Copernicus Climate Change Service

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Copernicus Climate Change Service - 311a Lot 2
Defining a Common Data Model

C3S_311a_Lot2_NUIM - Access to Observations from Global Climate Data Archives

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Summary

This document describes background information on the definition of a common data model for the representation of in situ observations as part of the C3S 311a activity.

A draft data model is proposed.

Call participants are requested to:

- Review the proposed data model, specifically tables 3 - 7.
- Review the configuration field tables and suggest modifications, additions and deletions.
- Review the configuration code tables and suggest modifications, additions and deletions.
- Review the code tables and propose / identify where an existing table (e.g. BUFR code table) and be used in replacement.

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

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

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1 Introduction

The Copernicus Climate Change Service (C3S), through its ”Collection and Processing of In Situ Observations (C3S 311a)” tender, seeks to harmonise both data formats and metadata (discovery and observational) conventions. The first step of this process, as noted within the invitation to tender, is the development or adoption of a common data model[1] for the data and metadata. Within this document, when complete, we will describe the common data model developed within Lot(s) 1 - 4 of the C3S 311a tender in consultation with ECMWF. The themes for the Lots 1 - 4 are:

- Lot 1 - Coordination of data rescue activities
- Lot 2 - Access to observations from global climate data archives
- Lot 3 - Access to observations from baseline and reference networks
- Lot 4 - Climate monitoring products for Europe based on in situ observations.

Lot 1 (C3S DRS) are building a new data portal, developed based on two existing efforts: the WMO I-DARE portal and the EU FP 7 ERA-CLIM 2 data registry. New and enhanced data tools and techniques rescugin / digitising data will also be developed. Lot 1 includes a small data rescue component focused on three regions in the Southern Hemisphere in and around Argentina, South Africa and in the New Zealand to Drake Passage sector, and will link to other data rescue efforts including ACRE, IEDRO and ICA&D. Lot 1 will deal with the full range of historical terrestrial and marine surface weather observations plus upper air data and have the capacity to deal with their metadata (including a compendium of all data forms/templates these data are recorded on), scanned images of hard copy data, and weather and analogue (pluviograms, thermograms, barograms etc) charts etc.

Within Lot 2, observations and metadata from land stations and marine platforms will be harmonised into a common data model and a web based service developed to serve the data through the C3S Climate Data Store (CDS). The observations include instantaneous / point observations, such as those from SYNOP weather reports, as well as daily and monthly summaries (CLIMAT DAILY and CLIMAT). A single report may contain observations of multiple parameters, e.g. air temperature, humidity, wind speed etc. The data sources include land stations,merchant ships, drifting buoys and other marine platforms. As part of Lot 2 as common data model (CDM) will be developed in collaboration with the other Lots. The aim is to make this compliant with the ISO19115 Satandard and WIGOS Metadata Standard and be compatible with the ODB database / data model developed by ECMWF.

Lot 3 will create a harmonised observational dataset of measurements from the Global Baseline and Reference radiosounding networks. Within the first year observations are restricted to temperature and humidity measurements, in future years this will be expanded to include other essential climate variables (surface temperature, wind, ozone, trace gases, GPS IWV). Observations from the GRUAN and GUAN networks will be the main focus, but with potential extension to the broader RAOB program. Annual updates will be provided. Integrated physical and statistical corrections will be used to improve the quality of the baseline observations using the data from the reference networks. Lot 3 intend to be fully compliant with ECMWF Observations DataBase (ODB) version 2 (ODB2), noting that some changes will be necessary to ODB2 to report the full range of information required. Discovery metadata are planned to be compliant with ISO 19115 and observational metadata reported using the CF conventions. Compliance with the WIGOS metadata standard is also expected.

Lot 4 will build on and extend the European Climate Assessment and Dataset (ECA&D) project and E-OBS daily dataset for Europe. The gridded E-OBS dataset was initially developed as part of the ENSEMBLES project

[1] From 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.

for statistical comparisons with Regional Climate Model output (Haylock et al., 2008). More recently European research projects EURO4M, UERRA, EUPORIAS, EUSTACE, and CLIPc led to further improvements and applications, and ECA&D/E-OBS have now become reference datasets for a larger user community, extending beyond climate research. Funding by EUMETNET and KNMI supported the developments of additional functionality, and the close collaboration with EUMETNET members has led to strongly improved ECA&D station coverage over Europe in recent years. Within C3S_311a lot 4, the ECA&D and E-OBS will be transformed into an operational system for the Copernicus Climate Change Service (C3S), delivering regularly updated gridded products based on European in situ data for many Essential Climate Variables (ECVs). The underlying station data that include surface air temperature, precipitation, humidity, wind speed and direction, will be made available as well, pending permission by the owners of these data. To serve climate change monitoring and climate impact assessments a large number of user-oriented climate indices will be provided, both as time series at station sites and as gridded products. No preference has been specified for the data models to be used.

Section 2 of this report provides background information on joint activities between Lots 2 and 3 so far, the ECMWF Observations DataBase (ODB) data model and relevant WMO data models. Section 3 gives an overview of the preferred data model from Lot 2 and proposes a list of elements for the observations table. Auxiliary tables are also proposed in Section 3 but left empty for future discussion once the principles of the type of data model have been agreed across lots. Section 4 proposes a governance mechanism for the common data model across lots and next steps required.

2 Background and existing standards

2.1 ODB and tenders for Lots 2 and 3

Both Lots 2 and 3 have proposed using data models based on the data model developed by ECMWF as part of the Observations DataBase (ODB) software. Within the ODB type data model each observation of a single parameter is stored as a separate record, with a single report spanning multiple records. Within each record the station / report information is repeated. A simplified example is shown in Table 1.

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

The implementation of the ODB model at ECMWF, that proposed in Lots 2 and 3 all have differing requirements. For example, the existing observations table columns defined within ODB[2] contain many parameters that are of

[2] http://apps.ecmwf.int/odbgov/column/

little relevance to the In Situ observations but are relevant to the assimilation of data from many different sources into the numerical models. Conversely, there are many parameters included in the data from Lots 2 and 3 that are required to correctly interpret the observations but that are not included in ODB.

In order to facilitate the development of the data model there have been two initial teleconferences between Lots 2 and 3 discussing the CDM and collating information on the parameters required . Each parameter and report type has its own unique set of fields and metadata fields. For example, surface air temperature observations are typically made in a screen or shelter that can influence the quality of the measurements. As a result, it is desirable to include information on the screen type, material and dimensions alongside the observation. For upper air temperature observations this metadata information is not relevant but other parameters will be required, such as the type of balloons used, instrument type and burst point.

In order to represent the wide variety of metadata required across (and within) Lots four different solutions are possible:

- The observations table is expanded to include all possible metadata fields, with new columns added when a new data / report type is included.
- Each report (and possibly parameter) type has a separate observations table, with a minimum set of common parameters defined across the different tables.
- The observations table is defined to include the minimum set of information required for each observation and the metadata is then linked via a series of Entity-Attribute-Value (EAV) based tables (e.g. see Table 2).
- Similar to the EAV based approach, the minimum set of information required is included in the main observations table and the main observations table is linked to a series of metadata tables. These metadata tables then include the additional fields through the use of arrays indicating the field the metadata is for and storing the value of the metadata.

Within this document we are proposing to use solution (4), with the use of arrays to store metadata elements not common across all data types. Compared to the EAV approach, this requires fewer joins between tables and less duplication of entries, making the data model in principle more efficient. Solution (1) has been discounted as being impractical from an implementation perspective and from the perspective of adding new data types at a future date. Option (2) has not been discounted but will result in a series of data models being defined rather than a single unified data model.

Table 2: Simplified example for EAV type table for profile (atmospheric and oceanic) data.

report id	report type	field	value coded	value numeric
4	GRUAN	Ascent Balloon Number	1	NA
4	GRUAN	Ascent Balloon Type	1	NA
4	GRUAN	Ascent balloon weight (g)	NA	100.0

End of table

2.2 BUFR and WIGOS Metadata Standard

Prior to defining the data model it is useful to refer to both 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).

The BUFR format 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 should be referenced and used in preference to defining new code tables.

In recognition of the increasing importance of observational metadata the WMDS is currently under development and undergoing a phased implementation (WMO, 2015b). The WMDS forms an extension of 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 should be referenced, where appropriate, in preference to defining new code tables. Additionally, for compatibility with WIGOS the CDM should contain all mandatory elements of the WMDS.

3 Common Data Model

As noted above, we are proposing a data model based on the ODB type data model, but with the metadata linked / nested through a series of auxiliary / configuration tables. A schematic of this is shown in Figure 1 - a more complete schematic can be found at `https://github.com/glamod/common_data_model/blob/master/cdm_short.pdf`. The primary table, or data structure, containing the observations is defined by the ”observations_table” (Table 3). This table contains the information on the geospatial location of the observations (and station), date / time of the report, the observed parameter, source information; data licensing and usage permissions etc and links to additional metadata. The ”station_configuration” table (Table 4) contains detailed information on the station reporting the data including: institute operating the station; the type of station; station / AWS model type; location; operating territory; reporting frequency etc. The ”source_configuration” table (Table 5) 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. The ”profile_configuration” table (Table 6) contains detailed metadata for atmospheric and oceanic profiles, including: profile type; type of launcher; direction of profile; balloon / XBT type etc; The ”sensor_configuration” table (Table 7) 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;

Whilst Figure 1 and Tables 3 - 7 show the data model from a relational database perspective the same data model could be represented in XML. A simplified XML example of this is shown in Figure 2. For readability the majority of elements have been omitted, with a few example elements and nested data structures retained. In this example, the records from the configuration tables are nested within the entries for the respective records from the observations_table.

Within the following tables the following syntax has been used to indicate the data type for the different elements:

- numeric: Any numeric value (integer or floating point).
- int: An integer value.
- varchar: A variable length character string.
- timestamp: A timestamp, e.g. ”2017-07-01 00:00:0.0+00”.
- []: An array of the indicated type.

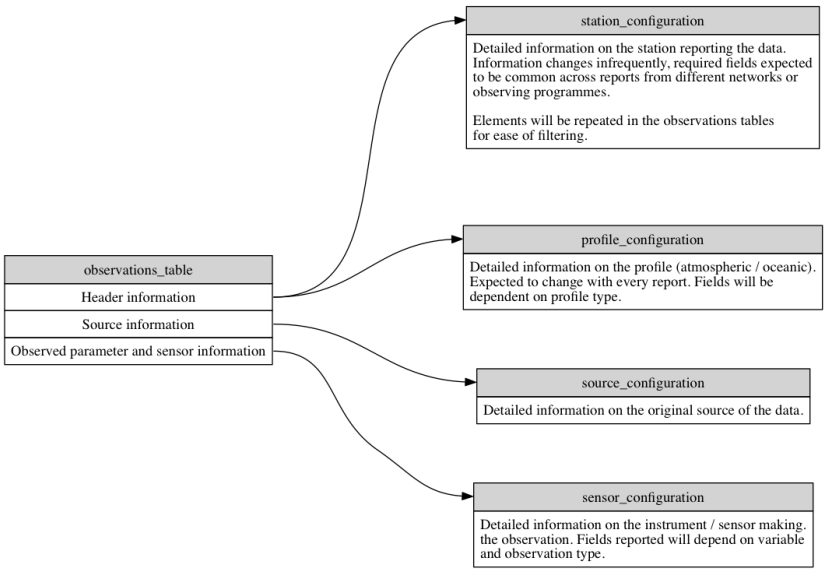

Figure 1: Simplified schematic showing overview of common data model

- (fk) The indicated value is also a foreign key linking to another table.

```
<observations_table>
    <report>
        <report_id type="integer"/>
        <region type="integer"/>
        <sub_region type="integer"/>
        <application_area type="array"></application_area>
        <observing_programme type="array"></observing_programme>
        <report_type type="integer"/>
        <station_name type="string"/>
        ...
        ...
        <station_configuration>
            <station_primary_id type="string"/>
            <station_primary_id_scheme type="integer"/>
            ...
            ...
            <field_numeric type="array"></field_numeric>
            <value_numeric type="array"></value_numeric>
              ...
        </station_configuration>
        ...
        ...
    </report>
    <report>
     ...
    </report>
</observations_table>
```

Figure 2: Truncated / simplified XML example of data model defined in Tables 3 - 7.

3.1 Observations table

Table 3: observations_table

element_number	element_name	kind	external_table	description
1	report_id	int (pk)		Unique ID for report (unique ID given by combination of RecordID and ObservationID)
2	region	int (fk)	region	Region (WMO region / Ocean basin)
3	sub_region	int (fk)	sub_region	Country / regional sea
4	application_area	int[] (fk)	application_area	WMO application area(s)
5	observing_programme	int[] (fk)	observing_programme	Observing programme, e.g. VOS
6	report_type	int (fk)	report_type	e.g. SYNOP, TEMP, CLIMAT, etc
7	station_name	varchar		e.g. GRUAN station name, ship name, site name etc
8	station_type	int (fk)	station_type	Type of station, e.g. land station, sea station etc
9	platform_type	int (fk)	platform_type	Structure upon which sensor is mounted, e.g. ship, drifting buoy, tower etc
10	platform_sub_type	int (fk)	platform_sub_type	Sub-type for platform, e.g. 3m discuss buoy
11	primary_station_id	varchar		Primary station identifier, e.g. WIGOS ID
12	primary_station_id_scheme	int (fk)	id_scheme	Scheme used for station ID
13	secondary_station_id	varchar		Alternate (e.g. local) ID for station
14	secondary_station_id_scheme	int (fk)	id_scheme	Alternate ID Scheme, e.g. Network ID
15	station_location_longitude	numeric		Longitude of station, -180.0 to 180.0 (or other as defined by station_crs)
16	station_location_latitude	numeric		Latitude of station, -90 to 90 (or other as defined by station_crs)
17	station_location_accuracy	numeric		Accuracy to which station location recorded (radius in km)
18	station_location_method	int(fk)	location_method	Method by which location determined
19	station_location_quality	int (fk)	location_quality	Quality flag for station location
20	station_crs	int (fk)	crs	Coordinate reference scheme for station location
21	station_speed	numeric		Station speed over ground if mobile (m/s)
22	station_course	numeric		Station course over ground if mobile (degree true)
23	station_heading	numeric		Station heading if mobile
27	station_configuration	int (fk)	station_configuration	Link to station metadata / configuration
28	height_of_station_above_local_ground	numeric		Height of station above local ground (m)

Continued on next page

Table 3 observations_table (cont.)

element_number	element_name	kind	external_table	description
29	height_of_station_above_sea_level	numeric		Height of station above mean sea level (m), negative values for below sea level.
30	height_of_station_above_sea_level_accuracy	numeric		Accuracy to which height of station known (m)
31	sea_level_datum	int (fk)	sea_level_datum	Datum used for sea level
32	report_meaning_of_time_stamp	int (fk)	meaning_of_time_stamp	Report time - beginning, middle or end of reporting period
33	report_year	int		Year of report (UTC)
34	report_month	int		Month of report (UTC)
35	report_day	int		Day of report (UTC)
36	report_hour	int		Hour of report (UTC)
37	report_minutes	int		Minute of report (UTC)
38	report_seconds	int		Seconds of report (UTC)
39	report_duration	int		Report duration (s), e.g. 86400 = daily obs, 3600 hourly etc
40	report_time_accuracy	numeric		Precision to which time was recorded (s)
41	report_time_quality	int (fk)	time_quality	Quality flag for ReportDateTime
42	report_time_reference	int (fk)	time_reference	Reference Time (e.g. referenced to time server, atomic clock, radio clock etc)
43	profile_configuration	int (fk)	profile_configuration	Information on profile (atmospheric / oceanographic) configuration. Set to Record ID for profile data or missing (NULL) otherwise.
44	events_at_station	int[] (fk)	events_at_station	e.g. ship hove to, crop burning etc.
45	report_quality	int (fk)	quality_flag	Overall quality of report
46	duplicate_status	int (fk)	duplicate_status	E.g. no duplicates, best duplicate, duplicate, not checked.
47	duplicates	int[] (fk)	observations_table	Array of report_id's for duplicates
48	maintenance_and_update_frequency	int (fk)	update_frequency	Frequency with which modifications and deletions are made to the data after it is first produced
49	history	varchar		Sequence of processing steps. Free text with timestamp 1 : history 1; timestamp 2 : history 2 etc.
50	record_year	int		Year of revision of this record (UTC)
51	record_month	int		Month of revision of this record (UTC)
52	record_day	int		Day of revision of this record (UTC)
53	record_hour	int		Hour of revision of this record (UTC)

Continued on next page

Table 3 observations_table (cont.)

element_number	element_name	kind	external_table	description
54	record_minute	int		Minute of revision of this record (UTC)
55	record_seconds	int		Seconds of revision of this record (UTC)
56	processing_level	int (fk)	report_processing_level	Level of processing applied to this report
57	processing_codes	int[] (fk)	report_processing_codes	Processing applied to this report
58	source_id	int (fk)	source_configuration	Original source of data link to table
59	source_record_id	varchar		Record ID in source data, e.g. ID of event from GRUAN meta database
60	data_policy_licence	int (fk)	data_policy_licence	WMOessential, WMOadditional, WMOother
61	observation_id	int (pk)		Together with RecordID forms unique ID for observation / record
62	observed_variable	int (fk)	observed_variable	The variable being observed / measured
63	units	int (fk)	units	Units for the observed variable
64	code_table	int (fk)	observation_code_table	Encode / decode table for variable (if encoded)
65	observation_value	numeric		The observed value
66	observation_value_significance	int (fk)	observation_value_significance	e.g. min, max, mean, sum
67	observation_timestamp_meaning	int (fk)	meaning_of_time_stamp	beginning, middle, end
68	observation_year	int		Year ofobservation (UTC)
69	observation_month	int		Month of observation (UTC)
70	obvservation_day	int		Day of observation (UTC)
71	observation_hour	int		Hour of observation (UTC)
72	observation_minute	int		Minutes of observation (UTC)
73	observation_seconds	int		Seconds of observation (UTC)
74	observation_duration	int		Duration/period over which observation was made (s)
75	observation_longitude	numeric		Longitude of the observed value, -180 to 180 (or other as defined by CRS)
76	observation_latitude	numeric		Latitude of the observed value, -90 to 90 (or other as defined by CRS)
77	observation_location_method	int (fk)	location_method	Method of determining location,
78	observation_location_precision	numeric		Precision to which location is reported (radius km)

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Table 3 observations_table (cont.)

element_number	element_name	kind	external_table	description
79	observation_bounding_box_min_longitude	numeric		Bounding box for observation, valid range given by CRS
80	observation_bounding_box_max_longitude	numeric		Bounding box for observation, valid range given by CRS
81	observation_bounding_box_min_latitude	numeric		Bounding box for observation, valid range given by CRS
82	observation_bounding_box_max_latitude	numeric		Bounding box for observation, valid range given by CRS
83	observation_spatial_representativeness	int (fk)	spatial_representativeness	Spatial representativeness of observation
84	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.
85	observation_z_coordinate	numeric		z coordinate of observation
86	observation_z_coordinate_type	int (fk)	z_coordinate_type	Type of z coordinate
87	observation_z_coordinate_method	int (fk)	z_coordinate_method	Method of determining z coordinate
88	quality_flag	int (fk)	quality_flag	Quality flag for observation
89	numerical_precision	int		Reporting precision of observation in units given by 'units' variable. Equivalent to BUFR scale factor
90	standard_uncertainty	numeric		Standard uncertainty in reported value
91	method_of_estimating_standard_uncertainty	int (fk)	method_of_estimating_uncertainty	Method of estimating the standard uncertainty
92	uncertainty_due_to_correlated_errors	numeric		Uncertainty due to errors in the observation that are correlated between observations, e.g. due to sensor housing
93	method_of_estimating_uncertainty_due_to_correlated_errors	int (fk)	method_of_estimating_uncertainty	NA
94	uncertainty_due_to_uncorrelated_errors	numeric		Uncertainty due to errors in the observation that are uncorrelated between observations, e.g. due to sensor noise / small scale variability

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Table 3 observations_table (cont.)

element_number	element_name	kind	external_table	description
95	method_of_estimating_uncertainty_due_to_uncorrelated_errors	int (fk)	method_of_estimating_uncertainty	NA
96	uncertainty_due_to_systematic_errors	numeric		Uncertainty due to errors in the observations that are correlated under similar observing conditions
97	method_of_estimating_uncertainty_due_to_systematic_errors	int (fk)	method_of_estimating_uncertainty	NA
98	total_uncertainty	numeric		Sum of uncertainty terms added in quadrature
99	method_of_estimating_total_uncertainty	int (fk)	method_of_estimating_uncertainty	NA
100	sensor_id	int (fk)	sensor_configuration	NA
101	sensor_automation_status	int (fk)	automation_status	Automated, manual, mixed or visual observation
102	exposure_of_sensor	int (fk)	instrument_exposure_quality	Whether the exposure of the instrument will impact on the quality of the measurement
103	original_precision	int		Original reporting precision in units given by 'original_units'
104	original_units	int (fk)	units	Original units
105	original_value	numeric		Original value as reported or recorded in log book.
106	conversion_method	int (fk)	conversion_method	Link to table describing conversion process
107	processing_code	int[] (fk)	processing_code	e.g. TRC (temperature radiation corrections) etc. Encoded in table.
108	processing_level	int (fk)	processing_level	Level of processing applied to observation.
109	adjustment_id	int (fk)	adjustment	Adjustment applied to observation reported in observation value (observation_value = original + adjustment)
110	traceability	int (fk)	traceability	Whether observation can be traced to international standards.
111	advanced_qc	int (fk)	NA	Whether there are advanced qc data available for this observation in qc_records table
112	advanced_uncertainty	flag	NA	Whether there are advanced uncertainty estimates for this observation in the uncertainty_budget table

End of table

3.2 Station configuration table

Table 4: station_configuration

element_number	element_name	type	external_table	description
0	station_primary_id	varchar		Primary (e.g. WMO) ID for station
1	station_primary_id_scheme	int (fk)	id_scheme	Scheme used for primary ID
2	station_record_number	int		Record number for this station entry
3	station_secondary_id	varchar		Secondary (e.g. local) ID for station
4	station_secondary_id_scheme	int (fk)	id_scheme	Scheme used for secondary ID
5	station_name	varchar		Name of station (e.g. Tateno)
6	station_abbreviation	varchar		Abbreviation of station name (e.g. TAT)
7	start_date	timestamp		Date that the station first started reporting in this configuration
8	end_date	timestamp		Last data the station reported in this configuration
9	station_type	int (fk)	station_type	Type of reporting station
10	platform_type	int (fk)	platform_type	Generic type of observing platform
11	platform_sub_type	int (fk)	platform_sub_type	Specific type of observing platform
12	operating_institute	int (fk)	institute	Institute operating the station
13	operating_territory	int (fk)	sub_region	Sub-region where station is located or country of registry for mobile station
14	observing_frequency		observing_frequency	Typical frequency of observations for this station
15	telecommunication_method	int (fk)	communication_method	Method used to report observations
16	station_automation	int (fk)	automation_status	Whether station is automated, manual or mixed
17	measuring_system_model	int (fk)	measuring_system_model	Station / AWS model type
18	measuring_system_id	varchar		ID or serial number of measuring system
19	field_numeric	int[] (fk)	station_configuration_fields	Field to which following values correspond
20	value_numeric	numeric[]		Values for specified fields
21	field_coded	int[] (fk)	station_configuration_fields	Field to which following values correspond
22	value_coded	int[] (fk)	station_configuration_codes	Values for specified fields

Continued on next page

Table 4 station_configuration (cont.)

element_number	element_name	type	external_table	description
23	field_character	int[] (fk)	station_configuration_fields	Field to which following values correspond
24	value_character	varchar[]		Values for specified fields
25	field_timestamp	int[] (fk)	station_configuration_fields	Field to which following values correspond
26	value_timestamp	timestamp[]		Values for specified fields
27	comment	varchar		Any other comments / footnotes
28	city	varchar	NA	Nearest city / town to station location
29	local_gravity	numeric	NA	Local gravity at station location

End of table

3.3 Profile configuration table

Table 5: profile_configuration

element_number	element_name	kind	external_table	description
0	profile_id	varchar	NA	Unique ID for this profile entry
1	report_id	int (fk)	observations_table	Report to which this profile entry belongs
3	standard_time	int (fk)	standard_time	e.g. Standard / scheduled time for launch or report, e.g. 00, 06, 12, 18 UTC
4	actual_time	timestamp		Actual report / launch time
5	profile_number	numeric		e.g. Balloon Number
6	field_numeric	int[] (fk)	profile_configuration_fields	Fields to which the following values apply
7	value_numeric	numeric		Values for the additional fields
8	field_coded	int[] (fk)	profile_configuration_fields	Fields to which the following values apply
9	value_coded	int[] (fk)	profile_configuration_codes	Values for the additional fields
10	field_character	int[] (fk)	profile_configuration_fields	Fields to which the following values apply
11	value_character	varchar[]		Values for the additional fields
12	field_timestamp	int[] (fk)	profile_configuration_fields	Fields to which the following values apply
13	value_timestamp	timestamp[]		Values for the additional fields
14	comments	varchar		Any additional comments / footnotes

End of table

3.4 Source configuration table

Table 6: source_configuration

element_number	element_name	type	external_table	description
0	source_id	int		Unique record ID for dataset
1	product_id	varchar		ID for product
2	product_name	varchar		Name of source, e.g. International Comprehensive Ocean Atmosphere Data Set, RS92 GRUAN Data Product
3	product_code	varchar		Abbreviations / product code, e.g. ICOADS, RS92-GDP
4	product_version	varchar		Version number for dataset, e.g. Release 3.0.0
5	product_level	int (fk)	product_level	Level of product
6	description	varchar		Description of dataset / comments
7	product_references	varchar[]		References describing the dataset
8	product_citation	varchar[]		Citation to use when using this product
9	product_status	int (fk)	product_status	Status of product, draft, pre-release, release
10	source_format	int (fk)	source_format	Original format for data
11	source_format_version	varchar		Version of original data format
12	source_file	varchar		Filename for data from source
13	source_file_checksum	varchar		Checksum of source datafile
14	data_centre	int (fk)	institute	Data centre from which data sourced
15	data_centre_url	varchar		URL for data centre
16	data_policy_licence	int (fk)	data_policy_licence	Data policy / licence
17	pi_name	varchar		Name of PI responsible for dataset
18	pi_email	varchar		Email address of PI
19	pi_url	varchar		URL for PI
21	field_numeric	int[] (fk)	source_configuration_fields	Fields to which following values apply
22	value_numeric	numeric[]		additional values
21	field_coded	int[] (fk)	source_configuration_fields	Fields to which following values apply
22	value_coded	int[] (fk)	source_configuration_codes	additional values
21	field_character	int[] (fk)	source_configuration_fields	Fields to which following values apply
22	value_character	varchar[]		additional values

Continued on next page

Table 6 source_configuration (cont.)

element_number	element_name	type	external_table	description
21	field_timestamp	int[] (fk)	source_configur ation_fields	Fields to which following values apply
22	value_timestamp	timestamp[]		additional values
23	history	varchar		History of source
24	comments	varchar		Additional comments / footnotes
25	timestamp			Date record created / created

End of table

3.5 Sensor configuration table

Table 7: sensor_configuration

element_number	element_name	type	external_table	description
0	instrument_id	varchar		Unique ID for this instrument
1	station_id	varchar	station_configuration	Station associated with this instrument
2	observing_method	int (fk)	observing_method	Method (instrumental, estimated / visual, computed) by which observation made
3	sampling_strategy	int (fk)	sampling_strategy	Sampling strategy used by instrument
4	calibration_status	int (fk)	calibration_status	Whether the sensor is in / out of calibration
5	calibration_date	timestamp		Date of last calibration
6	field_numeric	int[] (fk)	sensor_configuration_fields	fields for which this entry is applicable
7	value_numeric	numeric[]		Numeric value for this entry (if numeric)
8	field_coded	int[] (fk)	sensor_configuration_fields	fields for which this entry is applicable
9	value_coded	int[] (fk)	sensor_configuration_codes	coded value for this entry
10	field_character	int[] (fk)	sensor_configuration_fields	fields for which this entry is applicable
11	value_character	varchar[]		Value for entry if not coded or numeric
12	field_timestamp	int[] (fk)	sensor_configuration_fields	fields for which this entry is applicable
13	value_timestamp	timestamp[]		time stamp entry
14	comments	varchar		additional comments for sensor not reportable elsewhere
15	date_start	timestamp		start date for period of validity associated with this entry
16	date_end	timestamp		end date for period of validity associated with this entry

End of table

4 Mapping to WIGOS metadata standard

To do ...

5 Mapping to INSPIRE

To do ...

6 Common Data Model governance

- Tables defining data model and decode tables stored in Git repository (`https://github.com/glamod/common_data_model/`).
- Whilst service in development data model updated / revised annually (modified / new elements in Tables 3 - 7).
- New entries to decode tables every 3 / 6 months (TBD).
- Changes made by consensus across Lots and with ECMWF.

7 References

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.

8 Appendix

8.1 Code tables

Table 8: adjustment

index	adjustment	report_id	observation_id	value	reason	reference
0	0	0	0	-0.123	Test value	DOI of paper / document describing adjustment methodology

End of table

Table 9: application_area (WIGOS Code Table 2-02)

index	application_area	description
0	1	Global numerical weather prediction (GNWP)
1	2	High-resolution numerical weather prediction (HRNWP)
2	3	Nowcasting and very short range forecasting (NVSRF)
3	4	Seasonal and inter-annual forecasting (SIAF)
4	5	General weather forecasting
5	6	Aeronautical meteorology
6	7	Ocean applications
7	8	Agricultural meteorology
8	9	Hydrology
9	10	Climate monitoring (as undertaken through the Global Climate Observing System, GCOS)
10	11	Climate applications
11	12	Space weather
12	13	Cryosphere applications
13	14	Energy sector
14	15	Transportation sector
15	16	Health sector
16	17	Terrestrial ecology
17	18	Operational air quality forecasting
18	19	Atmospheric composition forecasting
19	20	Atmospheric composition monitoring and analysis
20	21	Large urban complexes

End of table

Table 10: automation_status

index	automation_status	description
0	0	Automatic observation.
1	1	Automatic, always supplemented by manual input.
2	2	Automatic, occasionally supplemented by manual input.
3	3	Automatic, supplemented by manual observations.
4	4	Manual observation.
5	5	Unknown.
6	6	Visual observation.

End of table

Table 11: calibration_status (WIGOS Code Table 5-08)

index	calibration_status	description
0	0	No changes - in calibration.

Continued on next page

Table 11 calibration_status (cont.)

index	calibration_status	description
1	1	No changes - out of calibration.
2	2	No changes - calibration unknown.
3	3	Recalibrated - in calibration.

End of table

Table 12: communication_method

index	communication_method	description
0	0	Cellular (unspecified)
1	1	Meteosat DCP
2	2	Iridium (unspecified)
3	3	GOES DCP
4	4	VSAT (unspecified)
5	5	Landline telephone
6	6	Radio modem
7	7	E-mail (unspecified)
8	8	Voice (ship). The observation is sent to a NMS through the telephone network. The communication may use Inmarsat, Iridium, Vsat, VHF
9	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
10	10	Web (ship). The observation is sent through the Web (example: TurboWeb). The satellite communication provider may be Inmarsat, Iridium, Vsat
11	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	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	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	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	15	Automated Identification System (direct or through satellite)
16	16	Argos system

Continued on next page

Table 12 communication_method (cont.)

index	communication_method	description
17	17	Cellular (Dial-up). Dial-up communication using terrestrial wireless networks (GSM, GPRS)
18	18	Cellular (SMS). SMS sent through terrestrial wireless networks (GSM, GPRS)
19	19	Globalstar communication system
20	20	GMS (DCP). Data Collecting Platform of Geostationary Meteorological Satellites
21	21	Iridium (SBD). Short Burst Data service of Iridium communication system
22	22	Iridium (Email). Email sent through Iridium (e.g. Easymail)
23	23	Iridium (Dial-up). Dial-up communication using Iridium
24	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	25	Inmarsat-C (Email). Email sent through Inmarsat-C
26	26	Orbcomm communication system
27	27	Vsat (Email). Email sent through Vsat
28	28	Vsat (Dial-up). Dial-up communication using Vsat
29	29	Delayed Mode only
30	30	Other (specify in footnote).

End of table

Table 13: conversion_method

index	conversion	description	implementation	reference
0	0	Farenheit to degrees Celsius	T_Celsius = (T_Farenheit - 32) / 1.8	NA

End of table

Table 14: crs (BUFR Code Table 0 01 150)

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

End of table

Table 15: data_policy_licence (WIGOS Code Table 9-02)

index	data_policy_licence	name	description
0	1	WMOessential	WMO Essential Data: free and unrestricted international exchange of basic data and products.
1	2	WMOadditional	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.
2	3	WMOother	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.

End of table

Table 16: duplicate_status

index	duplicate_status	description
0	0	Unique observation, no known duplicates
1	1	Best duplicate
2	2	Worst duplicate

Continued on next page

Table 16 duplicate_status (cont.)

index	duplicate_status	description
3	3	Unchecked

End of table

Table 17: events_at_station (WIGOS Code Table 4-04 (Needs expanding for marine obs.))

index	events_at_station	description
0	1	Grass-cutting
1	2	Snow clearing
2	3	Tree removal
3	4	Construction activity
4	5	Road work
5	6	Biomass burning
6	7	Dust storm
7	8	Storm damage
8	9	Wind storm
9	10	Flood
10	11	Fire
11	12	Earthquake
12	13	Land slide
13	14	Storm surge or tsunami
14	15	Lightning
15	16	Vandalism

End of table

Table 18: id_scheme

index	id_scheme	description
0	0	ICOADS: ID present, but unknown type
1	1	ICOADS: ship, Ocean Station Vessel (OSV), or ice station callsign
2	2	ICOADS: generic ID (e.g., SHIP, BUOY, RIGG, PLAT)
3	3	ICOADS: WMO 5-digit buoy number
4	4	ICOADS: other buoy number (e.g., Argos or national buoy number)
5	5	ICOADS: Coastal-Marine Automated Network (C-MAN) ID (assigned by US NDBC or other organizations)
6	6	ICOADS: station name or number
7	7	ICOADS: oceanographic platform/cruise number
8	8	ICOADS: fishing vessel psuedo-ID
9	9	ICOADS: national ship number
10	10	ICOADS: composite information from early ship data
11	11	ICOADS: 7-digit buoy ID (proposed)
12	12	WIGOS ID

Continued on next page

Table 18 id_scheme (cont.)

index	id_scheme	description
13	13	GRUAN ID
14	14	IMO Number
15	15	National ID
16	16	WMO buoy / station number

End of table

Table 19: institute

index	institute	name	region	sub_region	address	contact	contact_email	URL
0	0	National Oceanography Centre	6	76	European Way, Southampton, UK, SO14 3ZH	Dr David I. Berry	dyb@noc.ac.uk	www.noc.ac.uk

End of table

Table 20: instrument_exposure_quality (WIGOS Code Table 5-15)

index	instrument_exposure_quality	description
0	1	Class 1 - Exposure of instrument allows reference level measurements
1	2	Class 2 - Exposure of instrument has small or infrequent influence on measurement
2	3	Class 3 - Exposure of instrument leads to increased uncertainty or occasional invalid measurements
3	4	Class 4 - Exposure of instruemnt leads to high uncertainty or regular invalid measurements
4	5	Class 5 - Exposure of instrument leads to invalid measurements

End of table

Table 21: location_method

index	location_method	description
0	0	Argos
1	1	ARGOS DOPPLER
2	2	ARGOS Kalman
3	3	Argos-3
4	4	Argos-4
5	5	From map
6	6	GALILEO
7	7	GOES DCP
8	8	GPS
9	9	INMARSAT
10	10	Iridium
11	11	Iridium and GPS
12	12	IRIDIUM DOPPLER
13	13	LORAN
14	14	Meteosat DCP
15	15	Orbcomm
16	16	Surveyed

End of table

Table 22: location_quality

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

End of table

Table 23: meaning_of_time_stamp

index	meaning_of_time_stamp	name	description
0	1	beginning	Date / time specified indicates the start of the period over which the observation was made.
1	2	end	Date / time specified indicates the end of the period over which the observation was made.
2	3	middle	Date / time specified indicates the middle of the period over which the observation was made.

End of table

Table 24: measuring_system_model

index	measuring_system_model	description
0	0	BATOS 4.8

End of table

Table 25: method_of_estimating_uncertainty

index	method_of_estimating_uncertainty	description
0	0	Laboratory based calibration.
1	1	Comparison to co-located instrument

End of table

Table 26: observed_variable

index	observed_variable	parameter_group	domain	sub_domain	abbreviation	name	units	description
0	0	cloud	atmospheric	upper-air	ch	high_cloud_type	coded	type of high clouds (ch)
1	1	cloud	atmospheric	upper-air	cm	middle_cloud_type	coded	type of middle clouds (cm)
2	2	cloud	atmospheric	upper-air	cl	low_cloud_type	coded	type of low clouds (cl)
3	3	cloud	atmospheric	upper-air	nh	cloud_base_height	m	cloud base height (nh)
4	4	cloud	atmospheric	upper-air	nl	low_cloud_amount	Okta	low cloud amount (n)
5	5	cloud	atmospheric	upper-air	tcc	total_cloud_amount	Okta	total amount of clouds
6	6	cloud	atmospheric	upper-air	n	cloud_cover	Okta	Total cloud cover
7	7	humidity	atmospheric	surface; upper-air	rh	relative_humidity	1	NA
8	8	humidity	atmospheric	surface; upper-air	q	specific_humidity	1	specific means per unit mass. Specific humidity is the mass fraction of water vapor in (moist) air.
9	9	humidity	atmospheric	surface; upper-air	dep_dew	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.
10	10	humidity	atmospheric	surface; upper-air	t_dew	dew_point_temperature	K	Dew point temperature is the temperature at which a parcel of air reaches saturation upon being cooled at constant pressure and specific humidity.

Continued on next page

Table 26 observed_variable (cont.)

index	observed_variable	parameter_group	domain	sub_domain	abbreviation	name	units	description
11	11	humidity	atmospheric	surface; upper-air	t_wet	wet_bulb_temperature	K	NA
12	12	humidity	atmospheric	surface; upper-air	t_ice_bulb	ice_bulb_temperature	K	NA
13	13	pressure	atmospheric	surface	a	pressure_tendancy_characteristics	coded	characteristic of pressure tendency (used in synoptic maps)
14	14	pressure	atmospheric	surface	p	air_pressure	Pa	NA
15	15	pressure	atmospheric	surface	mslp	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.
16	16	pressure	atmospheric	surface	ppp	pressure_tendancy	Pa	pressure tendency
17	18	salinity	oceanic	surface; sub-surface	sal	salinity	psu	ocean salinity (PSU)
18	19	temperature	atmospheric	surface; upper-air	t_air	air_temperature	K	Air temperature is the bulk temperature of the air, not the surface (skin) temperature.
19	20	temperature	oceanic	surface; sub-surface	t_water	water_temperature	K	Water (sea, river, lake) temperature at depth indicated
20	21	visibility	atmospheric	surface	vv	horizontal_visibility_in_air	m	The visibility is the distance at which something can be seen.
21	22	weather	atmospheric	surface	w1	past_weather_1	coded	past weather (w)
22	23	weather	atmospheric	surface	ww	present_weather	coded	present weather (ww)
23	24	weather	atmospheric	surface	w2	past_weather_2	coded	past weather 2 (used in synoptic maps)
24	26	wind	atmospheric	surface; upper-air	d	wind_from_direction	degree	direction from which the wind is blowing

Continued on next page

Table 26 observed_variable (cont.)

index	observed_variable	parameter_group	domain	sub_domain	abbreviation	name	units	description
25	27	wind	atmospheric	surface; upper-air	u	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.)
26	28	wind	atmospheric	surface; upper-air	v	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.)
27	29	wind	atmospheric	surface; upper-air	w	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.

Continued on next page

Table 26 observed_variable (cont.)

index	observed_variable	parameter_group	domain	sub_domain	abbreviation	name	units	description
28	30	wind	atmospheric	surface	w_gust	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.

End of table

Table 27: observation_code_tables

index	code_table_scheme	code_table_id	code_table_name	value	description
0	BUFR	0 20 003	Present weather	NA	See BUFR 0 20 003
1	BUFR	0 20 004	Past weather	NA	See BUFR 0 20 004
2	BUFR	0 10 063	Characteristics of pressure tendancy	NA	See BUFR 0 10 063

End of table

Table 28: observation_value_significance

index	observation_value_significance	description
0	0	Maximum value over indicated period
1	1	Minimum value over indicated period
2	2	Mean value over indicated period
3	3	Median value over indicated period
4	4	Modal value over indicated period
5	5	Mean absolute error over indicated period
6	6	Best estimate of standard deviation (N-1) of observed parameter over indicated period
7	7	Standard deviation (N) of observed parameter over indicated period
8	8	Harmonic mean of observed parameter over indicated period
9	9	Root mean square vector error of observed parameter over indicated period
10	10	root mean square of observed parameter over indicated period
11	11	Vector mean of observed parameter over indicated period
12	12	Instantaneous value of observed parameter
13	13	Accumulation over specified period
14	14	Not applicable

End of table

Table 29: observing_frequency

index	observing_frequency	abbreviation	description
0	0	opd	One observation per day (24 hour intervals).
1	1	tpd	Two observations per day (12 hour intervals).
2	2	fpd	Four observations per day (6 hour intervals).
3	3	epd	Eight observations per day (3 hour intervals).
4	4	hly	Hourly observations.
5	5	irr	Irregular observations.

End of table

Table 30: observing_method

index	observing_method	description
0	0	Measured
1	1	Estimated
2	2	Computed

End of table

Table 31: observing_programme (WIGOS Code Table 2-02)

index	observing_programme	abbreviation	description	sponsor
0	1	AMDAR	Global Aircraft Meteorological DAta Relay	WMO/GOS
1	2	EPA	Environmental Protection Agency	NA
2	3	EUMETNET	Grouping of European National Meteorological Services	WMO/GOS
3	4	WMO/GAW	World Meteorological Organization/Global Atmospheric Watch	NA
4	5	GCOS	Global Climate Observing System	NA
5	6	GCW	Global Cryosphere Watch	NA
6	7	GOOS	Global Ocean Observing System	NA
7	8	IPA	International Permafrost Association	NA
8	9	JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology	WMO/GOS
9	10	WMO/GOS	World Meteorological Organization/Global Observing System	NA
10	11	GTOS	Global Terrestrial Observing System	NA
11	12	IAGOS	In-service Aircraft for a Global Observing System	NA
12	13	WHYCOS	World Hydrological Cycle Observing System	NA
13	14	WMO/CLW	World Meteorological Office/Climate and Water Department	NA

Continued on next page

Table 31 observing_programme (cont.)

index	observing_programme	abbreviation	description	sponsor
14	15	ADNET	Asian dust and aerosol lidar observation network	GALION ; WMO/GAW
15	16	Aeronet	AErosol RObotic NETwork	NASA?
16	17	ANTON	Antarctic Observing Network	WMO/GOS
17	18	ASAP	Automated Shipboard Aerological Program	WMO/GOS
18	19	BSRN	Baseline Surface Radiation Network	WMO/GAW & GCOS
19	20	CASTNET	Clean Air Status and Trends Network	(National - USA)
20	21	CIS-LiNet	Lidar network for monitoring atmosphere over CIS regions	GALION ; WMO/GAW
21	22	CLN	CREST Lidar Network	GALION ; WMO/GAW
22	23	DART	Deep-ocean Assessment and Reporting of Tsunamis	NOAA Centre for Tsunamis Research
23	24	E-AMDAR	European - Aircraft Meteorological DAta Relay	EUMETNET ; WMO/GOS
24	25	E-ASAP	European - Automated Shipboard Aerological Program	EUMETNET ; WMO/GOS
25	26	E-GVAP	European - GNSS water vapour programme	EUMETNET ; WMO/GOS
26	27	E-PROFILE	European - wind profiles from radar	EUMETNET ; WMO/GOS
27	28	E-SURFMAR	European - Surface Marine Operational Service	EUMETNET ; WMO/GOS
28	29	EARLINET	European Aerosol Research Lidar Network	GALION ; WMO/GAW
29	30	GALION	GAW Aerosol Lidar Observation Network	WMO/GAW
30	31	GAW-PFR	GAW-Precision Filter Radiometers	WMO/GAW

Continued on next page

Table 31 observing_programme (cont.)

index	observing_programme	abbreviation	description	sponsor
31	32	German AOD Network	German Aerosol Optical Depth Network	WMO/GAW
32	33	GLOSS	Global Sea Level Observing System	JCOMM ; WMO/GOS
33	34	GRUAN	GCOS Reference Upper Air Network	GCOS
34	35	GSN	GCOS Surface Network	GCOS
35	36	GTN-G	Global Terrestrial Network - Glaciers	GCOS
36	37	GTN-H	Global Terrestrial Network - Hydrology	WMO/CLW ; GCOS ; GTOS
37	38	GTN-P	Global Terrestrial Network - Permafrost	IPA ; GCOS ; GTOS
38	39	GUAN	GCOS Upper Air Network	GCOS
39	40	IAGOS-MOZAIC	Measurement of Ozone and Water Vapour on Airbus in-service Aircraft	IAGOS
40	41	LALINET	Latin America Lidar Network	GALION; WMO/GAW
41	42	MPLNET	Micro Pulse Lidar Network	GALION; WMO/GAW
42	43	NDACC	Network for the Detection of Atmospheric Composition Change	GALION; WMO/GAW
43	44	OPERA	European Weather Radar Project	EUMETNET; (WMO/GOS)
44	45	PIRATA	Prediction and Research Moored Array in the Atlantic	GOOS; WMO/GOS
45	46	PolarAOD	Polar Aerosol Optical Depth Measurement Network Project	WMO/GAW

Continued on next page

Table 31 observing_programme (cont.)

index	observing_programme	abbreviation	description	sponsor
46	47	RAMA	Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction	NOAA
47	48	RBCN	Regional Basic Climatological Network	WMO/GOS
48	49	RBON	Regional Basic Observing Network	WMO/GOS
49	50	RBSN	Regional Basic Synoptic Network	WMO/GOS
50	51	TAO	Tropical Atmosphere and Ocean Array	NOAA; GCOS
51	52	SKYNET	Aerosol -cloud-radiation interaction in the atmosphere project	WMO/GAW
52	53	SibRad	NA	WMO/GAW
53	54	SOOP	Ship of Opportunity	JCOMM ; WMO/GOS
54	55	U.S. IOOS	United States Integrated Ocean Observing System	(National - USA)
55	56	VOS	Voluntary Observing Fleet	JCOMM ; WMO/GOS
56	57	VOSCLIM	Voluntary Observing Fleet (VOS) Climate Project	JCOMM ; WMO/GOS
57	58	WRAP	Worldwide Recurring ASAP Project	JCOMM ; WMO/GOS

End of table

Table 32: platform_sub_type

index	platform_sub_type	platform_type	abbreviation	description
0	0	Ship	BA	Barge
1	1	Ship	BC	Bulk Carrier
2	2	Ship	CA	Cable ship
3	3	Ship	CG	Coast Guard Ship
4	4	Ship	CS	Container Ship
5	5	Ship	DR	Dredger
6	6	Ship	FE	Passenger ferries
7	7	Ship	FP	Floating production and storage units
8	8	Ship	FV	Other Fishing Vessel
9	9	Ship	GC	General Cargo
10	10	Ship	GT	Gas Tanker
11	11	Ship	IC	Icebreaking vessel
12	12	Ship	IF	Inshore Fishing Vessel
13	13	Ship	LC	Livestock carrier
14	14	Ship	LT	Liquid Tanker
15	15	Ship	LV	Light Vessel
16	16	Ship	MI	Mobile installation including mobile offshore drill ships, jack-up rigs and semi-submersibles
17	17	Ship	MS	Military Ship
18	18	Ship	OT	Other
19	19	Ship	MW	Ocean Weather Ship
20	20	Ship	PI	Pipe layer
21	21	Ship	PS	Passenger ships and cruise liners
22	22	Ship	RF	Ro/Ro Ferry
23	23	Ship	RR	Ro/Ro Cargo
24	24	Ship	RS	Refrigerated cargo ships including banana ships
25	25	Ship	RV	Research Vessel
26	26	Ship	SA	Large sailing vessels
27	27	Ship	SV	Support Vessel
28	28	Ship	TR	Trawler
29	29	Ship	TU	Tug
30	30	Ship	VC	Vehicle carriers
31	31	Ship	YA	Yacht / Pleasure Craft
32	32	Ship	BA	Barges, including crane barges and tank barges.

Continued on next page

Table 32 platform_sub_type (cont.)

index	platform_sub_type	platform_type	abbreviation	description
33	33	Ship	BC	Bulk Carriers, including Ore/Bulk/Oil (OBO) carriers and Ore/Oil carriers.
34	34	Ship	CA	Cable ships.
35	35	Ship	CG	Coastguard cutters, patrol ships and launches.
36	36	Ship	CS	Container ships, including open and closed container ships and refrigerated container ships.
37	37	Ship	DR	Dredgers including bucket, hopper, grab and suction dredgers.
38	38	Ship	FE	Passenger ferries (carrying passengers only).
39	39	Ship	FP	Floating Production and Storage Units.
40	40	Ship	FV	Fishing Vessels including purse seiners, long liners etc., but excluding trawlers.
41	41	Ship	GC	General Cargo ships with one or more holds.
42	42	Ship	GT	Liquefied gas carriers/tankers including LNG and LPG carriers.
43	43	Ship	IC	Icebreaking vessels (dedicated vessel). If the vessel fits in another category and is ice strengthened
44	44	Ship	LC	Livestock Carrier (dedicated ship for the carriage of livestock).
45	45	Ship	LT	Liquid tankers including oil product tankers, chemical tankers and crude oil tankers (including VLCC's and ULCC's).
46	46	Ship	LV	Light vessels.
47	47	Ship	MI	Mobile installations, including mobile offshore drill ships, jack-up rigs, semi-submersibles.
48	48	Ship	MS	Military ships.
49	49	Ship	OW	Ocean Weather Ships (dedicated weather ship).
50	50	Ship	PI	Pipe Layers.
51	51	Ship	PS	Passenger ships and Cruise liners.
52	52	Ship	RF	Ro Ro ferries (carrying passengers and laden vehicles).
53	53	Ship	RR	Ro Ro cargo ships for carriage of road and/or rail vehicles and cargo, including containerised cargo.
54	54	Ship	RS	Refrigerated cargo ships including banana ships.

Continued on next page

Table 32 platform_sub_type (cont.)

index	platform_sub_type	platform_type	abbreviation	description
55	55	Ship	RV	Research Vessels, including oceanographic, meteorological and hydrographic research ships and seismographic research ships.
56	56	Ship	SA	Large sailing vessels, including sail training vessels.
57	57	Ship	SV	Support vessels including offshore support vessels, offshore supply vessels, stand-by vessels, pipe carriers, anchor handling vessels, buoy tenders (including coastguard vessels engaged solely on buoy tending duties), diving support vessels, etc.
58	58	Ship	TR	Trawler fishing vessels.
59	59	Ship	TU	Tugs, including fire-fighting tugs, salvage tugs, pusher tugs, pilot vessels, tenders etc.
60	60	Ship	VC	Vehicle Carriers: dedicated multi deck ships for the carriage of new unladen road vehicles.
61	61	Ship	YA	Yachts and pleasure craft.
62	62	Ship	OT	Other (specify in footnote).
63	63	Land station		Synoptic network
64	64	Land station		Local Network
65	65	Ship		Ocean Weather Ship (on station)
66	66	Ship		Ocean Weather Ship (off station)
67	67	Coastal / Island		Other
68	68	Coastal / Island		Coastal-Marine Automated Network (C-MAN) (NDBC operated)
69	69	Drifting buoy		Unspecified drifting buoy
70	70	Drifting buoy		Standard Lagrangian drifter (Global Drifter Programme)
71	71	Drifting buoy		Standard FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy)
72	72	Drifting buoy		Wind measuring FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy)
73	73	Ice buoy		Ice drifter
74	74	Drifting buoy		SVPG Standard Lagrangian drifter with GPS
75	75	Drifting buoy		SVP-HR drifter with high-resolution temperature or thermistor string
76	76	Subsurface float		Unspecified subsurface float

Continued on next page

Table 32 platform_sub_type (cont.)

index	platform_sub_type	platform_type	abbreviation	description
77	77	Profiling float		SOFAR
78	78	Profiling float		ALACE
79	79	Profiling float		MARVOR
80	80	Profiling float		RAFOS
81	81	Profiling float		PROVOR
82	82	Profiling float		SOLO
83	83	Profiling float		APEX
84	84	Moored buoy		Unspecified moored buoy
85	85	Moored buoy		Nomad
86	86	Moored buoy		3-metre discus
87	87	Moored buoy		10-12-metre discus
88	88	Moored buoy		ODAS 30 series
89	89	Moored buoy		ATLAS (e.g. TAO area)
90	90	Moored buoy		TRITON buoy
91	91	Moored buoy		FLEX mooring (e.g. TIP area)
92	92	Moored buoy		Omnidirectional waverider
93	93	Moored buoy		Directional waverider
94	94	Profiling float		Subsurface ARGO float
95	95	Profiling float		PALACE
96	96	Profiling float		NEMO
97	97	Profiling float		NINJA
98	98	Ice buoy		Ice buoy/float (POPS or ITP)
99	99	Moored buoy		Mooring oceanographic
100	100	Moored buoy		Mooring meteorological
101	101	Moored buoy		Mooring multidisciplinary (OceanSITES)
102	102	Moored buoy		Mooring tide gauge or tsunami buoy
103	103	Ice buoy		Ice beacon
104	104	Ice buoy		Ice mass balance buoy

End of table

Table 33: platform_type

index	platform_type	description
0	0	Aircraft
1	1	Autonomous marine vehicle
2	2	Autonomous pinneped bathythermograph
3	3	Coastal / Island
4	4	Drifting buoy
5	5	Expendable bathythermograph (XBT)
6	6	Glider
7	7	High-resolution Conductivity-Temperature-Depth (CTD) / Expendable CTD(XCTD)
8	8	Ice buoy
9	9	Ice station
10	10	Land station
11	11	Land vehicle
12	12	Lightship
13	13	Mechanical / digital / micro bathythermograph (MBT)
14	14	Moored buoy
15	15	Oceanographic station data (bottle and low resolution CTD / XCTD data)
16	16	Profiling float
17	17	Rig / platform
18	18	Shallow water station (fixed to sea / lake floor)
19	19	Ship
20	20	Subsurface float (moving)
21	21	Tide gauge
22	22	Underwater platform
23	23	Undulating oceanographic recorder

End of table

Table 34: processing_level (WIGOS Code Table 7-06)

index	processing_level	name	description
0	0	Unknown	NA
1	1	Raw	NA
2	2	Level 0	Analogue/digital electric signals

Continued on next page

Table 34 processing_level (cont.)

index	processing_level	name	description
3	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	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	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	6	Level IV	NA

End of table

Table 35: product_level

index	product_level	description
0	2	Data read from original data file

End of table

Table 36: product_status

index	product_status	description	extended_description
0	1	Data approved	Data exist, read from chache, PTU + altitude columns available, all GC25 tests ok, all uncertainties as expected

End of table

Table 37: profile_configuration_codes

field_id	field_name	code_value	abbreviation	description	start_date	end_date
0	include_descent	NA	NA	NA	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
2	unwinder_type		NA	STRING	NA	NA
B002003	type_of_measuring_equipment_used	0 - 15	NA	See BUFR table 0 02 003	NA	NA
B002011	radiosonde_sounding_system	0 - 255	NA	See BUFR table 0 02 011	NA	NA
B002013	solar_and_infrared_radiation_correction	0 - 15	NA	See BUFR table 0 02 013	NA	NA
B002014	tracking_technique	0 - 127	NA	See BUFR table 0 02 014	NA	NA
B002015	radiosonde_completeness	0 - 15	NA	See BUFR table 0 02 015	NA	NA
B002017	humidity_correction_algorithm	0 - 31	NA	See BUFR table 0 02 017	NA	NA
B002066	radiosonde_ground_receiving_system	0 - 63	NA	See BUFR table 0 02 066	NA	NA

Continued on next page

Table 37 profile_configuration_codes (cont.)

field_id	field_name	code_value	abbreviation	description	start_date	end_date
B002080	balloon_manufacturer	0 - 63	NA	See BUFR table 0 02 080	NA	NA
B002081	balloon_type	0 - 31	NA	See BUFR table 0 02 081	NA	NA
B002083	type_of_balloon_shelter	NA	NA	See BUFR table 0 02 083	NA	NA
B002084	type_of_gas_used_in_balloon	NA	NA	See BUFR table 0 02 084	NA	NA
B002095	type_of_pressure_sensor	0 - 31	NA	See BUFR table 0 02 095	NA	NA
B002191	geopotential_height_calculation	0 - 15	NA	See BUFR table 0 02 191	NA	NA
B003011	method_of_depth_calculation	0 - 3	NA	See BUFR table 0 03 011	NA	NA
B022056	profile_direction	0 - 3	NA	See BUFR table 0 22 056	NA	NA
B022067	instrument_type_for_water_temperature_salinity_profile	0 - 1023	NA	See BUFR table 0 22 067	NA	NA
B022068	water_temperature_profile_recorder_type	0 - 127	NA	See BUFR table 0 22 068	NA	NA
B022178	XBT_launcher_type	0 - 255	NA	See BUFR table 0 22 178	NA	NA
B035035	reason_for_termination	0 - 31	NA	See BUFR table 0 35 035	NA	NA

End of table

Table 38: profile_configuration_fields

field_id	field_name	type	description
0	include_descent	int (fk)	NA
1	processing_code	int (fk)	NA
2	unwinder_type	varchar	NA
3	burstpoint_altitude	numeric	NA
4	burstpoint_pressure	numeric	NA
5	filling_weight	numeric	NA
6	gross_weight	numeric	NA
7	payload	numeric	NA
B002016	radiosonde_configuration	int (fk)	NA
B002003	type_of_measuring_equipmentused	int (fk)	NA
B002011	radiosonde_sounding_system	int (fk)	NA
B002011	radiosonde_type	int (fk)	NA
B002013	solar_and_infrared_radiation_correction	int (fk)	NA
B002014	tracking_technique	int (fk)	NA
B002015	radiosonde_completeness	int (fk)	NA
B002017	humidity_correction_algorithm	int (fk)	NA
B002066	radiosonde_ground_receiving_system	int (fk)	NA
B002080	balloon_manufacturer	int (fk)	NA
B002081	balloon_type	int (fk)	NA
B002081	balloon_type	int (fk)	NA
B002083	type_of_balloonshelter	int (fk)	NA
B002084	type_of_gasusedinballoon	int (fk)	NA
B002095	type_of_pressure_sensor	int (fk)	NA
B002191	geopotential_height_calculation	int (fk)	NA
B003011	method_of_depth_calculation	int (fk)	NA
B022056	profile_direction	int (fk)	NA
B022067	instrument_type_for_water_temperature_salinity_profile	int (fk)	NA
B022068	water_temperature_profile_recorder_type	int (fk)	NA
B022178	XBT_launcher_type	int (fk)	NA
B035035	reason_for_termination	int (fk)	NA

End of table

Table 39: quality_flag (BUFR Code Table 0 33 020)

index	quality_flag	description
0	0	Good
1	1	Inconsistent
2	2	Doubtful
3	3	Wrong
4	4	Not checked
5	5	Has been changed
6	6	Estimated
7	7	Missing value

End of table

Table 40: region (WIGOS Code Table 3-01)

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

End of table

Table 41: report_processing_codes

index	report_processing_codes	description
0	0	date / times quality controlled
1	1	location quality controlled
2	2	observation quality controlled
3	3	adjustment applied to observed value

End of table

Table 42: report_processing_level

index	report_processing_level	description
0	0	Raw - data as originally reported in source data set
1	1	Partial - subset of reported values (location, date / time, observand etc) processed
2	2	Full - all elements of report processed

End of table

Table 43: report_type

index	report_type	abbreviation	description
0	0	SYNOP	NA
1	1	TEMP	NA
2	2	CLIMAT	NA

End of table

Table 44: sampling_strategy (WIGOS Code Table 6-03)

index	sampling_strategy	description
0	1	Continuous
1	2	Discrete
2	3	Event

End of table

Table 45: sea_level_datum (BUFR Code Table 0 01 151)

index	sea_level_datum	description
0	0	Earth Gravitational Model 1996
1	1	Baltic height system 1977

End of table

Table 46: sensor_configuration_codes

field_id	field_name	parameter	code_value	abbreviation	description
B002033	sensortype-salinity	salinity	0 - 7		See BUFR table 0 02 033
B002038	sensortype-wat ertemperature	water temperature	0 - 15		See BUFR table 0 02 038
B002038	sensortype-wat ertemperature	water temperature	16		Bait tanks thermometer.
B002038	sensortype-wat ertemperature	water temperature	17		electronic sensor
B002038	sensortype-wat ertemperature	water temperature	18		limplied bucket [note: applicable to early ICOADS data]
B002038	sensortype-wat ertemperature	water temperature	19		Radiation thermometer.
B002038	sensortype-wat ertemperature	water temperature	20		Through Hull sensor.
B002038	sensortype-wat ertemperature	water temperature	21		Trailing thermistor
B002038	sensortype-wat ertemperature	water temperature	22		unknown or non-bucket
B002051	sensortype-e xtremes	air temperature	0 - 15		See BUFR table 0 02 051
B002096	sensortype-airt emperature	air temperature	0		See BUFR table 0 02 096
B002097	sensortype-humidity	humidity	0 - 31		See BUFR table 0 02 097
B002169	sensortype-wi ndspeed	wind speed	0 - 15		See BUFR table 0 02 169
B002169	sensortype-wi ndspeed	wind speed	16		Anemograph.
B002169	sensortype-wi ndspeed	wind speed	17		Anemometer - type unspecified
B002169	sensortype-wi ndspeed	wind speed	18		Beaufort force
B002169	sensortype-wi ndspeed	wind speed	19		Cup anemometer and wind vane (combined unit).
B002169	sensortype-wi ndspeed	wind speed	20		Cup anemometer and wind vane (separate instruments).

Continued on next page

Table 46 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
B002169	sensortype-windspeed	wind speed	21		Handheld anemometer.
B002169	sensortype-windspeed	wind speed	22		Other (specify in footnote).
B002169	sensortype-windspeed	wind speed	23		Propeller vane.
B002185	sensortype-evaporation	evaporation	0 - 15		See BUFR table 0 02 185
B003003	sensorhousing-type	all	0 - 15		See BUFR table 0 03 003
B003004	sensorhousing-radiationshielding	all	0 - 15		See BUFR table 0 03 004
B003008	sensorhousing-ventilation	all	0 - 7		See BUFR table 0 03 008
B003020	sensorhousing-material	all	0 - 7		See BUFR table 0 03 020
B003021	sensorhousing-heating	all	0 - 4		See BUFR table 0 03 021
B003022	sensorowner	all	0 - 7		See BUFR table 0 03 022
B003023	sensorhousing-configuration	all	0 - 7		See BUFR table 0 03 023
BARG	sensortype-barograph	pressure trend	0		Open Scale barograph with 1 day clock.
BARG	sensortype-barograph	pressure trend	1		Open Scale barograph with 2 day clock.
BARG	sensortype-barograph	pressure trend	2		Open Scale barograph with 3 day clock.
BARG	sensortype-barograph	pressure trend	3		Open Scale barograph with 4 day clock.
BARG	sensortype-barograph	pressure trend	4		Open Scale barograph with 5 day clock.
BARG	sensortype-barograph	pressure trend	5		Open Scale barograph with 6 day clock.
BARG	sensortype-barograph	pressure trend	6		Open Scale barograph with 7 day clock.
BARG	sensortype-barograph	pressure trend	7		Open Scale barograph with 8 day clock.

Continued on next page

Table 46 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
BARG	sensortype-barograph	pressure trend	8		Open Scale barograph with 9 day clock.
BARG	sensortype-barograph	pressure trend	9		Open Scale barograph.
BARG	sensortype-barograph	pressure trend	10		Other (specify in footnote).
BARG	sensortype-barograph	pressure trend	11		Small Scale barograph.
BARG	sensortype-barograph	pressure trend	12		Tendency obtained from an electronic digital barometer.
BARM	sensortype-barometer	pressure	0		Aneroid barometer (issued by the PMO or a NMS).
BARM	sensortype-barometer	pressure	1		Digital aneroid barometer (aka Precision Aneroid Barometer).
BARM	sensortype-barometer	pressure	2		Electronic digital barometer (consisting of one or more pressure transducers).
BARM	sensortype-barometer	pressure	3		Mercury barometer.
BARM	sensortype-barometer	pressure	4		Other
BARM	sensortype-barometer	pressure	5		Ship's aneroid barometer.
IBS	icebulbstatus	humidity	0		Ice bulb
IBS	icebulbstatus	humidity	1		Wet bulb
MANU	manufacturer	all	0		Vaisala
SLOC	sensorlocation-ship	all	0		Aft mast.
SLOC	sensorlocation-ship	all	1		Bridge wing
SLOC	sensorlocation-ship	all	2		Foremast yardarm
SLOC	sensorlocation-ship	all	3		Foremast.
SLOC	sensorlocation-ship	all	4		Handheld.
SLOC	sensorlocation-ship	all	5		Main deck

Continued on next page

Table 46 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SLOC	sensorlocation-ship	all	6		Mainmast yardarm
SLOC	sensorlocation-ship	all	7		Mainmast.
SLOC	sensorlocation-ship	all	8		Mast on wheelhouse top yardarm
SLOC	sensorlocation-ship	all	9		Mast on wheelhouse top.
SLOC	sensorlocation-ship	all	10		Meteorological mast.
SLOC	sensorlocation-ship	all	11		Not fitted.
SLOC	sensorlocation-ship	all	12		Other
SLOC	sensorlocation-ship	all	13		Pressurised wheelhouse (closed and not vented to the outside).
SLOC	sensorlocation-ship	all	14		Wheelhouse
SLOC	sensorlocation-ship	all	15		Wheelhouse, not pressurised (vented to the outside).
SRR	sensortype-precipitation	precipitation	NA		Place holder
SSIDE	sensorside-ship	all	0		Center
SSIDE	sensorside-ship	all	1		Port
SSIDE	sensorside-ship	all	2		Starboard
SSIDE	sensorside-ship	all	3		Windward side
SWV	sensortype-waves	waves	0		buoy
SWV	sensortype-waves	waves	1		other
SWV	sensortype-waves	waves	2		shipborne wave recorder
SWW	sensortype-presentweather	present weather	0		Automatic, included (using WMO Codes 4677 and 4561)
SWW	sensortype-presentweather	present weather	1		Automatic, included (using WMO codes 4680 amd 4531)
SWW	sensortype-presentweather	present weather	2		Automatic, omitted (no observation, data not available)
SWW	sensortype-presentweather	present weather	3		Automatic, omitted (no significant phenomenon to report)

Continued on next page

Table 46 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SWW	sensortype-presentweather	present weather	4		Manned, included
SWW	sensortype-presentweather	present weather	5		Manned, omitted (no observation, data not available)
SWW	sensortype-presentweather	present weather	6		Manned, omitted (no significant phenomenon to report)
TSONDE	telemetry_sonde	sonde	TBD		TBD
TREAT	sampletreatment	all	TBD		TBD
SPROC	sampleprocedure	all	TBD		TBD
QCPROC	qualitycontrol procedure	all	TBD		TBD
CALMETH	Calibrationmethod	all	TBD		TBD

End of table

Table 47: sensor_configuration_fields

field_id	field_name	parameter	type	decription
SACC	sensoraccuracy	all	numeric	Reported accuracy (trueness) of sensor in units of measurement.
SPRE	sensorprecision	all	numeric	Reported precision (repeatability) of sensor in units of measurement
B002033	sensortype-salinity	salinity	int (fk)	NA
B002038	sensortype-watert emperature	water temperature	int (fk)	NA
B002051	sensortype-extremes	air temperature	int (fk)	NA
B002096	sensortype-airte mperature	air temperature	int (fk)	NA
B002097	sensortype-humidity	humidity	int (fk)	NA
B002169	sensortype-windspeed	wind speed	int (fk)	NA
B002185	sensortype-evaporation	evaporation	int (fk)	NA
B003003	sensorhousing-type	all	int (fk)	NA
B003004	sensorhousing-rad iationshielding	all	int (fk)	NA
B003008	sensorhousing-ventilation	all	int (fk)	NA
B003020	sensorhousing-material	all	int (fk)	NA
B003021	sensorhousing-heating	all	int (fk)	NA
B003022	sensorowner	all	int (fk)	NA
B003023	sensorhousing-c onfiguration	all	int (fk)	NA
BARG	sensortype-barograph	pressure trend	int (fk)	NA
BARM	sensortype-barometer	pressure	int (fk)	NA
CALINT	calibrationinterval	all	numeric	Maximum number of months recommended between calibrations.
CALMETH	calibrationmethod	all	int (fk)	Method used to calibrate instrument
CALPRTY	calibrationparty	all	varchar	Who performed the calibration
CALRES	calibrationresult	all	varchar TBD	Result of the calibration
FREQ	samplingfrequency	all	numeric	time period (s) between successive measurements from sensor
IBS	icebulbstatus	humidity	int (fk)	NA
LDCL	sensorlocation-dista ncefromcenterline	wind speed	numeric	NA

Continued on next page

Table 47 sensor_configuration_fields (cont.)

field_id	field_name	parameter	type	decription
LDFB	sensorlocation-distancefrombow	wind speed	numeric	NA
LHAD	sensorlocation-heightabovedeck	wind speed	numeric	NA
MANU	manufacturer	all	int (fk)	NA
QCPROC	qualitycontrolprocedure	all	int (fk)	Procedure used to quality control the observation and set quality flag
SERIAL	serialnumber	all	varchar	NA
SHVR	sensorhousing-ventilationrate	all	numeric	NA
SLOC	sensorlocation-ship	all	int (fk)	NA
SMAX	sensorrange-max	all	numeric	Maximum observable value with sensor in reported units of measurement
SMIN	sensorrange-min	all	numeric	Minimum observable value with sensor in reported units of measurement
SMOD	sensormodel	all	varchar	NA
SOFT	software_version	all	varchar	NA
SPROC	samplingprocedure	all	int (fk)	how the sample was obtained
SRES	sensorresolution	all	numeric	NA
SRESP	sensorresponsetime	all	numeric	Time (s) for sensor to chnage from previous state to current state
SRR	sensortype-precipitation	precipitation	int (fk)	NA
SSIDE	sensorside-ship	all	int (fk)	NA
STAB	sensorstability	all	numeric	Reported stability of sensor in reported units of measurement per year.
SWV	sensortype-waves	waves	int (fk)	NA
SWW	sensortype-presentweather	present weather	int (fk)	NA
TREAT	sampletreatment	all	int (fk)	treatment of the sample prior to analysis
TSONDE	telemetry_sonde	sonde	int (fk)	NA
WGHT	weight	sonde	numeric	NA
STIME	sampletimes	all	timestamp	time of the samples used to calculate statistics

End of table

Table 48: source_configuration_codes

index	field	field_name	code_value	description	extended_description
0	0	delayed mode format	0	IMMT version just prior to version number being included	NA
1	0	delayed mode format	1	IMMT-1 (in effect from 2 Nov. 1994)	NA
2	0	delayed mode format	2	IMMT-2 (in effect from Jan. 2003)	NA
3	0	delayed mode format	3	IMMT-3 (in effect from Jan. 2007)	NA
4	0	delayed mode format	4	IMMT-4 (in effect from Jan. 2011)	NA
5	0	delayed mode format	5	IMMT-5 (in effect from June 2012)	NA
6	1	metadata source	0	COAPS	NA
7	1	metadata source	1	WMO Publication 47	NA
8	2	metadata source format	1	Output from digitisation project, semi-colon delimited format (1955)	NA
9	2	metadata source format	2	Output from digitisation project, semi-colon delimited format (1956)	NA
10	2	metadata source format	3	Output from digitisation project, semi-colon delimited format (1957 - 1967)	NA
11	2	metadata source format	4	Output from digitisation project, semi-colon delimited format (1968 - 1969)	NA

Continued on next page

Table 48 source_configuration_codes (cont.)

index	field	field_name	code_value	description	extended_description
12	2	metadata source format	5	Fixed format (1970 - 1004)	NA
13	2	metadata source format	6	Semi-colon delimited format (1995 - 2001)	NA
14	2	metadata source format	7	Semi-colon delimited format (2002 - 2007 q1)	NA
15	2	metadata source format	8	Semi-colon delimited format (2007 - 2008)	NA
16	2	metadata source format	9	Semi-colon delimited format (2009 - 2014)	NA
17	3	observation source type	0	unknown	NA
18	3	observation source type	1	delayed mode - logbook (paper)	NA
19	3	observation source type	2	real time - national telecommunication channels	NA
20	3	observation source type	3	delayed mode - national publications	NA
21	3	observation source type	4	delayed mode - logbook (electronic)	NA
22	3	observation source type	5	real time - global telecommunication system (GTS)	NA
23	3	observation source type	6	delayed mode - International publications	NA
24	4	real time format	0	previous to FM24-V	NA
25	4	real time format	1	FM 24-V	NA
26	4	real time format	2	FM 24-VI Ext.	NA
27	4	real time format	3	FM 13-VII	NA

Continued on next page

Table 48 source_configuration_codes (cont.)

index	field	field_name	code_value	description	extended_description
28	4	real time format	4	FM 13-VIII	NA
29	4	real time format	5	FM 13-VIII Ext.	NA
30	4	real time format	6	FM 12-IX	NA
31	4	real time format	7	FM 13-IX Ext.	NA
32	4	real time format	8	FM 13-X	NA
33	4	real time format	9	FM 13-XI	NA
34	4	real time format	10	FM 13-XII Ext.	NA
35	4	real time format	11	FM 13-XIII	NA
36	4	real time format	12	FM 13-XIV Ext.	NA
37	5	source format	0	IMMA - Version 0	NA
38	5	source format	1	IMMA - Version 1	NA
39	6	icoads source deck	NA	See ICOADS Source Deck	NA
40	7	icoads source id	NA	See ICOADS Source ID	NA
41	8	product level	2	Data read from original data file	NA
42	9	product status	1	Data approved	Data exist, read from chache, PTU + altitude columns available, all GC25 tests ok, all uncertainties as expected

End of table

Table 49: source_configuration_fields

index	field	field_name	kind	description
0	0	delayed mode format	int (fk)	NA
1	1	metadata source	int (fk)	NA
2	2	metadata source format	int (fk)	NA
3	3	observation source type	int (fk)	NA
4	4	real time format	int (fk)	NA
5	5	source format	int (fk)	NA
6	6	source deck	int (fk)	NA
7	7	source id	int (fk)	NA
10	10	product original time resolution	numeric	NA

End of table

Table 50: source_format

index	source_format	description
0	0	IMMA
1	1	NetCDF (GRUAN)
2	2	NetCDF (Other)
3	3	CSV

End of table

Table 51: spatial_representativeness

index	spatial_representativeness	description
0	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	1	Microscale - An area or volume less than 100 m horizontal extent (for example, evaporation)
2	2	Toposcale, local scale - An area or volume of 100 m to 3 km horizontal extent (for example, air pollution, tornadoes)
3	3	Mesoscale - An area or volume of 3 km to 100 km horizontal extent (for example, thunderstorms, sea and mountain breezes)
4	4	Large scale- An area or volume of 100 km to 3000 km horizontal extent (for example, fronts, various cyclones, cloud clusters)
5	5	Planetary scale - An area or volume of more than 3000 km horizontal extent (for example, long upper tropospheric waves)
6	6	Drainage area - An area (also known as catchment) having a common outlet for its surface runoff, in km2

End of table

Table 52: station_configuration_codes

index	field	field_name	code_value	abbreviation	description
0	0	AWS Entry and Display Software			TBD
1	1	AWS Entry and Display Software Version			TBD
2	2	AWS Model			TBD
3	3	AWS Model Version			TBD
4	4	AWS Software			TBD
5	5	AWS Software version			TBD
6	9	Drogue type	NA		See BUFR code table 0 02 034
12	11	Lagrangian drifter drogue status	NA		See BUFR code table 0 22 060
15	11	LogBook software and version			TBD
16	16	Other instruments	0	BAT	Bathythermometer.
17	16	Other instruments	1	BT	Bathythermograph (towed).
18	16	Other instruments	2	FLM	Fluorometer.
19	16	Other instruments	3	LWR	Long wave radiation.
20	16	Other instruments	4	MAX	Maximum thermometer.
21	16	Other instruments	5	MIN	Minimum thermometer.
22	16	Other instruments	6	NTE	Nitrate sensor.
23	16	Other instruments	7	NTT	Nutrient sensor.
24	16	Other instruments	8	P	Pilot balloon equipment.
25	16	Other instruments	9	CO2	pCO2 system.
26	16	Other instruments	10	PLK	Plankton recorder.
27	16	Other instruments	11	PRS	Photosynthetic radiation sensor.
28	16	Other instruments	12	PYG	Pyrogeometer.
29	16	Other instruments	13	R	Radiosonde equipment.
30	16	Other instruments	14	RG	Rain gauge.
31	16	Other instruments	15	RSD	Radar storm and meteorological phenomena detection.
32	16	Other instruments	16	RT	Reversing thermometer.
33	16	Other instruments	17	SKY	Sky camera.

Continued on next page

Table 52 station_configuration_codes (cont.)

index	field	field_name	code_value	abbreviation	description
34	16	Other instruments	18	SLM	Solarimeter.
35	16	Other instruments	19	ST	Sea thermograph.
36	16	Other instruments	20	SWR	Short wave radiation.
37	16	Other instruments	21	TSD	Temperature/salinity/depth probe.
38	16	Other instruments	22	TUR	Turbidity sensor.
39	16	Other instruments	23	W	Radiowind or radarwind equipment.
40	16	Other instruments	24	WR	Wave Recorder
41	16	Other instruments	25	XBT	Expendable bathythermograph.
42	16	Other instruments	26	OT	Other (specify in footnote).
43	17	Station status	1		Planned
44	17	Station status	2		Pre-operational
45	17	Station status	3		Operational / Reporting
46	17	Station status	4		Partly reporting
47	17	Station status	5		Temporarily suspended
48	17	Station status	6		Closed
49	18	Type of meteorological reporting ship	0	70	Auxiliary ship
50	18	Type of meteorological reporting ship	1	75	Auxiliary ship (AWS)
51	18	Type of meteorological reporting ship	2	10	Selected
52	18	Type of meteorological reporting ship	3	15	Selected (AWS)
53	18	Type of meteorological reporting ship	4	40	Supplementary
54	18	Type of meteorological reporting ship	5	45	Supplementary (AWS)
55	18	Type of meteorological reporting ship	6	80	Third party

Continued on next page

Table 52 station_configuration_codes (cont.)

index	field	field_name	code_value	abbreviation	description
56	18	Type of meteorological reporting ship	7	85	Third party (AWS)
57	18	Type of meteorological reporting ship	8	99	Unknown
58	18	Type of meteorological reporting ship	9	30	VOSClim - VOS Climate
59	18	Type of meteorological reporting ship	10	35	VOSClim (AWS) - VOS Climate (AWS)

End of table

Table 53: station_configuration_fields

index	field	field_name	kind	description
0	0	AWS Entry and Display Software	int (fk)	NA
1	1	AWS Entry and Display Software Version	int (fk)	NA
2	2	AWS Model	int (fk)	NA
3	3	AWS Model Version	int (fk)	NA
4	4	AWS Software	int (fk)	NA
5	5	AWS Software version	int (fk)	NA
6	6	Cargo height	numeric	NA
7	7	Distance of bridge from bow	numeric	NA
8	8	Draught	numeric	NA
9	9	Drogue type	int (fk)	NA
10	10	Freeboard	numeric	NA
11	11	Lagrangian drifter drogue status	int (fk)	NA
12	12	Length overall of the ship, ignoring bulbous bow	numeric	NA
13	13	LogBook software and version	int (fk)	NA
14	14	Maximum operating speed on normal service	numeric	NA
15	15	Moulded breadth	numeric	NA
16	16	Other instruments	int (fk)	NA
17	17	Station status	int (fk)	NA
18	18	Type of meteorological reporting ship	int (fk)	NA
19	19	Surface cover	int (fk)	NA
20	20	Surface cover scheme	int (fk)	NA
21	21	Topography	int (fk)	NA
22	22	Soil type	int (fk)	NA
23	23	Land use	int (fk)	NA

End of table

Table 54: station_type

index	station_type	description
0	1	Land station
1	2	Sea station
2	3	Aircraft
3	4	Satellite
4	5	Underwater platform

End of table

Table 55: sub_region

index	sub_region	type	code	name
0	0	country	AD	ANDORRA
1	1	country	AE	UNITED ARAB EMIRATES
2	2	country	AF	AFGHANISTAN
3	3	country	AG	ANTIGUA AND BARBUDA
4	4	country	AI	ANGUILLA
5	5	country	AL	ALBANIA
6	6	country	AM	ARMENIA
7	7	country	AN	NETHERLANDS ANTILLES
8	8	country	AO	ANGOLA
9	9	country	AQ	ANTARCTICA
10	10	country	AR	ARGENTINA
11	11	country	AS	AMERICAN SAMOA
12	12	country	AT	AUSTRIA
13	13	country	AU	AUSTRALIA
14	14	country	AW	ARUBA
15	15	country	AX	ALAND ISLANDS
16	16	country	AZ	AZERBAIJAN
17	17	country	BA	BOSNIA AND HERZEGOVINA
18	18	country	BB	BARBADOS
19	19	country	BD	BANGLADESH
20	20	country	BE	BELGIUM
21	21	country	BF	BURKINA FASO
22	22	country	BG	BULGARIA
23	23	country	BH	BAHRAIN
24	24	country	BI	BURUNDI
25	25	country	BJ	BENIN
26	26	country	BL	SAINT BARTHLEMY
27	27	country	BM	BERMUDA
28	28	country	BN	BRUNEI DARUSSALAM
29	29	country	BO	BOLIVIA
30	30	country	BR	BRAZIL
31	31	country	BS	BAHAMAS
32	32	country	BT	BHUTAN
33	33	country	BV	BOUVET ISLAND
34	34	country	BW	BOTSWANA

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
35	35	country	BY	BELARUS
36	36	country	BZ	BELIZE
37	37	country	CA	CANADA
38	38	country	CC	COCOS (KEELING) ISLANDS
39	39	country	CD	CONGO, THE DEMOCRATIC REPUBLIC OF THE
40	40	country	CF	CENTRAL AFRICAN REPUBLIC
41	41	country	CG	CONGO
42	42	country	CH	SWITZERLAND
43	43	country	CI	COTE D'IVOIRE
44	44	country	CK	COOK ISLANDS
45	45	country	CL	CHILE
46	46	country	CM	CAMEROON
47	47	country	CN	CHINA
48	48	country	CO	COLOMBIA
49	49	country	CR	COSTA RICA
50	50	country	CU	CUBA
51	51	country	CV	CAPE VERDE
52	52	country	CX	CHRISTMAS ISLAND
53	53	country	CY	CYPRUS
54	54	country	CZ	CZECH REPUBLIC
55	55	country	DD	GERMAN DEMOCRATIC REPUBLIC
56	56	country	DE	GERMANY
57	57	country	DJ	DJIBOUTI
58	58	country	DK	DENMARK
59	59	country	DM	DOMINICA
60	60	country	DO	DOMINICAN REPUBLIC
61	61	country	DZ	ALGERIA
62	62	country	EC	ECUADOR
63	63	country	EE	ESTONIA
64	64	country	EG	EGYPT
65	65	country	EH	WESTERN SAHARA
66	66	country	ER	ERITREA
67	67	country	ES	SPAIN
68	68	country	ET	ETHIOPIA
69	69	country	FI	FINLAND

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
70	70	country	FJ	FIJI
71	71	country	FK	FALKLAND ISLANDS (MALVINAS)
72	72	country	FM	MICRONESIA, FEDERATED STATES OF
73	73	country	FO	FAROE ISLANDS
74	74	country	FR	FRANCE
75	75	country	GA	GABON
76	76	country	GB	UNITED KINGDOM
77	77	country	GD	GRENADA
78	78	country	GE	GEORGIA
79	79	country	GF	FRENCH GUIANA
80	80	country	GG	GUERNSEY
81	81	country	GH	GHANA
82	82	country	GI	GIBRALTAR
83	83	country	GL	GREENLAND
84	84	country	GM	GAMBIA
85	85	country	GN	GUINEA
86	86	country	GP	GUADELOUPE
87	87	country	GQ	EQUATORIAL GUINEA
88	88	country	GR	GREECE
89	89	country	GS	SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS
90	90	country	GT	GUATEMALA
91	91	country	GU	GUAM
92	92	country	GW	GUINEA-BISSAU
93	93	country	GY	GUYANA
94	94	country	HK	HONG KONG
95	95	country	HM	HEARD ISLAND AND MCDONALD ISLANDS
96	96	country	HN	HONDURAS
97	97	country	HR	CROATIA
98	98	country	HT	HAITI
99	99	country	HU	HUNGARY
100	100	country	ID	INDONESIA
101	101	country	IE	IRELAND
102	102	country	IL	ISRAEL
103	103	country	IM	ISLE OF MAN
104	104	country	IN	INDIA

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
105	105	country	IO	BRITISH INDIAN OCEAN TERRITORY
106	106	country	IQ	IRAQ
107	107	country	IR	IRAN, ISLAMIC REPUBLIC OF
108	108	country	IS	ICELAND
109	109	country	IT	ITALY
110	110	country	JE	JERSEY
111	111	country	JM	JAMAICA
112	112	country	JO	JORDAN
113	113	country	JP	JAPAN
114	114	country	KE	KENYA
115	115	country	KG	KYRGYZSTAN
116	116	country	KH	CAMBODIA
117	117	country	KI	KIRIBATI
118	118	country	KM	COMOROS
119	119	country	KN	SAINT KITTS AND NEVIS
120	120	country	KP	KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF
121	121	country	KR	KOREA, REPUBLIC OF
122	122	country	KW	KUWAIT
123	123	country	KY	CAYMAN ISLANDS
124	124	country	KZ	KAZAKHSTAN
125	125	country	LA	LAO PEOPLE'S DEMOCRATIC REPUBLIC
126	126	country	LB	LEBANON
127	127	country	LC	SAINT LUCIA
128	128	country	LI	LIECHTENSTEIN
129	129	country	LK	SRI LANKA
130	130	country	LR	LIBERIA
131	131	country	LS	LESOTHO
132	132	country	LT	LITHUANIA
133	133	country	LU	LUXEMBOURG
134	134	country	LV	LATVIA
135	135	country	LY	LIBYAN ARAB JAMAHIRIYA
136	136	country	MA	MOROCCO
137	137	country	MC	MONACO
138	138	country	MD	MOLDOVA, REPUBLIC OF
139	139	country	ME	MONTENEGRO

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
140	140	country	MF	SAINT MARTIN
141	141	country	MG	MADAGASCAR
142	142	country	MH	MARSHALL ISLANDS
143	143	country	MK	MACEDONIA, THE FORMER YUGOSLAV REPUBLIC OF
144	144	country	ML	MALI
145	145	country	MM	MYANMAR
146	146	country	MN	MONGOLIA
147	147	country	MO	MACAO
148	148	country	MP	NORTHERN MARIANA ISLANDS
149	149	country	MQ	MARTINIQUE
150	150	country	MR	MAURITANIA
151	151	country	MS	MONTSERRAT
152	152	country	MT	MALTA
153	153	country	MU	MAURITIUS
154	154	country	MV	MALDIVES
155	155	country	MW	MALAWI
156	156	country	MX	MEXICO
157	157	country	MY	MALAYSIA
158	158	country	MZ	MOZAMBIQUE
159	159	country	NA	NAMIBIA
160	160	country	NC	NEW CALEDONIA
161	161	country	NE	NIGER
162	162	country	NF	NORFOLK ISLAND
163	163	country	NG	NIGERIA
164	164	country	NI	NICARAGUA
165	165	country	NL	NETHERLANDS
166	166	country	NO	NORWAY
167	167	country	NP	NEPAL
168	168	country	NR	NAURU
169	169	country	NU	NIUE
170	170	country	NZ	NEW ZEALAND
171	171	country	OM	OMAN
172	172	country	PA	PANAMA
173	173	country	PE	PERU
174	174	country	PF	FRENCH POLYNESIA

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
175	175	country	PG	PAPUA NEW GUINEA
176	176	country	PH	PHILIPPINES
177	177	country	PK	PAKISTAN
178	178	country	PL	POLAND
179	179	country	PM	SAINT PIERRE AND MIQUELON
180	180	country	PN	PITCAIRN
181	181	country	PR	PUERTO RICO
182	182	country	PS	PALESTINIAN TERRITORY, OCCUPIED
183	183	country	PT	PORTUGAL
184	184	country	PW	PALAU
185	185	country	PY	PARAGUAY
186	186	country	QA	QATAR
187	187	country	RE	REUNION
188	188	country	RO	ROMANIA
189	189	country	RS	SERBIA
190	190	country	RU	RUSSIAN FEDERATION
191	191	country	RW	RWANDA
192	192	country	SA	SAUDI ARABIA
193	193	country	SB	SOLOMON ISLANDS
194	194	country	SC	SEYCHELLES
195	195	country	SD	SUDAN
196	196	country	SE	SWEDEN
197	197	country	SG	SINGAPORE
198	198	country	SH	SAINT HELENA
199	199	country	SI	SLOVENIA
200	200	country	SJ	SVALBARD AND JAN MAYEN
201	201	country	SK	SLOVAKIA
202	202	country	SL	SIERRA LEONE
203	203	country	SM	SAN MARINO
204	204	country	SN	SENEGAL
205	205	country	SO	SOMALIA
206	206	country	SR	SURINAME
207	207	country	ST	SAO TOME AND PRINCIPE
208	208	country	SU	USSR
209	209	country	SV	EL SALVADOR
210	210	country	SY	SYRIAN ARAB REPUBLIC

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Table 55 sub_region (cont.)

index	sub_region	type	code	name
211	211	country	SZ	SWAZILAND
212	212	country	TC	TURKS AND CAICOS ISLANDS
213	213	country	TD	CHAD
214	214	country	TF	FRENCH SOUTHERN TERRITORIES
215	215	country	TG	TOGO
216	216	country	TH	THAILAND
217	217	country	TJ	TAJIKISTAN
218	218	country	TK	TOKELAU
219	219	country	TL	TIMOR-LESTE
220	220	country	TM	TURKMENISTAN
221	221	country	TN	TUNISIA
222	222	country	TO	TONGA
223	223	country	TR	TURKEY
224	224	country	TT	TRINIDAD AND TOBAGO
225	225	country	TV	TUVALU
226	226	country	TW	TAIWAN, PROVINCE OF CHINA
227	227	country	TZ	TANZANIA, UNITED REPUBLIC OF
228	228	country	UA	UKRAINE
229	229	country	UG	UGANDA
230	230	country	UM	UNITED STATES MINOR OUTLYING ISLANDS
231	231	country	US	UNITED STATES
232	232	country	UY	URUGUAY
233	233	country	UZ	UZBEKISTAN
234	234	country	VA	HOLY SEE (VATICAN CITY STATE)
235	235	country	VC	SAINT VINCENT AND THE GRENADINES
236	236	country	VE	VENEZUELA
237	237	country	VG	VIRGIN ISLANDS, BRITISH
238	238	country	VI	VIRGIN ISLANDS, U.S.
239	239	country	VN	VIET NAM
240	240	country	VU	VANUATU
241	241	country	WF	WALLIS AND FUTUNA
242	242	country	WS	SAMOA
243	243	country	YE	YEMEN
244	244	country	YT	MAYOTTE
245	245	country	YU	YUGOSLAVIA
246	246	country	ZA	SOUTH AFRICA

Continued on next page

Table 55 sub_region (cont.)

index	sub_region	type	code	name
247	247	country	ZM	ZAMBIA
248	248	country	ZW	ZIMBABWE
249	249	country	ZZ	THIRD PARTY SUPPORT SHIPS

End of table

Table 56: time_quality

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

End of table

Table 57: time_reference

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

End of table

Table 58: traceability

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

End of table

Table 59: units

index	units	name	conventional_ abbreviation	abbreviatio n_in_ASCII	abbreviatio n_in_ITA2	definition_in_base_units
0	1	metre	m	m	M	NA
1	2	kilogram	kg	kg	KG	NA
2	3	second	s	s	S	NA
3	4	ampere	A	A	A	NA
4	5	kelvin	K	K	K	NA
5	6	mole	mol	mol	MOL	NA
6	7	candela	cd	cd	CD	NA
7	21	radian	rad	rad	RAD	NA
8	22	steradian	sr	sr	SR	NA
9	30	hertz	Hz	Hz	HZ	s1
10	31	newton	N	N	N	kg m s-2
11	32	pascal	Pa	Pa	PAL	kg m-1 s2
12	33	joule	J	J	J	kg m2 s-2
13	34	watt	W	W	W	kg m2 s-3
14	35	coulomb	C	C	C	A s
15	36	volt	V	V	V	kg m2 s-3 A1
16	37	farad	F	F	F	kg-1 m2 s4 A2
17	38	ohm		Ohm	OHM	kg m2 s-3 A2
18	39	siemens	S	S	SIE	kg-1 m2 s3 A2
19	40	weber	Wb	Wb	WB	kg m2 s-2 A1
20	41	tesla	T	T	T	kg s-2 A1
21	42	henry	H	H	H	kg m2 s-2 A2
22	60	degree Celsius	C	Cel	CEL	K+273.15
23	70	lumen	lm	lm	LM	cd sr
24	71	lux	lx	lx	LX	cd sr m-2
25	80	becquerel	Bq	Bq	BQ s-1	NA
26	81	grey	Gy	Gy	GY	m2 s-2
27	82	sievert	Sv	Sv	SV	m2 s-2
28	110	degree (angle)		deg	DEG	NA
29	111	minute (angle)	’	’	MNT	NA
30	112	second (angle)	”	”	SEC	NA
31	120	litre	l or L	l or L	L	NA
32	130	minute (time)	min	min	MIN	NA
33	131	hour	h	h	HR	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
34	132	day	d	d	D	NA
35	150	tonne	t	t	TNE	NA
36	160	electron volt	eV	eV	EV	NA
37	161	atomic mass unit	u	u	U	NA
38	170	astronomic unit	AU	AU	ASU	NA
39	171	parsec	pc	pc	PRS	NA
40	200	nautical mile	NA	NA	NA	NA
41	201	knot	kt	kt	KT	NA
42	210	decibel (6)	dB	dB	DB	NA
43	220	hectare	ha	ha	HAR	NA
44	230	week	NA	NA	NA	NA
45	231	year	a	a	ANN	NA
46	300	per cent	%	%	PERCENT	NA
47	301	parts per thousand		0/00	PERTHOU	NA
48	310	eighths of cloud	okta	okta	OKTA	NA
49	320	degrees true		deg	DEG	NA
50	321	degrees per second	degree/s	deg/s	DEG/S	NA
51	350	degrees Celsius (8)	C	C	C	NA
52	351	degrees Celsius per metre	C/m	C/m	C/M	NA
53	352	degrees Celsius per 100 metres	C/100 m	C/100 m	C/100 M	NA
54	360	Dobson Unit (9)	DU	DU	DU	NA
55	430	month	mon	mon	MON	NA
56	441	per second (same as hertz)	s-1	/s	/S	NA
57	442	per second squared	s-2	s2	NA	NA
58	501	knots per 1000 metres	kt/1000 m	kt/km	KT/KM	NA
59	510	foot	ft	ft	FT	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_ abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
60	511	inch	in	in	IN	NA
61	520	decipascals per second (micro-bar per second)	dPa s-1	dPa/s	DPAL/S	NA
62	521	centibars per second	cb s-1	cb/s	CB/S	NA
63	522	centibars per 12 hours	cb/12 h	cb/12 h	CB/12 HR	NA
64	523	dekapascal	daPa	daPa	DAPAL	NA
65	530	hectopascal	hPa	hPa	HPAL	NA
66	531	hectopascals per second	hPa s-1	hPa/s	HPAL/S	NA
67	532	hectopascals per hour	hPa h-1	hPa/h	HPAL/HR	NA
68	533	hectopascals per 3 hours	hPa/3 h	hPa/3 h	HPAL/3 HR	NA
69	535	nanobar = hPa 10-6	nbar	nbar	NBAR	NA
70	620	grams per kilogram	g kg-1	g/kg	G/KG	NA
71	621	grams per kilogram per second	g kg-1 s1	g kg1 s1	NA	NA
72	622	kilograms per kilogram kg kg-1	kg/kg	KG/KG	NA	NA
73	623	kilograms per kilogram per second	kg kg-1 s1	kg kg1 s1	NA	NA
74	624	kilograms per square metre	kg m-2	kg m2	NA	NA
75	630	acceleration due to gravity	g	g	NA	NA
76	631	geopotential metre	gpm	gpm	NA	NA
77	710	millimetre	mm	mm	MM	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
78	711	millimetres per second	mm s-1	mm/s	MM/S	NA
79	712	millimetres per hour	mm h-1	mm/h	MM/HR	NA
80	713	millimetres to the sixth power per cubic metre	mm6 m-3	mm6 m3	NA	NA
81	715	centimetre	cm	cm	CM	NA
82	716	centimetres per second	cm s-1	cm/s	CM/S	NA
83	717	centimetres per hour	cm h-1	cm/h	CM/HR	NA
84	720	decimetre	dm	dm	DM	NA
85	731	metres per second	m s-1	m/s	M/S	NA
86	732	metres per second per metre	m s-1/m	m s1/m	NA	NA
87	733	metres per second per 1000 metres	m s-1/1000 m	m s1/km	NA	NA
88	734	square metres	m2	m2	M2	NA
89	735	square metres per second	m2 s-1	m2/s	M2/S	NA
90	740	kilometre	km	km	KM	NA
91	741	kilometres per hour	km h-1	km/h	KM/HR	NA
92	742	kilometres per day	km/d	km/d	KM/D	NA
93	743	per metre	m-1	m1	/M	NA
94	750	becquerels per litre	Bq l-1	Bq/l	BQ/L	NA
95	751	becquerels per square metre	Bq m-2	Bq m2	BQ/M2	NA
96	752	becquerels per cubic metre	Bq m-3	Bq m3	BQ/M3	NA
97	753	millisievert	mSv	mSv	MSV	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
98	760	metres per second squared	m s-2	m s2	NA	NA
99	761	square metres second	m2 s	m2 s	NA	NA
100	762	square metres per second squared	m2 s-2	m2 s2	NA	NA
101	763	square metres per radian second	m2 rad-1 s	m2 rad1 s	NA	NA
102	764	square metres per hertz	m2 Hz-1	m2/Hz	NA	NA
103	765	cubic metres	m3	m3	NA	NA
104	766	cubic metres per second	m3 s-1	m3/s	NA	NA
105	767	cubic metres per cubic metre	m3 m-3	m3 m3	NA	NA
106	768	metres to the fourth power	m4	m4	NA	NA
107	769	metres to the two thirds power per second	m2/3 s-1	m2/3 s1	NA	NA
108	772	logarithm per metre	log (m-1)	log (m1)	NA	NA
109	773	logarithm per square metre	log (m-2)	log (m2)	NA	NA
110	775	kilograms per metre	kg m-1	kg/m	NA	NA
111	776	kilograms per square metre per second	kg m-2 s1	kg m2 s1	NA	NA
112	777	kilograms per cubic metre	kg m-3	kg m3	NA	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_ abbreviation	abbreviatio n_in_ASCII	abbreviatio n_in_ITA2	definition_in_base_units
113	778	per square kilogram per second	kg-2 s1	kg2 s1	NA	NA
114	779	seconds per metre	s m-1	s/m	NA	NA
115	785	kelvin metres per second	K m s-1	K m s1	NA	NA
116	786	kelvins per metre	K m-1	K/m	NA	NA
117	787	kelvin square metres per kilogram per second	K m2 kg-1 s1	K m2 kg1 s1	NA	NA
118	788	moles per mole	mol mol-1	mol/mol	NA	NA
119	790	radians per metre	rad m-1	rad/m	NA	NA
120	795	newtons per square metre	N m-2	N m2	NA	NA
121	800	pascals per second	Pa s-1	Pa/s	NA	NA
122	801	kilopascal	kPa	kPa	NA	NA
123	805	joules per square metre	J m-2	J m2	NA	NA
124	806	joules per kilogram	J kg-1	J/kg	NA	NA
125	810	watts per metre per steradian	W m-1 sr1 W m1 sr1	NA	NA	NA
126	811	watts per square metre	W m-2	W m2	NA	NA
127	812	watts per square metre per steradian	W m-2 sr1	W m2 sr1	NA	NA
128	813	watts per square metre per steradian centimeter	W m-2 sr1 cm	W m2 sr1 cm	NA	NA

Continued on next page

Table 59 units (cont.)

index	units	name	conventional_abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
129	814	watts per square metre per steradian metre	W m-2 sr1 m	W m2 sr1 m	NA	NA
130	815	watts per cubic metre per steradian	W m-3 sr1	W m3 sr1	NA	NA
131	820	siemens per metre	S m-1	S/m	NA	NA
132	825	square degrees	degree2	deg2	NA	NA
133	830	becquerel seconds per cubic metre	Bq s m-3	Bq s m3	NA	NA
134	835	decibels per metre	dB m-1	dB/m	NA	NA
135	836	decibels per degree	dB degree-1	dB/deg	NA	NA
136	841	pH unit	pH unit	pH unit	NA	NA
137	842	N units	N units	N units	NA	NA
138	843	Nephelometric turbidity units	NTU	NTU	NA	NA
139	no	(yotta)	(Y)	(Y)	(Y)	NA
140	no	(zetta)	(Z)	(Z)	(Z)	NA
141	no	exa	E	E	E	NA
142	no	peta	P	P	PE	NA
143	no	tera	T	T	T	NA
144	no	giga	G	G	G	NA
145	no	mega	M	M	MA	NA
146	no	kilo	k	k	K	NA
147	no	hector	h	h	H	NA
148	no	deca	da	da	DA	NA
149	no	deci	d	d	D	NA
150	no	centi	c	c	C	NA
151	no	milli	m	m	M	NA
152	no	micro		u	U	NA

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Table 59 units (cont.)

index	units	name	conventional_abbreviation	abbreviation_in_ASCII	abbreviation_in_ITA2	definition_in_base_units
153	no	nano	n	n	N	NA
154	no	pico	p	p	P	NA
155	no	femto	f	f	F	NA
156	no	atto	a	a	A	NA
157	no	(zepto)	(z)	(z)	NA	NA
158	no	(yocto)	(y)	(y)	NA	NA

End of table

Table 60: update_frequency

index	update_frequency	description
0	1	Annual

End of table

Table 61: z_coordinate_method

index	z_coordinate_method	description
0	0	Value from chart

End of table

Table 62: z_coordinate_type

index	z_coordinate_type	description
0	0	height (m) above sea level

End of table