ECMWF COPERNICUS REPORT

Copernicus Climate Change Service

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

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1 Introduction

1.1 Purpose of this document

This document defines the initial version of the Common Data Model (CDM)[1] 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 with ECMWF.

1.2 Scope

The defined common data model is intended for use with in situ land and marine observations. Instantaneous (or point) observations and temporal statistics (e.g. daily and monthly min / max temperatures, accumulation of precipitation etc.) are supported through the use of a significance qualifier. Similarly, column average data are supported through the reporting of the observed variable alongside its value. Profile data is supported through reporting the z-coordinate for each observed value.

Whilst initially intended for use with observations of Essential Climate Variables (ECVs; e.g. GCOS, 2016) the data model is not restricted to the ECVs. As noted above, and 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] As 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.

1.3 Structure of this document

Section 2 of this document provides background information on the data model and existing relevant data models and standards. Section 3 proposes a governance mechanism for the CDM in recognition that the data model will change and evolve as 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 311a service (Collection and Processing of In Situ Observations) access will be provided to observations from surface terrestrial and marine environments 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. 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 will be initially included in the service. The surface level data include observations made at standard and non-standard heights. The upper air data will include multiple observations, starting at the surface and at increasing heights through the atmosphere, often as a function of pressure or geopotential height. Columnar averages will be included. As a result 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, 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 Lot 2 of the service ranges from $\sim$1850 to present. 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 applied to the data need to be recorded. The full range of observational practices and instruments used is not currently known and developed data model will need to be extendable to accommodate new metadata as required.

The observations to be included will be 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. 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 Lots within the service.

In order to meet the above requirements a data model based on 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 will be 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) (WMO, 2015a) and the WMO Integrated Observing System Metadata Standard (WMDS) (WMO, 2015b) are key background material.

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 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 will be set up to manage the governance of the common data model. This group will operate 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 shall be 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.

During the initial development stage of the service proposals sent to the above email address will be assessed monthly, with discussion via email and teleconference as required. Accepted changes will be implemented at the beginning of the following month or with at least 2 weeks notice. These changes will be published both via the service website and via a subscription email list:

c3s_311a_CDM_notifications@surfacetemperatures.org.

The working group will be self nominating and initially contain at least one member from each Lot to act as a primary point of contact for that Lot and to represent their requirements on the working group. The working group will also contain a representative from ECMWF, or a nominated representative from another organisation, to represent the needs of the wider C3S community. Additional members from the different Lots will be 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.

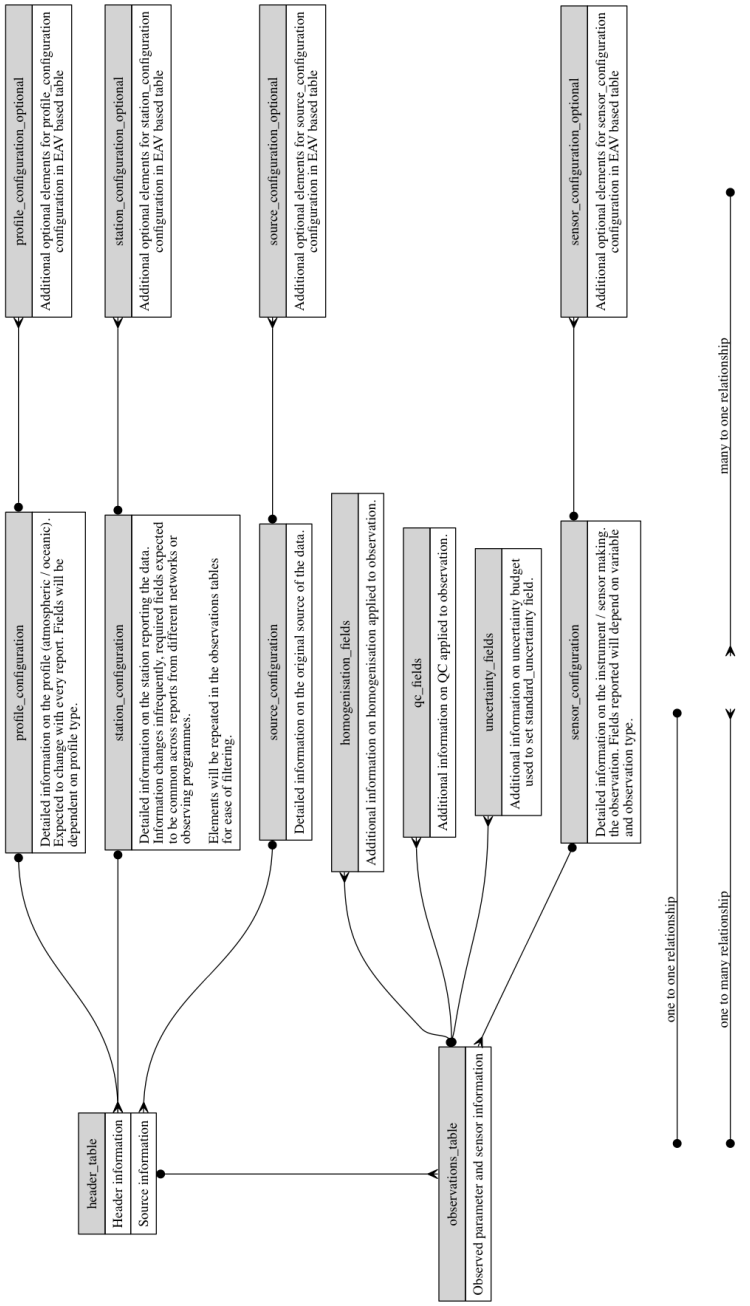

Figure 1: Simplified schematic showing overview of common data model

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

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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_time_stamp: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.

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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

4.2 Observations table

Table 3: 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_time_stamp:meaning	beginning, middle, end
observation_duration	int	duration:duration	Duration/period over which observation was made

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Table 3 observations_table (cont.)

element_name	kind	external_table	description
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
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
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.

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Table 3 observations_table (cont.)

element_name	kind	external_table	description
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.
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

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Table 3 observations_table (cont.)

element_name	kind	external_table	description
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
source_id	varchar	source_configuration:source_id	Original source of data, link to external table

End of table

4.3 Station configuration

Table 4: 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. Tateno)

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Table 4 station_configuration (cont.)

element_name	type	external_table	description
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
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.

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Table 4 station_configuration (cont.)

element_name	type	external_table	description
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
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 5: 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 6: 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 metadata available

End of table

Table 7: 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 7 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

4.5 Source configuration

Table 8: 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
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

Continued on next page

Table 8 source_configuration (cont.)

element_name	type	external_table	description
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
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 9: 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 10: 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 assoiciated with this entry
date_end	timestamp		end date for period of validity assoiciated with this entry
optional_data	int	data_present:flag	Flag indicating if additional data available

End of table

Table 11: 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 12: 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 13: 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 uncerainty 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 14: 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)
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

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.

Saarinen, 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 15: 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 16: 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 contacr
email	varchar		email address for contact
url	varchar		website for contact

End of table

Table 17: 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 17 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 17 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_time_stamp: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.
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 17 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 18: 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)
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 19: 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

Continued on next page

Table 19 observations_table (cont.)

element_name	kind	external_table	description
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
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
value_significance	int	observation_value_significance:significance	e.g. min, max, mean, sum

Continued on next page

Table 19 observations_table (cont.)

element_name	kind	external_table	description
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.
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

Continued on next page

Table 19 observations_table (cont.)

element_name	kind	external_table	description
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
source_id	varchar	source_configuration:source_id	Original source of data, link to external table

End of table

Table 20: organisation definition

element_name	kind	external_table	description
organisation_id	varchar (pk)		unique ID for organisation
parent_organisation	varchar	organisation:organisation_id	Link to parent organisation (or NA/NULL or none)

Continued on next page

Table 20 organisation (cont.)

element_name	kind	external_table	description
name	varchar		Name of organisation
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 21: 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 metadata available

End of table

Table 22: 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 22 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 23: 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 24: 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 assoiciated with this entry
date_end	timestamp		end date for period of validity assoiciated with this entry

Continued on next page

Table 24 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 25: 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 26: 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 26 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 26 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 27: 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 28: 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. Tateno)
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 28 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 28 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 29: 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 29 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 30: 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 uncerainty 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 31: 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 32: 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 33: 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 34: 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 35: 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 36: 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 37: 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 38: 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 38 data_policy_licence (cont.)

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

End of table

Table 39: 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 40: 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 41: 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 42: 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 43: 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 44: 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 45: 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 46: 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 47: 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 48: 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 49: 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 50: 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 51: 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 52: 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
value	int (pk)		coded value
description	varchar		decoded value / meaning of decoded value

End of table

Table 53: 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 54: observed_variable definition

element_name	kind	external_table	description
variable	int(pk)		primary key for table

Continued on next page

Table 54 observed_variable (cont.)

element_name	kind	external_table	description
parameter_group	varchar		parameter group (e.g. temperature, pressure) that this variable belongs to
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 55: 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 56: 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 57: observing_programme definition (WIGOS 2-02)

element_name	kind	external_table	description
observing_programme	int(pk)		primary key for table

Continued on next page

Table 57 observing_programme (cont.)

element_name	kind	external_table	description
abbreviation	varchar		Commonly used abbreviation for observing programme (e.g. VOS)
description	varchar		Description or name of obsserving programme (e.g. Voluntary Observing Ships)
sponsor	varchar		primary sponsor of observing programme (e.g. JCOMM)

End of table

Table 58: 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 59: 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 60: processing_code definition

element_name	kind	external_table	description
code	int (pk)		primary key for table

Continued on next page

Table 60 processing_code (cont.)

element_name	kind	external_table	description
abbreviation	varchar		abbreviation for processing code
description	varchar		description / meaning of processing code

End of table

Table 61: 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 62: 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 63: 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 64: 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

Continued on next page

Table 64 profile_configuration_codes (cont.)

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

End of table

Table 65: 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 66: 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 67: qc_method definition

element_name	kind	external_table	description
method	int (pk)		Primary key for table

Continued on next page

Table 67 qc_method (cont.)

element_name	kind	external_table	description
description	varchar		Description of method
originator	varchar		Originator (person / institute) of QC scheme / method
reference	varchar		DOI or reference for method

End of table

Table 68: 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 69: 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 70: 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 71: 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

Continued on next page

Table 71 report_processing_level (cont.)

element_name	kind	external_table	description

End of table

Table 72: 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 73: 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 74: 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 75: 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 dataum

End of table

Table 76: 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 77: 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 78: 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 if relevant for

Continued on next page

Table 78 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 79: 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 80: 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 81: source_format definition

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

Continued on next page

Table 81 source_format (cont.)

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

End of table

Table 82: 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 83: 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 84: station_configuration_codes definition

element_name	kind	external_table	description
field_id	varchar (pk)	station_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 85: 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 86: 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 87: 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 88: 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 89: 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 90: 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 91: 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 92: 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)

End of table

Table 93: 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 94: update_frequency definition

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

End of table

Table 95: 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 96: 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 97: 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 (NVSRF)
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 98: 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 98 automation_status (cont.)

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

End of table

Table 99: 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 100: 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 100 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 100 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 101: 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 102: 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 102 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 102 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	$$log_{10}\frac{p_0}{p_s} = \frac{K_p H_p}{T_{mv}}$$ 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	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)	$$W = 0.836 * F^{\frac{3}{2}}$$ where F = Wind speed in Beaufort scale; W = wind speed in m/s.	NA

Continued on next page

Table 102 conversion_method (cont.)

method	variable	description	implementation	reference
3	108	Wind speed value in Beaufort scale converted to metres per second (m/s)	$W = 0.836 * F^{\frac{3}{2}}$ where F = Wind speed in Beaufort scale; W = wind speed in m/s.	NA
3	109	Wind speed value in Beaufort scale converted to metres per second (m/s)	$W = 0.836 * F^{\frac{3}{2}}$ where F = Wind speed in Beaufort scale; W = wind speed in m/s.	NA
4	106	Wind direction from 32 point compass	Wind direction converted from 32 point compass, mid point used (see observation_code_table 1, GLAMOD wind32)	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	$SD = SD\_orig * 0.1$ where SD is the converted snow depth and SD_orig the original value.	NA
7	58	Conversion from hPa to Pa	$P = P\_orig * 100$	NA

End of table

Table 103: 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 104: 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 104 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/)

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Table 104 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 104 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 104 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

End of table

Table 105: data_present codes

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

End of table

Table 106: 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 107: 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	
15	mixed frequency	

End of table

Table 108: 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

End of table

Table 109: homogenisation_method codes

method	description	reference
0	NA	NA

End of table

Table 110: homogenisation_operator codes

operator	symbol	description
0	NA	NA

End of table

Table 111: 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	ICOADS other
9	ICOADS unknown
10	ICOADS composite
11	Oceangraphic platform / cruise number
12	Other buoy number (e.g. Argo)
13	C3S 311a Lot 2 Internal

End of table

Table 112: 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

Continued on next page

Table 112 instrument_exposure_quality (cont.)

exposure	description
3	Class 3 - Exposure of instrument leads to increased uncertainty or occasional invalid measurements
4	Class 4 - Exposure of instruemnt leads to high uncertainty or regular invalid measurements
5	Class 5 - Exposure of instrument leads to invalid measurements

End of table

Table 113: kind codes

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

End of table

Table 114: 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
13	LORAN
14	Meteosat DCP
15	Orbcomm
16	Surveyed

End of table

Table 115: 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 116: 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 117: method_of_estimating_uncertainty codes

method	description	reference
0	NA	NA

End of table

Table 118: 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 118 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 118 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 118 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 118 observation_code_table (cont.)

code_table	code_table_scheme	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 118 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 118 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 118 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 INTERMITTENT 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 intermittent 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 intermittent 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 118 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 118 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 log (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

Continued on next page

Table 118 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 hall
0	BUFR	0 20 003	Present weather	285	Precipitation of snow pellets or small hail, with rain

Continued on next page

Table 118 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 hall, 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 miss-ing, but expected
0	BUFR	0 20 003	Present weather	511	Missing value
1	GLAMOD	wind32	Wind direc-tion using 32 point compass	0	Still, no wind
1	GLAMOD	wind32	Wind direc-tion using 32 point compass	1	(5.625 to 16.875 degrees true; 11.25)
1	GLAMOD	wind32	Wind direc-tion using 32 point compass	2	NNE (16.875 to 28.125 degrees true; 22.5)

Continued on next page

Table 118 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 118 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)

Continued on next page

Table 118 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 118 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 119: 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

End of table

Table 120: 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. 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
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. Dz) where K is the extinction coefficient [km-1] and Dz the vertical path [km]

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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 to-tal 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
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 conduc-tivity	km	TBD
13	albedo			blue ice and snow albedo	percent	TBD

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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
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 amout	Okta	low or (if low clouds don’t exist) middle cloud amount

Continued on next page

Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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 evapotran-spiration	mm day-1	Quantity of water evaporated from the soil and plants when the ground is at its natural moisture content.
32	evaporation	atmospheric		real evapo-transpiration	mm day-1	TBD
33	humidity	atmospheric		absolute hu-midity	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 temper-ature 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 tem-perature	K	TBD
38	humidity	atmospheric	surface; upper-air	relative hu-midity	percent	TBD

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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
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 instensity liquid	mm h-1	Precipitation intensity at surface (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

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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 temperature barometer	K	temperature of the adjunct thermometer to the barometer to reduce pressure to 0 degC
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 tendency	Pa	pressure tendency
60	pressure	atmospheric	surface	pressure tendency characteristics	coded	characteristic of pressure tendency (used in synoptic maps)
61	radiation	atmospheric		diffuse radiation	W m-2	TBD
62	radiation	atmospheric		downward longwave irradiance 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 radiation at the Earth surface

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
64	radiation	atmospheric		downward shortwave irradiance at toa	W m-2	Flux density of the solar radiation at the top of the atmosphere
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

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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.
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 irradi-ance at Earth surface	W m-2	Flux density of terrestrial radiation emitted by the Earth surface
80	radiation	atmospheric		upward long-wave irradi-ance at TOA	W m-2	Flux density of terrestrial radiation emitted by the Earth surface and the gases, aerosols and clouds ot 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 spec-tral 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)

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Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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
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

Continued on next page

Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
94	temperature	atmospheric		soil temperature	K	Lot 1 is using Ts - WMO abbrev.
95	temperature	oceanic	surface; subsurface	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.
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 phomenon (w)
101	weather	atmospheric	surface	past weather 2	coded	past weather 2 - most frequent phomenon (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

Continued on next page

Table 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
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.)
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 120 observed_variable (cont.)

variable	parameter_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 120 observed_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
116				frost point temperature	K	TBD
117	pressure	atmospheric	surface; upper air	geopotential height	m	height of a standard or significant pressure level in meters
118	pressure	atmospheric	surface; upper air	geopotential height decameters	decametres	height of a standard or significant pressure level in decameters
119	temperature	atmospheric	surface; upper air	vertical gradient of temperature	K m-1	vertical variation of temperature
120	temperature	atmospheric	surface; upper air	vertical gradient of potential temperature	K m-1	vertical variation of potential temperature
121	temperature	atmospheric	surface; upper 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; upper air	vertical speed of radiosonde	m s-1	vertical speed of radiosonde ascent

End of table

Table 121: 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 122: observing_method codes

method	description
0	Measured
1	Estimated
2	Computed

End of table

Table 123: 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 123 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 Shipboard Aerological Program	WMO/GOS
19	BSRN	Baseline Surface Radiation Network	WMO/GAW & GCOS

Continued on next page

Table 123 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 Shipboard 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 123 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 123 observing_programme (cont.)

observing_programme	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 Observing Network	WMO/GOS
50	RBSN	Regional Basic Synoptic Network	WMO/GOS
51	TAO	Tropical Atmosphere and Ocean Array	NOAA; GCOS
52	SKYNET	Aerosol -cloud-radiation interaction in the atmosphere project	WMO/GAW
53	SibRad	NA	WMO/GAW
54	SOOP	Ship of Opportunity	JCOMM ; WMO/GOS
55	U.S. IOOS	United States Integrated Ocean Observing System	(National - USA)
56	VOS	Voluntary Observing Fleet	JCOMM ; WMO/GOS
57	VOSCLIM	Voluntary Observing Fleet (VOS) Climate Project	JCOMM ; WMO/GOS
58	WRAP	Worldwide Recurring ASAP Project	JCOMM ; WMO/GOS

End of table

Table 124: platform_sub_type codes

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

Continued on next page

Table 124 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
63	0		Synoptic network
64	7		Local Network
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)

Continued on next page

Table 124 platform_sub_type (cont.)

sub_type	platform_type	abbreviation	description
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)
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

Continued on next page

Table 124 platform_sub_type (cont.)

sub_type	platform_type	abbreviation	description
104	6		Ice mass balance buoy

End of table

Table 125: 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 126: processing_code codes

index	processing_code	abbreviation	description
0	NA	NA	NA

End of table

Table 127: 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.
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 128: product_level codes

level	description
0	NA

End of table

Table 129: product_status codes

status	description	extended_description
0	NA	NA

End of table

Table 130: 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 131: 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 131 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 132: profile_type codes

type	description
0	Atmospheric
1	Oceanographic
2	Soil
3	Snow

End of table

Table 133: qc_method codes

method	description	reference	
0	TBD	TBD	TBD

End of table

Table 134: quality_flag codes

flag	description
0	Passed
1	Failed
2	Not checked
3	Missing

End of table

Table 135: 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 136: report_processing_codes codes

code	abbreviation	description
0	TBD	TBD

End of table

Table 137: report_processing_level codes

level	abbreviation	description
0	TBD	TBD

End of table

Table 138: report_type codes

type	abbreviation	description
0	SYNOP	NA
1	TEMP	NA
2	CLIMAT	NA

End of table

Table 139: 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.
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.

Continued on next page

Table 139 role (cont.)

role	description	
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
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 140: 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 141: sea_level_datum codes

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

End of table

Table 142: secondary_variable codes

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

Continued on next page

Table 142 secondary_variable (cont.)

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

Continued on next page

Table 142 secondary_variable (cont.)

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

Continued on next page

Table 142 secondary_variable (cont.)

variable	variable_name	value	symbol	description
0	atmospheric constituent	44	SO2	Sulphur dioxide
0	atmospheric constituent	45	SO2	Sulphur dioxide (Total column)

End of table

Table 143: 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 143 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 143 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 143 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 amd 4531)
SWW	sensor type - present weather	present weather	2		Automatic, omitted (no observation, 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 observation, data not available)
SWW	sensor type - present weather	present weather	6		Manned, omitted (no significant phenomenon to report)

End of table

Table 144: 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 144 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 calibtation
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 144 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 chnage 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 144 sensor_configuration_fields (cont.)

field_id	field_name	parameter	type	description
MNTDATE	maintenance date	all	3	Date when maintenance performed (use MTNCE to summarise activites 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 145: 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 145 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 145 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 146: 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 147: source_format codes

format	description
0	ASCII (comma separated values)
1	IMMA

End of table

Table 148: 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)
3	Mesoscale - An area or volume of 3 km to 100 km horizontal extent (for example, thunderstorms, sea and mountain breezes)

Continued on next page

Table 148 spatial_representativeness (cont.)

representativeness	description
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 km2

End of table

Table 149: standard_time codes

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

End of table

Table 150: 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 150 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)

End of table

Table 151: 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 151 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)

End of table

Table 152: station_type codes

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

End of table

Table 153: 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 153 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 REPUBLIC
56	country	DE	DEU	GERMANY
57	country	DJ	DJI	DJIBOUTI

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Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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	GIBRALTAR
83	country	GL	GRL	GREENLAND
84	country	GM	GMB	GAMBIA
85	country	GN	GIN	GUINEA

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Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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
113	country	JP	JPN	JAPAN

Continued on next page

Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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	LBY	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
142	country	MH	MHL	MARSHALL ISLANDS

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Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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
170	country	NZ	NZL	NEW ZEALAND

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Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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
198	country	SH	SHN	SAINT HELENA, ASCENSION AND TRISTAN DA CUNHA

Continued on next page

Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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
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
226	country	TW	TWN	TAIWAN, PROVINCE OF CHINA
227	country	TZ	TZA	TANZANIA, UNITED REPUBLIC OF

Continued on next page

Table 153 sub_region (cont.)

sub_region	type	code	alpha_3_code	name
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
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

End of table

Table 154: 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 155: time_reference codes

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

End of table

Table 156: traceability codes

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

End of table

Table 157: uncertainty_method codes

method	description	reference
0	TBD	TBD

End of table

Table 158: uncertainty_type codes

uncertainty_type	name	description
TBD	TBD	TBD

End of table

Table 159: 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

Continued on next page

Table 159 units (cont.)

units	name	abbreviation	base_units
131	hour	h	NULL
132	day	d	NULL
150	tonne	t	NULL
160	electron	eV	EV
161	atomic	unit	u
170	astronomic	AU	ASU
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

Continued on next page

Table 159 units (cont.)

units	name	abbreviation	base_units
522	centibars per 12 hours	h	h
523	dekapascal	daPa	NULL
530	hectopascal	hPa	NULL
531	hectopascals per second	s-1	HPAL/S
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 kilogram	g/kg	NULL
621	grams per kilogram per second	g kg-1 s-1	NULL
622	kilograms per kilogram	kg/kg	NULL
623	kilograms per kilogram 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	mm6 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

Continued on next page

Table 159 units (cont.)

units	name	abbreviation	base_units
731	metres per second	m/s	NULL
732	metres per second per metre	m s-1/m	NULL
733	metres per second per 1000 metres	m s-1/km	NULL
734	square metres	m2	NULL
735	square metres per second	m2/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 second squared	m s-2	NULL
761	square metres second	m2 s	NULL
762	square metres per second squared	m2 s-2	NULL
763	square metres per radian second	m2 rad-1 s	NULL
764	square metres per hertz	m2/Hz	NULL
765	cubic metres	m3	NULL
766	cubic metres per second	m3/s	NULL
767	cubic metres per cubic metre	m3 m-3	NULL
768	metres to the fourth power		NULL
769	metres to the two thirds power per second	m2/3 s-1	NULL

Continued on next page

Table 159 units (cont.)

units	name	abbreviation	base_units
772	logarithm per metre	log (m-1)	NULL
773	logarithm per square metre	log (m-2)	NULL
775	kilograms per metre	kg/m	NULL
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 kilogram 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 m2 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

Continued on next page

Table 159 units (cont.)

units	name	abbreviation	base_units
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
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

End of table

Table 160: update_frequency codes

frequency	description
0	Irregular
1	Daily
2	Weekly
3	Monthly
4	Annual

End of table

Table 161: z_coordinate_method codes

method	description
0	Value from chart

End of table

Continued on next page

Table 162 z_coordinate_type (cont.)

type	description

Table 162: z_coordinate_type codes

type	description
0	height (m) above sea level

End of table

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