANDS |
| 231 | country | US | USA | UNITED STATES OF AMERICA |
| 232 | country | UY | URY | URUGUAY |
| 233 | country | UZ | USB | UZBEKISTAN |
| 234 | country | VA | VAT | HOLY SEE |
| 235 | country | VC | VCT | SAINT VINCENT AND THE GRENADINES |
| 236 | country | VE | VEN | VENEZUELA, BOLIVARIAN REPUBLIC OF |
| 237 | country | VG | VGB | VIRGIN ISLANDS, BRITISH |
| 238 | country | VI | VIR | VIRGIN ISLANDS, U.S. |
| 239 | country | VN | VNM | VIET NAM |
| 240 | country | VU | VUT | VANUATU |
| 241 | country | WF | WSM | WALLIS AND FUTUNA |
| 242 | country | WS | WSM | SAMOA |
| 243 | country | YE | YEM | YEMEN |
| 244 | country | YT | MYT | MAYOTTE |
| 245 | country | YU | | YUGOSLAVIA (OBSOLETE) |
| 246 | country | ZA | ZAF | SOUTH AFRICA |
| 247 | country | ZM | ZMB | ZAMBIA |
| 248 | country | ZW | ZWE | ZIMBABWE |
| 249 | country | ZZ | | THIRD PARTY SUPPORT SHIPS |
| 250 | country | CW | CUW | CURACAO |
| 251 | country | BQ | BES | BONAIRE, SINT EUSTATIUS AND SABA |
| 252 | country | SS | SSD | SOUTH SUDAN |
| 253 | country | SX | SXM | SINT MAARTEN, DUTCH PART |

Continued on next page



Table 163 sub_region (cont.)

| sub_region | type | code | alpha_3_code | name |
|------------|---------|------|--------------|--|
| 254 | country | Z1 | | BRITISH CARIBBEAN TERRITORIES (OBSOLETE) |
| 255 | country | Z2 | | KENYA, UGANDA, TANZANIA (OBSOLETE) |
| 256 | country | EU | | EUROPEAN UNION |

End of table



Table 164: time_quality codes

| quality | description |
|---------|--|
| 0 | Timestamp valid, time reported to nearest second |
| 1 | Timestamp valid, time reported to nearest minute |
| 2 | Timestamp valid, time reported to nearest hour |
| 3 | Time missing, date valid. Report set to local midday |
| 4 | Day missing |
| 5 | Invalid date / time |

End of table

Table 165: time_reference codes

| reference | description |
|-----------|-------------------|
| 0 | Unknown |
| 1 | Time server |
| 2 | Radio clock |
| 3 | Manual comparison |

End of table

Table 166: traceability codes

| traceability | description |
|--------------|--------------------------------------|
| 0 | Unknown |
| 1 | Traceable to international standards |
| 2 | Traceable to other standards |

End of table

Table 167: uncertainty_method codes

| method | description | reference |
|--------|--|--------------------|
| 1 | Post-processing radiation correction | Dirksen et al 2014 |
| 2 | Post-processing adjustment due to intercomparison with GRUAN | Dirksen et al 2014 |

Continued on next page



Table 167 uncertainty_method (cont.)

| method | description | reference |
|--------|--|---|
| 3 | Post-processing adjustment due to intercomparison with WMO/CIMO 2010 dataset | Nash et al. 2010 |
| 4 | Radiosonde HARMonization (RHARM) | Madonna et al. 2019 |
| 5 | Post assimilation observation error estimate from obs-an and obs-bg departures | Desroziers et al. (2005), DC3S311c_Lot2.2.2.1 |

End of table



Table 168: uncertainty_type codes

| uncertainty_type | name | description | reference |
|------------------|-------------------|---|-----------|
| 1 | random | Random uncertainties are the uncertainty contributions due to random effects causing random errors that cannot be corrected for in a single measured value, even in principle, because the effect is stochastic | |
| 2 | systematic | Systematic uncertainties are the uncertainty contributions due to systematic effects which, although they can be corrected in principle, cannot be corrected in practice. In other words, systematic uncertainties are statistical characterizations, by means of distributions of possible values of the measurand, of those systematic errors which, although removable in principle, cannot be corrected in practice | |
| 3 | quasi-systematic | The quasi-systematic uncertainties are related to the estimates of errors which behave in a consistent way between measurements over a time period similar to that over which measurements are recorded. | |
| 4 | structured random | The structured random uncertainty is a contribution systematic over one timescale and / or space scale, but effectively random over longer space and / or timescales. | |
| 5 | total | The total uncertainty is the sum in quadrature of all the contributions (systematic, quasi-systematic and statistical) to the uncertainty budget. | |

Continued on next page



Table 168 uncertainty_type (cont.)

| uncertainty_type | name | description | reference |
|------------------|---|--|--------------|
| 6 | ozone_partial_pressure_total_uncertainty | Uncertainty in the calculation of the ozone partial pressure as a composite of the individual uncertainties contribution. Uncertainties due to systematic bias are assumed as random and following a random normal distribution. The uncertainty calculation also accounts for the increased uncertainty incurred by homogenizing the data record. | |
| 7 | ozone_partial_pressure_percentage_total_uncertainty | Uncertainty in the calculation of the ozone partial pressure as a composite of the individual uncertainties contribution. Uncertainties due to systematic bias are assumed as random and following a random normal distribution. The uncertainty calculation also accounts for the increased uncertainty incurred by homogenizing the data record. | End of table |



Table 169: units codes

| units | name | abbreviation | base_units |
|--------------|----------------|---------------------|-------------------|
| 001 | metre | m | NULL |
| 002 | kilogram | kg | NULL |
| 003 | second | s | NULL |
| 004 | ampere | A | NULL |
| 005 | kelvin | K | NULL |
| 006 | mole | mol | NULL |
| 007 | candela | cd | NULL |
| 021 | radian | rad | NULL |
| 022 | steradian | sr | NULL |
| 030 | hertz | Hz | s-1 |
| 031 | newton | N | kg m s-2 |
| 032 | pascal | Pa | kg m-1 s-2 |
| 033 | joule | J | kg m2 s-2 |
| 034 | watt | W | kg m2 s-3 |
| 035 | coulomb | C | A s |
| 036 | volt | V | kg m2 s-3 A-1 |
| 037 | farad | F | kg-1 m-2 s4 A2 |
| 038 | ohm | Ohm | kg m2 s-3 A-2 |
| 039 | siemens | S | kg-1 m-2 s3 A2 |
| 040 | weber | Wb | kg m2 s-2 A-1 |
| 041 | tesla | T | kg s-2 A-1 |
| 042 | henry | H | kg m2 s-2 A-2 |
| 060 | degree Celsius | deg C | K+273.15 |
| 070 | lumen | lm | cd sr |
| 071 | lux | lx | cd sr m-2 |
| 080 | becquerel | Bq | s-1 |
| 081 | grey | Gy | m2 s-2 |
| 082 | sievert | Sv | m2 s-2 |
| 110 | degree (angle) | deg | NULL |
| 111 | minute (angle) | ' | NULL |
| 112 | second (angle) | " | NULL |
| 120 | litre | l or L | NULL |
| 130 | minute (time) | min | NULL |
| 131 | hour | h | NULL |
| 132 | day | d | NULL |
| 150 | tonne | t | NULL |
| 160 | electron | eV | EV |
| 161 | atomic | unit | u |
| 170 | astronomic | AU | ASU |

Continued on next page



Table 169 units (cont.)

| units | name | abbreviation | base_units |
|--------------|--|---------------------|-------------------|
| 171 | parsec | pc | NULL |
| 200 | nautical | | NULL |
| 201 | knot | kt | NULL |
| 210 | decibel | dB | NULL |
| 220 | hectare | ha | NULL |
| 230 | week | | NULL |
| 231 | year | a | NULL |
| 300 | per cent | % | NULL |
| 301 | parts per thousand | 0/00 | NULL |
| 310 | eighths of cloud | okta | NULL |
| 320 | degrees true | deg | NULL |
| 321 | degrees per second | deg/s | NULL |
| 350 | degrees Celsius | C | NULL |
| 351 | degrees Celsius per metre | C/m | NULL |
| 352 | degrees Celsius per 100 metres | m | m |
| 360 | Dobson Unit | DU | NULL |
| 430 | month | mon | NULL |
| 441 | per second (same as hertz) | /s | NULL |
| 442 | per second squared | s-2 | NULL |
| 501 | knots per 1000 metres | m | KT/KM |
| 510 | foot | ft | NULL |
| 511 | inch | in | NULL |
| 520 | decipascals per second (microbar per second) | dPa/s | NULL |
| 521 | centibars per second | cb/s | NULL |
| 522 | centibars per 12 hours | h | h |
| 523 | dekapascal | daPa | NULL |
| 530 | hectopascal | hPa | NULL |
| 531 | hectopascals per second | s-1 | HPAL/S |

Continued on next page



Table 169 units (cont.)

| units | name | abbreviation | base_units |
|--------------|--|---------------------|-------------------|
| 532 | hectopascals per hour | h-1 | HPAL/HR |
| 533 | hectopascals per 3 hours | h | h |
| 535 | nanobar = hPa 10-6 | nbar | NULL |
| 620 | grams per kilo- gram | g/kg | NULL |
| 621 | grams per kilo- gram per second | g kg-1 s-1 | NULL |
| 622 | kilograms per kilogram | kg/kg | NULL |
| 623 | kilograms per kilo- gram per second | kg kg-1 s-1 | NULL |
| 624 | kilograms per square metre | kg m-2 | NULL |
| 630 | acceleration due to gravity | g | NULL |
| 631 | geopotential metre | gpm | NULL |
| 710 | millimetre | mm | NULL |
| 711 | millimetres per second | mm/s | NULL |
| 712 | millimetres per hour | mm/h | NULL |
| 713 | millimetres to the sixth power per cubic metre | mm ⁶ m-3 | NULL |
| 715 | centimetre | cm | NULL |
| 716 | centimetres per second | cm/s | NULL |
| 717 | centimetres per hour | cm/h | NULL |
| 720 | decimetre | dm | NULL |
| 731 | metres per second | m/s | NULL |
| 732 | metres per sec- ond per metre | m s-1/m | NULL |
| 733 | metres per second per 1000 metres | m s-1/km | NULL |
| 734 | square metres | m ² | NULL |

Continued on next page



Table 169 units (cont.)

| units | name | abbreviation | base_units |
|--------------|---|------------------------------------|-------------------|
| 735 | square metres per second | m ² /s | NULL |
| 740 | kilometre | km | NULL |
| 741 | kilometres per hour | km/h | NULL |
| 742 | kilometres per day | km/d | NULL |
| 743 | per metre | m ⁻¹ | NULL |
| 750 | becquerels per litre | Bq/l | NULL |
| 751 | becquerels per square metre | Bq m ⁻² | NULL |
| 752 | becquerels per cubic metre | Bq m ⁻³ | NULL |
| 753 | millisievert | mSv | NULL |
| 760 | metres per sec- ond squared | m s ⁻² | NULL |
| 761 | square me- tres second | m ² s | NULL |
| 762 | square metres per second squared | m ² s ⁻² | NULL |
| 763 | square metres per radian second | m ² rad ⁻¹ s | NULL |
| 764 | square metres per hertz | m ² /Hz | NULL |
| 765 | cubic metres | m ³ | NULL |
| 766 | cubic metres per second | m ³ /s | NULL |
| 767 | cubic metres per cubic metre | m ³ m ⁻³ | NULL |
| 768 | metres to the fourth power | | NULL |
| 769 | metres to the two thirds power per second | m ^{2/3} s ⁻¹ | NULL |
| 772 | logarithm per metre | log (m ⁻¹) | NULL |
| 773 | logarithm per square metre | log (m ⁻²) | NULL |
| 775 | kilograms per metre | kg/m | NULL |

Continued on next page



Table 169 units (cont.)

| units | name | abbreviation | base_units |
|--------------|---|---|-------------------|
| 776 | kilograms per square metre per second | kg m ⁻² s ⁻¹ | NULL |
| 777 | kilograms per cubic metre | kg m ⁻³ | NULL |
| 778 | per square kilo-gram per second | kg ⁻² s ⁻¹ | NULL |
| 779 | seconds per metre | s/m | NULL |
| 785 | kelvin metres per second | K m s ⁻¹ | NULL |
| 786 | kelvins per metre | K/m | NULL |
| 787 | kelvin square metres per kilogram per second | K m ² kg ⁻¹ s ⁻¹ | NULL |
| 788 | moles per mole | mol/mol | NULL |
| 790 | radians per metre | rad/m | NULL |
| 795 | newtons per square metre | N m ⁻² | NULL |
| 800 | pascals per second | Pa/s | NULL |
| 801 | kilopascal | kPa | NULL |
| 805 | joules per square metre | J m ⁻² | NULL |
| 806 | joules per kilogram | J/kg | NULL |
| 810 | watts per metre per steradian | W m ⁻¹ sr ⁻¹ | NULL |
| 811 | watts per square metre | W m ⁻² | NULL |
| 812 | watts per square metre per steradian | W m ⁻² sr ⁻¹ | NULL |
| 813 | watts per square metre per steradian centimetre | W m ⁻² sr ⁻¹ cm | NULL |
| 814 | watts per square metre per steradian metre | W m ⁻² sr ⁻¹ m | NULL |
| 815 | watts per cubic metre per steradian | W m ⁻³ sr ⁻¹ | NULL |
| 820 | siemens per metre | S/m | NULL |

Continued on next page



Table 169 units (cont.)

| units | name | abbreviation | base_units |
|--------------|---|---------------------|-------------------|
| 825 | square degrees | deg2 | NULL |
| 830 | becquerel seconds per cubic metre | Bq s m-3 | NULL |
| 835 | decibels per metre | dB/m | NULL |
| 836 | decibels per degree | dB/deg | NULL |
| 841 | pH unit | pH unit | NULL |
| 842 | N units | N units | NULL |
| 843 | Nephelometric turbidity units | NTU | NULL |
| 1001 | Inches of mercury | NULL | NULL |
| 1002 | Millimetres of mercury | NULL | NULL |
| 1003 | Millibars | mb | NULL |
| 1004 | Paris Inches | NULL | NULL |
| 1005 | Fahrenheit | F | NULL |
| 1006 | Reaumur | NULL | NULL |
| 1007 | Micheli du Crest scale | NULL | NULL |
| 1008 | Delisle scale | NULL | NULL |
| 1009 | Florentine ther- mometer | NULL | NULL |
| 1010 | Hauksbee or Royal Society thermometer | NULL | NULL |
| 1011 | Air thermometer (undefined) | NULL | NULL |
| 1012 | Rijnland Inches | NULL | NULL |
| 1013 | Vienna Inches | NULL | NULL |
| 1014 | Swedish Inches | NULL | NULL |
| 1015 | Amsterdam Inches | NULL | NULL |

End of table

Table 170: update_frequency codes

| frequency | description |
|------------------|--------------------|
| 0 | Irregular |
| 1 | Daily |
| 2 | Weekly |
| 3 | Monthly |

Continued on next page



Table 170 update_frequency (cont.)

| frequency | description |
|-----------|-------------|
| 4 | Annual |

End of table

Table 171: z_coordinate_method codes

| method | description |
|--------|------------------|
| 0 | Value from chart |

End of table

Table 172: z_coordinate_type codes

| type | description |
|------|----------------------------|
| 0 | height (m) above sea level |

End of table



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