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

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Copernicus Climate Change Service - 311a Lot 2

Defining a Common Data Model

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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

1.1 Purpose of this document

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

1.2 Scope

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

Whilst initially intended for use with observations of Essential Climate Variables (ECVs; e.g. GCOS, 2010) the data model is not restricted to the ECVs. Following the ECMWF Observations DataBase (ODB) type data model, the measurand (or observed parameter) is parameterized, with both the variable being reported and its value specified in the data model.

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

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

Comprehensive quality control and uncertainty information can be recorded through the use of linked entity-attribute-value tables.

1.3 Structure of this document

Section 2 of this document provides background information on the data model and existing relevant data models and standards. Section 3 forms the core section of this document and defines the primary observations table and associated configuration, quality control and uncertainty budget tables. Recognising that the data model will change and evolve as the requirements of the users and the C3S Climate Data Store develop, Section 4 proposes a governance model for the CDM and outlines future developments.

2 Background and existing standards

2.1 Observational sources and requirements of the data model

Across the C3S 311a (Collection and Processing of In Situ Observations) service access to observations from the surface terrestrial and marine environments and upper air data will be provided in a Common Data Model.

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



The observations included in the service range from point observations made from moving platforms to daily and monthly statistics at fixed locations. The parameters reported include, inter alia: air temperature; humidity; wind speed; pressure; cloud cover information; present weather. The statistics include, inter alia: daily min, max and mean air temperature; accumulated precipitation over 3 or 24 hours; mean wind speed over the preceding 10 minutes. The full range of parameters and statistics to be reported will evolve as the service is developed. As new parameters are recovered from newly digitised sources and the reprocessed climate archives the list of parameters will need to expand.

Both surface level (terrestrial and marine) and upper air data will be included in the service. The surface level data includes observations made at standard and non-standard heights. The upper air data will include multiple observations, starting at the surface and at increasing height through the atmosphere, often as a function of pressure or geopotential height. As a result the data model needs to include the flexibility to record the height and the units used for reporting the height of observation with every observation. Similarly, some reporting stations, and hence observations, will move in the horizontal plan, and the horizontal coordinates need to be reported with each observation. To avoid ambiguity, the CRS should be provided with each location reported.

The period covered by the service ranges from ~1850 to present day. Over this period there have been many changes to the instruments and practices used to record the various parameters. The choice of instruments and practices will influence the quality of the observations and a change in instrumentation, or location, may introduce inhomogeneities into the record. To mitigate this risk, comprehensive observational metadata, where it exists, is required. Similarly, information on adjustments and conversions applied to the data need to be recorded. The full range of observational practices and instruments used is not currently known and developed data model will need to be expandable to accommodate new metadata as required.

The observations to be included will be sourced from a variety of existing datasets, such as the International Comprehensive Ocean and Atmosphere Data Set (ICOADS; e.g. Freeman et al., 2017), and newly digitised sources. In defining the data model the provenance and lineage of the data sources need to be preserved. Similarly, usage rights and citation information for those data sources need to be preserved and provided to the users alongside the observational data.

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

2.2 ECMWF Observations DataBase (ODB)

The data model defined and used in the ECMWF Observations DataBase (ODB) software allows the representation of environmental data from many sources, including in situ observations, satellite data and model output. This flexibility is achieved through storing each observation, or estimate, of a single parameter as a separate record together with header information providing information on the location and source of the observation. Where multiple observations are made in a single report the report spans multiple records, with the header information repeated. A simplified example is given in Table 1. Additional tables give further information on the coded values.



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

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

End of table

2.3 BUFR and WIGOS Metadata Standard

There has been a large body of work and significant effort previously invested in defining data models and parameterising the data and metadata for encoding the data into those data models. Within the scope of the CDM and the C3S 311a service, the WMO Binary Universal Form for the Representation of meteorological data (BUFR) (WMO, 2015a) and the WMO Integrated Observing System Metadata Standard (WMDS) (WMO, 2015b) are key background material.

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

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 have been referenced, where appropriate, in preference to defining new code tables.

3 Common Data Model

Whilst the ODB data model has great flexibility the requirements of the implementation at ECMWF and that required by the C3S 311a service are different. For example, the existing columns defined within ECMWFs ODB implementation² contain many parameters that are of 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 the C3S 311a service that are required to correctly interpret the observa-

²<http://apps.ecmwf.int/odbgov/column/>



tions but that are not included in ODB.

To give the flexibility required, and to maintain compatibility with the ODB, the primary observations table within the CDM has been developed based on the ODB 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 CDM consists of 7 primary tables:

- *observations_table* table (Table 2). This is the primary table, or data structure, containing the observations and 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.
- *station_configuration* table (Table 3). This table 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.
- *source_configuration* table (Table 5). This table 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.
- *profile_configuration* table (Table 7). This table contains detailed metadata for atmospheric and oceanic profiles, including: profile type; type of launcher; direction of profile; balloon / XBT type etc.
- *sensor_configuration* table (Table 9). This table 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.
- *qc_table* table (Table 11). This table contains detailed information on the quality control applied to each report and / or observation.
- *uncertainty_table* table (Table 13). This table contains detailed information on the uncertainty budget for each observation.

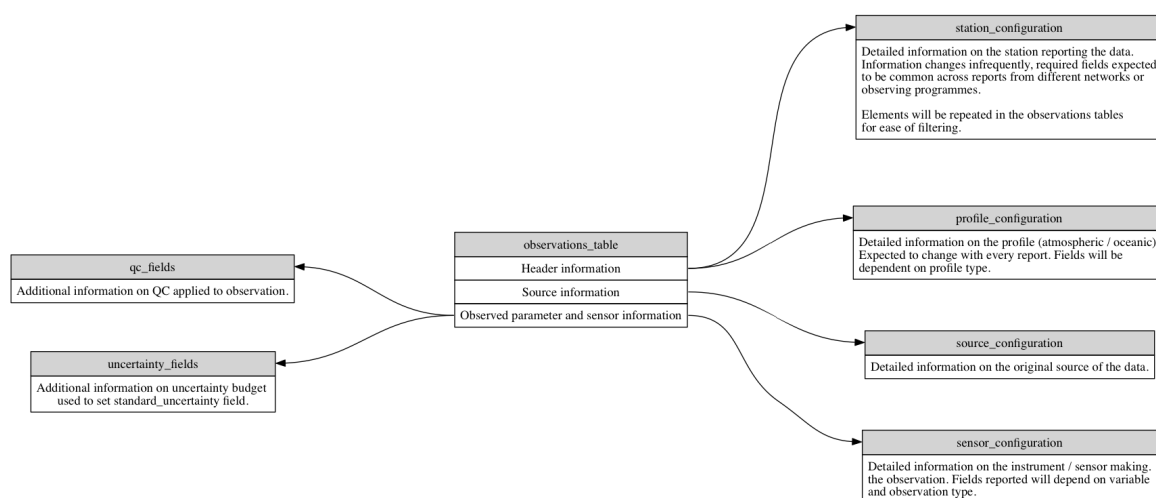


Figure 1: Simplified schematic showing overview of common data model

Whilst Figure 1 and the tables 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. Similarly, the data model could be represented in NetCDF with elements common at the report level, and from the configuration tables, included in the NetCDF file as global or variable attributes as appropriate.

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".
- byte: A single byte of data used to store e.g. a bit flag array.
- []: An array of the indicated type.
- (fk) The indicated value is also a foreign key linking to another table (e.g. decode table for encoded data).
- (pk) The indicated elements marked as (pk) within a table form the unique ID for the record.

Mandatory elements are indicated by a 1 (or 1+) in the occurrence column. Mandatory elements that are not available must be encoded but may be reported as missing (e.g. NA, NULL or format specific equivalent). Optional elements are indicated by 0+. Whilst arrays have been indicated for the elements containing multiple values this does not preclude other implementations. Where there are many optional elements for a given table these are parameterised and included in the appendix. For example, the *station_configuration* table has many optional elements, with valid optional elements, and their kind, listed in the *station_configuration_fields* table. This, in turn, is linked to the *station_configuration_codes* table. No method is specified for the inclusion of the additional elements as the inclusion is dependent on the implementation of the data model and format used.



```

<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.

(e.g. ASCII, NetCDF, XML, relational database). For example, as with the other configuration fields, the optional elements could be reported in the global attributes section of a NetCDF file. Alternatively, EAV based tables linked to the configuration tables could be used in a relational database setting.



3.1 Observations table

Table 2: observations_table

element_name	occurrence	kind	external table	description
report_id	1	varchar (pk)		Unique ID for report (unique ID given by combination of report_id and observation_id)
region	1	int (fk)	region	Region (WMO region / Ocean basin)
sub_region	1	int (fk)	sub_region	Country / regional sea
application_area	1+	int[] (fk)	application_area	WMO application area(s)
observing_programme	1+	int[] (fk)	observing_programme	Observing programme, e.g. VOS
report_type	1	int (fk)	report_type	e.g. SYNOP, TEMP, CLIMAT, etc
station_name	1	varchar		e.g. GRUAN station name, ship name, site name etc
station_type	1	int (fk)	station_type	Type of station, e.g. land station, sea station etc
platform_type	1	int (fk)	platform_type	Structure upon which sensor is mounted, e.g. ship, drifting buoy, tower etc
platform_sub_type	1	int (fk)	platform_sub_type	Sub-type for platform, e.g. 3m discuss buoy
primary_station_id	1	varchar (fk)	station_configuration	Primary station identifier, e.g. WIGOS ID
station_record_number	1	int (fk)	station_configuration	Together with primary_station_id this forms a link to the station configuration table.
primary_station_id_scheme	1	int (fk)	id_scheme	Scheme used for station ID
secondary_station_id	0+	varchar []		Alternate (e.g. local) ID for station.
secondary_station_id_scheme	0+	int[] (fk)	id_scheme	Alternate ID Scheme, e.g. Network ID.
station_location_longitude	1	numeric		Longitude of station, -180.0 to 180.0 (or other as defined by station_crs)
station_location_latitude	1	numeric		Latitude of station, -90 to 90 (or other as defined by station_crs)
station_location_accuracy	1	numeric		Accuracy to which station location recorded (radius in km)
station_location_method	1	int(fk)	location_method	Method by which location determined
station_location_quality	1	int (fk)	location_quality	Quality flag for station location
station_crs	1	int (fk)	crs	Coordinate reference scheme for station location
station_speed	1	numeric		Station speed over ground if mobile (m/s)
station_course	1	numeric		Station course over ground if mobile (degree true)
station_heading	1	numeric		Station heading if mobile

Continued on next page



Table 2 observations_table (cont.)

element_name	occurrence	kind	external_table	description
height_of_station_above_local_ground	1	numeric		Height of station above local ground (m)
height_of_station_above_sea_level	1	numeric		Height of station above mean sea level (m), negative values for below sea level.
height_of_station_above_sea_level_accuracy	1	numeric		Accuracy to which height of station known (m)
sea_level_datum	1	int (fk)	sea_level_datum	Datum used for sea level
report_meaning_of_time_stamp	1	int (fk)	meaning_of_time_stamp	Report time - beginning, middle or end of reporting period
report_timestamp	1	timestamp with timezone		e.g. 1991-01-01 12:00:00+0
report_duration	1	int		Report duration (s), e.g. 86400 = daily obs, 3600 hourly etc
report_time_accuracy	1	numeric		Precision to which time was recorded (s)
report_time_quality	1	int (fk)	time_quality	Quality flag for report_timestamp
report_time_reference	1	int (fk)	time_reference	Reference Time (e.g. referenced to time server, atomic clock, radio clock etc)
profile_id	1	varchar (fk)	profile_configuration	Information on profile (atmospheric / oceanographic) configuration. Set to Record ID for profile data or missing (NULL) otherwise.
events_at_station	0+	int[] (fk)	events_at_station	e.g. ship hove to, crop burning etc.
report_quality	1	int (fk)	quality_flag	Overall quality of report
duplicate_status	1	int (fk)	duplicate_status	E.g. no duplicates, best duplicate, duplicate, not checked.
duplicates	0+	varchar[] (fk)	observations_table	Array of report_id's for duplicates
record_timestamp	1	timestamp with timezone		Timestamp of revision for this record
history	1	varchar		Sequence of processing steps. Free text with timestamp 1 : history 1; timestamp 2 : history 2 etc.
processing_level	1	int (fk)	report_processing_level	Level of processing applied to this report
processing_codes	0+	int[] (fk)	report_processing_codes	Processing applied to this report
source_id	1	varchar (fk)	source_configuration	Original source of data link to table
source_record_id	1	varchar		Record ID in source data, e.g. ID of event from GRUAN meta database
data_policy_licence	1	int (fk)	data_policy_licence	WMOessential, WMOadditional, WMOother

Continued on next page



Table 2 observations_table (cont.)

element_name	occurrence	kind	external_table	description
observation_id	1	int (pk)		Together with report_id forms unique ID for observation / record
observed_variable	1	int (fk)	observed_variable	The variable being observed / measured
secondary_variable	0 or 1	int (fk)	secondary_variable	Secondary variable required to understand observation, e.g. chemical constituent
units	1	int (fk)	units	Units for the observed variable
code_table	1	int (fk)	observation_code_table	Encode / decode table for variable (if encoded)
observation_value	1	numeric		The observed value
secondary_value	0 or 1	int (fk)	TBD	value for the secondary variable.
observation_value_significance	1	int (fk)	observation_value_significance	e.g. min, max, mean, sum
observation_times_tamp_meaning	1	int (fk)	meaning_of_time_stamp	beginning, middle, end
observation_timestamp	1	timestamp with timezone		timestamp for observation
observation_duration	1	int		Duration/period over which observation was made (s)
observation_longitude	1	numeric		Longitude of the observed value, -180 to 180 (or other as defined by CRS)
observation_latitude	1	numeric		Latitude of the observed value, -90 to 90 (or other as defined by CRS)
observation_location_method	1	int (fk)	location_method	Method of determining location,
observation_location_precision	1	numeric		Precision to which location is reported (radius km)
observation_bounding_box_min_longitude	1	numeric		Bounding box for observation, valid range given by CRS
observation_bounding_box_max_longitude	1	numeric		Bounding box for observation, valid range given by CRS
observation_bounding_box_min_latitude	1	numeric		Bounding box for observation, valid range given by CRS
observation_bounding_box_max_latitude	1	numeric		Bounding box for observation, valid range given by CRS
observation_spatial_representativeness	1	int (fk)	spatial_representativeness	Spatial representativeness of observation

Continued on next page



Table 2 observations_table (cont.)

element_name	occurrence	kind	external_table	description
observation_height_above_station_surface	1	numeric		Height of sensor above local ground or sea surface. Positive values for above surface (e.g. sondes), negative for below surface (e.g. xbt). For visual observations, height of the visual observing platform.
observation_z_coordinate	1	numeric		z coordinate of observation
observation_z_coordinate_type	1	int (fk)	z_coordinate_type	Type of z coordinate
observation_z_coordinate_method	1	int (fk)	z_coordinate_method	Method of determining z coordinate
quality_flag	1	int (fk)	quality_flag	Quality flag for observation
quality_bitmap	1	byte		TBD
numerical_precision	1	int		Reporting precision of observation in units given by 'units' variable. Equivalent to BUFR scale factor
standard_uncertainty	1	numeric		Standard uncertainty in reported value
method_of_estimating_standard_uncertainty	1	int (fk)	method_of_estimating_standard_uncertainty	Method of estimating the standard uncertainty
sensor_id	1	varchar (fk)	sensor_configuration	NA
sensor_automation_status	1	int (fk)	automation_status	Automated, manual, mixed or visual observation
exposure_of_sensor	1	int (fk)	instrument_exposure_quality	Whether the exposure of the instrument will impact on the quality of the measurement
original_precision	1	int		Original reporting precision in units given by 'original_units'
original_units	1	int (fk)	units	Original units
original_value	1	numeric		Original value as reported or recorded in log book.
conversion_method	1	int (fk)	conversion_method	Link to table describing conversion process
processing_code	0+	int[] (fk)	processing_code	e.g. TRC (temperature radiation corrections) etc. Encoded in table.
processing_level	1	int (fk)	processing_level	Level of processing applied to observation.
adjustment_id	1	int (fk)	adjustment	Adjustment applied to observation reported in observation value (observation_value = original + adjustment)

Continued on next page



Table 2 observations.table (cont.)

element_name	occurrence	kind	external_table	description
traceability	1	int (fk)	traceability	Whether observation can be traced to international standards.
advanced.qc	1	flag	NA	Whether there are advanced qc data available for this observation in qc.records table
advanced.uncertainty	1	flag	NA	Whether there are advanced uncertainty estimates for this observation in the uncertainty_budget table

End of table



3.2 Station configuration

Table 3: station_configuration

element_name	occurrence	type	external_table	description
station_primary_id	1	varchar		Primary (e.g. WMO) ID for station
station_primary_id_scheme	1	int (fk)	id_scheme	Scheme used for primary ID
station_record_number	1	int		Record number for this station entry
station_secondary_id	0+	varchar		Secondary (e.g. local) ID for station
station_secondary_id_scheme	0+	int (fk)	id_scheme	Scheme used for secondary ID
station_name	1	varchar		Name of station (e.g. Tateno)
station_abbreviation	1	varchar		Abbreviation of station name (e.g. TAT)
alternative_name	0+	varchar[]		NA
station_crs	1	int (fk)	crs	coordinate reference system used to report stations location
station_longitude	1	numeric		Report position for station if stationary or NULL if mobile. If more than one estimate record best here and additional values using optional fields.
station_latitude	1	numeric		Report position for station if stationary or NULL if mobile
local_gravity	1	numeric	NA	Local gravity at station location (units ms-2)
start_date	1	timestamp		Date that the station first started reporting in this configuration
end_date	1	timestamp		Last data the station reported in this configuration
station_type	1	int (fk)	station_type	Type of reporting station
platform_type	1	int (fk)	platform_type	Generic type of observing platform
platform_sub_type	1	int (fk)	platform_sub_type	Specific type of observing platform
operating_institute	1	int (fk)	institute	Institute operating the station (e.g. National Oceanography Centre)
operating_organisation	1	int (fk)	organisation	Parent organisation for the institute (e.g. Natural Environment Research Council)
operating_territory	1	int (fk)	sub_region	Sub-region where station is located or country of registry for mobile station
city	1	int (fk)	cities	Nearest city / town to station location
observing_frequency	1	int (fk)	observing_frequency	Typical frequency of observations for this station (reports per day)

Continued on next page



Table 3 station_configuration (cont.)

element_name	occurrence	type	external_table	description
telecommunication_method	1	int (fk)	communication_method	Method used to report observations
station_automation	1	int (fk)	automation_status	Whether station is automated, manual or mixed
measuring_syst	1	int (fk)	measuring_syst	Station / AWS model type
em_model			em_model	
measuring_system_id	1	varchar		ID or serial number of measuring system
observed_variables	1+	int[] (fk)	observed_variable	array indicating which variables are observed by this station
comment	1	varchar		Any other comments / footnotes
	0+	NA		See station_configuration_fields for valid optional fields and types
End of table				



Table 4: station_configuration_fields

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

End of table



3.3 Profile configuration

Table 5: profile_configuration

element_name	occurrence	kind	external_table	description
profile_id	1	varchar	NA	Unique ID for this profile entry
profile_type	1	int (fk)	profile_type	Type of profile (e.g. atmospheric or oceanic)
standard_time	1	int (fk)	standard_time	e.g. Standard / scheduled time for launch or report, e.g. 00, 06, 12, 18 UTC
actual_time	1	timestamp		Actual report / launch time
profile_number	1	numeric		e.g. Balloon Number
comments	1	varchar		Any additional comments / footnotes
	0+	NA		See profile_configuration_fields for valid fields and types.
End of table				



Table 6: 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
8	unwinder length	numeric	NA
9	ascent rate	numeric	Rate of ascent / descent for profile (+ve values indicate ascent, -ve descent)(m/s)
B002016	radiosonde configuration	int (fk)	NA
B002003	type of measuring equipment used	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
B002083	type of balloon shelter	int (fk)	NA
B002084	type of gas used in balloon	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

Continued on next page



Table 6 profile_configuration_fields (cont.)

field_id	field_name	type	description
B035035	reason for termination	int (fk)	NA

End of table

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3.4 Source configuration

Table 7: source_configuration

element_name	occurrence	type	external table	description
source_id	1	varchar (pk)		Unique record ID for dataset
product_id	1	varchar		ID for product
product_name	1	varchar		Name of source, e.g. International Comprehensive Ocean Atmosphere Data Set, RS92 GRUAN Data Product
product_code	1	varchar		Abbreviations / product code, e.g. ICOADS, RS92-GDP
product_version	1	varchar		Version number for dataset, e.g. Release 3.0.0
product_level	1	int (fk)	product_level	Level of product
product_uri	1	varchar		URI for product, either to original source or to CDS
description	1	varchar		Description of dataset / comments
product_references	1+	varchar[]		References describing the dataset
product_citation	1+	varchar[]		Citation to use when using this product
product_status	1	int (fk)	product_status	Status of product, draft, pre-release, release
source_format	1	int (fk)	source_format	Original format for data
source_format_version	1	varchar		Version of original data format
source_file	1	varchar		Filename for data from source
source_file_checksum	1	varchar		Checksum of source datafile
data_centre	1	int (fk)	institute	Data centre from which data sourced
data_centre_url	1	varchar		URL for data centre
parent_organisation	1	int (fk)	organisation	Parent organisation for institute
data_policy_licence	1	int (fk)	data_policy_licence	Data policy / licence
pi_name	1	varchar		Name of PI responsible for dataset
pi_email	1	varchar		Email address of PI
pi_url	1	varchar		URL for PI
history	1	varchar		History of source
comments	1	varchar		Additional comments / footnotes
timestamp	1	timestamp with timezone		Date record created / created
maintenance_and_update_frequency	1	int (fk)	update_frequency	Frequency with which modifications and deletions are made to the data after it is first produced
	0+			See source_configuration_fields for list of optional fields and types

Continued on next page



Table 7 source configuration (cont.)

element_name	occurrence	type	external_table	description
End of table				



Table 8: source.configuration_fields

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

End of table



3.5 Sensor configuration

Table 9: sensor_configuration

element_name	occurrence	type	external_table	description
instrument_id	1	varchar (pk)		Unique ID for this instrument
observing_method	1	int (fk)	observing_method	Method (instrumental, estimated / visual, computed) by which observation made
sampling_strategy	1	int (fk)	sampling_strategy	Sampling strategy used by instrument
calibration_status	1	int (fk)	calibration_status	Whether the sensor is in / out of calibration
calibration_date	1	timestamp		Date of last calibration
comments	1	varchar		additional comments for sensor not reportable elsewhere
date_start	1	timestamp		start date for period of validity associated with this entry
date_end	1	timestamp		end date for period of validity associated with this entry
	0+			see sensor_configuration_fields for list of valid fields and types.
End of table				



Table 10: sensor_configuration_fields

field_id	field_name	parameter	type	description
SACC	sensor accuracy	all	numeric	Reported accuracy (trueness) of sensor in units of measurement.
SPRE	sensor precision	all	numeric	Reported precision (repeatability) of sensor in units of measurement
B002033	sensor type - salinity	salinity	int (fk)	NA
B002038	sensor type - water temperature	water temperature	int (fk)	NA
B002051	sensor type - extremes	air temperature	int (fk)	NA
B002096	sensor type - air temperature	air temperature	int (fk)	NA
B002097	sensor type - humidity	humidity	int (fk)	NA
B002169	sensor type - wind speed	wind speed	int (fk)	NA
B002185	sensor type - evaporation	evaporation	int (fk)	NA
B003003	sensor housing - type	all	int (fk)	NA
B003004	sensor housing - radiation shielding	all	int (fk)	NA
B003008	sensor housing - ventilation	all	int (fk)	NA
B003020	sensor housing - material	all	int (fk)	NA
B003021	sensor housing - heating	all	int (fk)	NA
B003022	sensor owner	all	int (fk)	NA
B003023	sensor housing - configuration	all	int (fk)	NA
BARG	sensor type - barograph	pressure trend	int (fk)	NA
BARM	sensor type - barometer	pressure	int (fk)	NA
CALINT	calibration interval	all	numeric	Maximum number of months recommended between calibrations.
CALMETH	calibration method	all	int (fk)	Method used to calibrate instrument
CALPTY	calibration party	all	varchar	Who performed the calibration
CALRES	calibration result	all	varchar TBD	Result of the calibration
FREQ	sampling frequency	all	numeric	time period (s) between successive measurements from sensor

Continued on next page



Table 10 sensor_configuration_fields (cont.)

field_id	field_name	parameter	type	description
IBS	ice bulb status	humidity	int (fk)	NA
LDCL	sensor location - distance from center line	wind speed	numeric	NA
LDFB	sensor location - distance from bow	wind speed	numeric	NA
LHAD	sensor location - height above deck	wind speed	numeric	NA
MANU	manufacturer	all	int (fk)	NA
QCPROC	quality control procedure	all	int (fk)	Procedure used to quality control the observation and set quality flag
SERIAL	serial number	all	varchar	NA
SHVR	sensor housing - ventilation rate	all	numeric	NA
SLOC	sensor location - ship	all	int (fk)	NA
SMAX	sensor range - max	all	numeric	Maximum observable value with sensor in reported units of measurement
SMIN	sensor range - min	all	numeric	Minimum observable value with sensor in reported units of measurement
SMOD	sensor model	all	varchar	NA
SOFT	software_version	all	varchar	NA
SPROC	sampling procedure	all	int (fk)	how the sample was obtained
SRES	sensor resolution	all	numeric	NA
SRESP	sensor response time	all	numeric	Time (s) for sensor to change from previous state to current state
SRR	sensor type - precipitation	precipitation	int (fk)	NA
SSIDE	sensor side - ship	all	int (fk)	NA
STAB	sensor stability	all	numeric	Reported stability of sensor in reported units of measurement per year.
SWV	sensor type - waves	waves	int (fk)	NA
SWW	sensor type - present weather	present weather	int (fk)	NA
TREAT	sample treatment	all	int (fk)	treatment of the sample prior to analysis
TSONDE	telemetry_sonde	sonde	int (fk)	NA
WGHT	weight	sonde	numeric	NA
STIME	sample times	all	timestamp	time of the samples used to calculate statistics

End of table



3.6 Quality control flags

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

Table 11: qc_table

element_name	kind	external_table	description
report_id	varchar (fk)	observations_table	Link to report this entry is for
observation_id	varchar (fk)	observations_table	Link to observation this entry is for. Set to NULL / NA if entry for report level QC
qc_method	int (fk)	qc_method	Link to table describing QC method used to set this flag
qc_flag	int (fk)	qc_flag	0 pass, 1 fail

End of table

3.7 Uncertainty budget

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

Table 12: uncertainty_table

element_name	kind	external_table	description
report_id	int (fk)	observations_table	Link to report this entry is for
observation_id	int (fk)	observations_table	Link to observation this entry is for
uncertainty_type	int (fk)	uncertainty_type	NA
uncertainty_value	numeric	NA	expected error variance due to specified uncertainty source

End of table

4 Common Data Model governance and future development

- 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.
- Mapping to WIGOS WMDS and INSPIRE / ISO 19139 (time permitting)
- User guide to CDM (time permitting)

5 Acknowledgements

- Participants from Lot 1



-
- Participants from Lot 2
 - Participants from Lot 3
 - External comments ...

6 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.

7 Appendix

7.1 Code tables

Draft



Table 13: adjustment ()

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

End of table



Table 14: application_area (WIGOS 2-01)

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

End of table

Table 15: automation_status

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

End of table

Table 16: calibration_status (WIGOS 5-08)

calibration_status	description
0	No changes - in calibration.

Continued on next page



Table 16 calibration_status (cont.)

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

End of table

Table 17: communication_method (Various (WMO47, WIGOS, BUFR))

communication_method	description
0	Cellular (unspecified)
1	Meteosat DCP
2	Iridium (unspecified)
3	GOES DCP
4	VSAT (unspecified)
5	Landline telephone
6	Radio modem
7	E-mail (unspecified)
8	Voice (ship). The observation is sent to a NMS through the telephone network. The communication may use Inmarsat, Iridium, Vsat, VHF
9	Email (ship). The observation is sent to a NMS through an email. The WMO message is attached to this email. The satellite communication provider may be Inmarsat, Iridium, Vsat
10	Web (ship). The observation is sent through the Web (example: TurboWeb). The satellite communication provider may be Inmarsat, Iridium, Vsat
11	Inmarsat-C (FM13, SAC41). Standard procedure used to report observations (FM13 messages) from conventional VOS for many years. Collect call system: the NMS which receives the observations pays the communication costs
12	Inmarsat-C (FM13, other SAC). FM13 messages are sent to a dedicated SAC (other than SAC41) established at one, or more LES. In general, communications are paid by the country who recruited the ship
13	Inmarsat-C (EUHC). Text messages containing compressed data (E-SURFMAR format) are sent ashore through Inmarsat-C to a dedicated SAC and LES. Communications are paid by the country who recruited the ship
14	Inmarsat-C (SEAS). SEAS binary messages sent through Inmarsat-C Data Mode to a dedicated SAC and LES. Communications are paid by NOAA/NWS
15	Automated Identification System (direct or through satellite)

Continued on next page



Table 17 communication_method (cont.)

communication_method	description
16	Argos system
17	Cellular (Dial-up). Dial-up communication using terrestrial wireless networks (GSM, GPRS)
18	Cellular (SMS). SMS sent through terrestrial wireless networks (GSM, GPRS)
19	Globalstar communication system
20	GMS (DCP). Data Collecting Platform of Geostationary Meteorological Satellites
21	Iridium (SBD). Short Burst Data service of Iridium communication system
22	Iridium (Email). Email sent through Iridium (e.g. Easymail)
23	Iridium (Dial-up). Dial-up communication using Iridium
24	Inmarsat-C (Data Mode). Data Mode service of Inmarsat-C used by S-AWS. See above for SEAS which also uses this service for conventional VOS
25	Inmarsat-C (Email). Email sent through Inmarsat-C
26	Orbcomm communication system
27	Vsat (Email). Email sent through Vsat
28	Vsat (Dial-up). Dial-up communication using Vsat
29	Delayed Mode only
30	Other (specify in footnote).

End of table

Table 18: conversion_method

conversion_method	description	implementation	reference
0	Fahrenheit to degrees Celsius	$T_{\text{Celsius}} = (T_{\text{Fahrenheit}} - 32) / 1.8$	NA

End of table

Table 19: crs (BUFR 0 01 150)

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

End of table



Table 20: data_policy_licence (WIGOS 9-02)

data_policy_licence	name	description
1	WMOessential	WMO Essential Data: free and unrestricted international exchange of basic data and products.
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.
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 21: duplicate_status (Simplified version of duplicate status flags from IMMA (ICODS))

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

End of table

Table 22: events_at_station (WIGOS 4-04)

events_at_station	description
1	Grass-cutting
2	Snow clearing
3	Tree removal
4	Construction activity
5	Road work

Continued on next page



Table 22 events_at_station (cont.)

events_at_station	description
6	Biomass burning
7	Dust storm
8	Storm damage
9	Wind storm
10	Flood
11	Fire
12	Earthquake
13	Land slide
14	Storm surge or tsunami
15	Lightning
16	Vandalism

End of table

Table 23: id_scheme (ICOADS, other ...)

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

End of table



Table 24: institute ()

institute	name	region	sub_region	address	contact	contact_email	URL
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 25: instrument_exposure_quality (WIGOS 5-15)

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

End of table

Table 26: location_method (WIGOS 11-01 and BUFR 0 02 148)

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

End of table

Table 27: location_quality

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

End of table



Table 28: meaning_of_time_stamp (WIGOS 11-03 (simplified))

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

End of table

Table 29: measuring_system_model

measuring_system_model	description
0	BATOS 4.8

End of table

Table 30: method_of_estimating_uncertainty

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

End of table



Table 31: observed_variable

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
0	aerosols			aaod	aerosol_absorption_optical_depth	Dimensionless	NA
1	aerosols			acb	aerosol_column_burden	g m ⁻²	NA
2	aerosols			adc	aerosol_dust_concentration	g kg ⁻¹	NA
3	aerosols			aer	aerosol_effective_radius	m	NA
4	aerosols			aec	aerosol_extinction_coefficient	m ⁻¹	NA
5	aerosols			ammr	aerosol_mass_mixing_ratio	g kg ⁻¹	NA
6	aerosols			aod	aerosol_optical_depth	Dimensionless	NA
7	aerosols			asmf	aerosol_species_fraction	moles per mole of dry air	NA
8	aerosols			astcb	aerosol_speciation_column_burden	moles m ⁻²	NA
9	aerosols			at	aerosol_type	coded	NA
10	aerosols			ava	aerosol_volcanic_ash	g kg ⁻¹	NA
11	aerosols			avat	total_column_aerosol_volcanic_ash	g m ⁻²	NA
12	aerosols			ac	air_conductivity	km	NA
13	albedo			bsa	blue_ice_and_snow_albedo	percent	NA
14	albedo			bir	blue_ice_bidirectional_reflectance	sr ⁻¹	NA

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
15	albedo			cga	clean_glacier_ice_albedo	percent	NA
16	albedo			dga	dirty_glacier_ice_albedo	percent	NA
17	albedo			esa	earth_surface_ice_albedo	percent	NA
18	albedo			sbr	snow_bidirectional_reflectance	sr-1	NA
19	cloud	atmospheric	upper-air	hb	cloud_base_height	m	cloud base height (hb)
20	cloud	atmospheric	upper-air	h	cloud_base_lowest_height	coded	Height above surface of the base of the lowest cloud seen (coded 0-9)
21	cloud	atmospheric	upper-air	n	cloud_cover	Okta or percent	NA
22	cloud	atmospheric	upper-air	c	cloud_genus	Coded	Genus of cloud (0 - Cirrus 9 - Cumulo-Nimbus)
23	cloud	atmospheric	upper-air	hs	cloud_genus_base_height	Coded or m	Height of base of cloud whose genus is c
24	cloud	atmospheric	upper-air	ch	high_cloud_type	coded	type of high clouds (ch)
25	cloud	atmospheric	upper-air	cl	low_cloud_type	coded	type of low clouds (cl)
26	cloud	atmospheric	upper-air	nh	lowest_cloud_amount	Okta	low or (if low clouds don't exist) middle cloud amount
27	cloud	atmospheric	upper-air	cm	middle_cloud_type	coded	type of middle clouds (cm)
28	cloud	atmospheric	upper-air	tca	total_cloud_amount	Okta	total amount of clouds
29	evaporation	atmospheric		eee	evaporation	mm	NA
30	evaporation	atmospheric		ev	evaporation	kg m-2 s-1	NA
31	evaporation	atmospheric		pev	potential_evapotranspiration	mm day-1	NA

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
32	evaporation	atmospheric		rev	real_evapotranspiration	mm day ⁻¹	NA
33	humidity	atmospheric		ah	absolute_humidity	g m ⁻³	NA
34	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.
35	humidity	atmospheric		td	dew_point_temperature	C	NA
36	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.
37	humidity	atmospheric	surface; upper-air	ibt	ice_bulb_temperature	K	NA
38	humidity	atmospheric	surface; upper-air	rh	relative_humidity	percent	NA usually abbreviated as UUU in WMO but I like rh
39	humidity	atmospheric	surface; upper-air	q	specific_humidity	g kg ⁻¹	specific means per unit mass. Specific humidity is the mass fraction of water vapor in (moist) air.
40	humidity	atmospheric		e	water_vapor_pressure	hPa	NA
41	humidity	atmospheric	surface; upper-air	tb	wet_bulb_temperature	C	NA
42	humidity	atmospheric	surface; upper-air	t_wet	wet_bulb_temperature	K	NA
43	ice			ddd	ice_thickness	m	NA

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
44	precipitation	atmospheric		rr	accumulated_precipitation	mm	accumulated precipitation over specified period
45	precipitation	atmospheric		fs	fresh_snow	mm	NA
46	precipitation	atmospheric		ht	hydromete_or_type	Code table	NA
47	precipitation	atmospheric		rrls	precipitation	g m-2 s-1	Precipitation (liquid or solid)
48	precipitation	atmospheric		rril	precipitation_intensity_n_instensity_liquid	mm h-1	Precipitation intensity at surface (liquid or solid)
49	precipitation	atmospheric		rris	precipitation_intensity_solid	mm h-1	Precipitation intensity at surface (solid)
50	precipitation	atmospheric		rrt	precipitation_type	coded	Liquid, snow, hail, fog
51	precipitation	atmospheric		nr	rainy_days	Days	NA
52	precipitation	atmospheric		sc	snow_cover	percent	NA
53	precipitation	atmospheric		sd	snow_depth	cm	NA
54	precipitation	atmospheric		sst	snow_status	coded	Wet — dry
55	precipitation	atmospheric		sw	snow_water_equivalent	mm	Surface snow amount
56	pressure	atmospheric	surface	atb	adjunct_temperature_barometer	C	temperature of the adjunct thermometer to the barometer to reduce pressure to 0C
57	pressure	atmospheric	surface	p	air_pressure	Pa	NA
58	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.
59	pressure	atmospheric	surface	ppp	pressure_tendency	Pa	pressure tendency
60	pressure	atmospheric	surface	a	pressure_tendency_characteristics	coded	characteristic of pressure tendency (used in synoptic maps)
61	radiation	atmospheric		dr	diffuse_radiation	W m-2	NA

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
62	radiation	atmospheric		dlwie	downward_longwave_irradiance_at_earth_surface	W m ⁻²	NA
63	radiation	atmospheric		dswie	downward_solar_wave_irradiance_at_earth_surface	W m ⁻²	NA
64	radiation	atmospheric		dswit	downward_solar_wave_irradiance_at_top_of_atmosphere	W m ⁻²	NA
65	radiation	atmospheric		eswr	earth_surface_reflectance	percent	NA
66	radiation	atmospheric		fapar	fraction_of_absorbed_global_radiation	percent	FAPAR
67	radiation	atmospheric		gr	global_radiation	W m ⁻²	NA
68	radiation	atmospheric		lwe	longwave_earth_surface_emissivity	percent	NA
69	radiation	atmospheric		lr	longwave_radiation	W m ⁻²	NA
70	radiation	atmospheric		mor	meteorological_optical_range	m	Meteorological optical range at surface
71	radiation	atmospheric		par	photosynthetically_active_radiation	W m ⁻²	NA
72	radiation	atmospheric		swcr	shortwave_cloud_reflectance	percent	NA
73	radiation	atmospheric		sr	shortwave_radiation	W m ⁻²	NA

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
74	radiation	atmospheric		sgf	solar_gamm a_ray_flux	W m-2	NA
75	radiation	atmospheric		suf	solar_UV_flux	W m-2	NA
76	radiation	atmospheric		svf	solar_VIS_flux	W m-2	NA
77	radiation	atmospheric		sxf	solar_X_r ay_flux	W m-2	NA
78	radiation	atmospheric		ss	sunshine_d uration	h	NA
79	radiation	atmospheric		ulwie	upward_lon gwave_irrad iance_at_Ea rth_surface	W m-2	NA
80	radiation	atmospheric		ulwit	upward_long wave_irradia nce_at_TOA	W m-2	NA
81	radiation	atmospheric		uswit	upward_shor twave_irradia nce_at_TOA	W m-2	NA
82	radiation	atmospheric		usrt	upward_spe ctral_radian ce_at_TOA	W m-2 nm- 1 sr-1	NA
83	salinity	oceanic	surface; sub- surface	sal	salinity	psu	ocean salinity (PSU)
84	temperature	atmospheric	surface; upper-air	ta	air_tempe rature	C	NA
85	temperature	atmospheric	surface; upper-air	tair	air_tempe rature	K	Air temperature is the bulk temperature of the air, not the surface (skin) temperature.
86	temperature	atmospheric		tmax	daily_maxim um_air_tem perature	C	Lot 1 is using Tx - WMO abbrev.
87	temperature	atmospheric		tmax_sun	daily_maxim um_air_tem perature_wit h_direct_sun _exposure	C	Lot 1 is using Tx

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
88	temperature	atmospheric		t_max_g	daily_maximum_grass_temperature	C	Lot 1 is using TGx - Grass maximum thermometer is 5 cm above ground
89	temperature	atmospheric		t_min	daily_minimum_air_temperature	C	Lot 1 is using Tn - WMO abbrev.
90	temperature	atmospheric		t_min_sun	daily_minimum_solar_radiation_exposure	C	Lot 1 is using Tns
91	temperature	atmospheric		t_min_g	daily_minimum_grass_temperature	C	Lot 1 is using TGn - Grass minimum thermometer is 5 cm above ground
92	temperature	atmospheric		days_frost	days_with_frost	Days	NA
93	temperature	atmospheric		t_snow	snow_temperature	C	NA
94	temperature	atmospheric		t_soil	soil_temperature	C	Lot 1 is using Ts - WMO abbrev.
95	temperature	oceanic	surface; sub-surface	t_water	water_temperature	K	Water (sea, river, lake) temperature at depth indicated
96	visibility	atmospheric	surface	vv	horizontal_visibility	m	The visibility is the distance at which something can be seen.
97	weather			ld	lightning_detection	deg (lat, lon) and UTC	NA
98	weather			ls	lightning_duration	s	NA
99	weather			lhd	lightning_horizontal_distance	Km	NA
100	weather	atmospheric	surface	w1	past_weather_1	coded	past weather 1 - most extreme phenomenon (w)
101	weather	atmospheric	surface	w2	past_weather_2	coded	past weather 2 - most frequent phenomenon (used in synoptic maps)

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
102	weather	atmospheric	surface	ww	present_weather	coded	present weather (ww)
103	weather			tld	Total light intensity	Dimensionless	NA
104	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.)
105	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.)
106	wind	atmospheric	surface; upper-air	d	wind_from_direction	degree	direction from which the wind is blowing. Lot 1 uses dd - WMO abbrev.
107	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. Lot 1 uses ff - WMO abbrev.

Continued on next page



Table 31 observed_variable (cont.)

observed_variable	parameter_group	domain	sub-domain	abbreviation	name	units	description/notes
108	wind	atmospheric	surface	w_gust	wind_speed d.of.gust	m s-1	Speed is the magnitude of velocity. Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward_air_velocity.) The wind speed is the magnitude of the wind velocity. A gust is a sudden brief period of high wind speed. In an observed timeseries of wind speed, the gust wind speed can be indicated by a cell_methods of maximum for the time-interval. In an atmospheric model which has a parametrised calculation of gustiness, the gust wind speed may be separately diagnosed from the wind speed. Lot 1 uses fx - WMO abbrev.
109	wind	atmospheric		w_max	wind_speed d_max	m s-1	Maximum observed wind speed over specified period Lot 1 uses fm - WMO abbrev.
110				turb	turbulence	J m-3	NA
							End of table



Table 32: observation_code_table

observation_c ode_table	code_table_ scheme	code_table_id	code_table_name	value	description
0	BUFR	0 20 003	Presentweather	NA	See BUFR 0 20 003
1	BUFR	0 20 004	Pastweather	NA	See BUFR 0 20 004
2	BUFR	0 10 063	Characteristicsofp ressuretenancy	NA	See BUFR 0 10 063
					End of table



Table 33: observation_value_significance (BUFR 0 08 023, BUFR 0 10 063)

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

End of table

Table 34: observing_frequency (WMO47 - 0602)

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

End of table

Table 35: observing_method

observing_method	description
0	Measured
1	Estimated
2	Computed

End of table



Table 36: observing_programme (WIGOS 2-02)

observing_programme	abbreviation	description	sponsor
1	AMDAR	Global Aircraft Meteorological Data Relay	WMO/GOS
2	EPA	Environmental Protection Agency	NA
3	EUMETNET	Grouping of European National Meteorological Services	WMO/GOS
4	WMO/GAW	World Meteorological Organization/Global Atmospheric Watch	NA
5	GCOS	Global Climate Observing System	NA
6	GCW	Global Cryosphere Watch	NA
7	GOOS	Global Ocean Observing System	NA
8	IPA	International Permafrost Association	NA
9	JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology	WMO/GOS
10	WMO/GOS	World Meteorological Organization/Global Observing System	NA
11	GTOS	Global Terrestrial Observing System	NA
12	IAGOS	In-service Aircraft for a Global Observing System	NA
13	WHYCOS	World Hydrological Cycle Observing System	NA
14	WMO/CLW	World Meteorological Office/Climate and Water Department	NA
15	ADNET	Asian dust and aerosol lidar observation network	GALION ; WMO/GAW
16	Aeronet	Aerosol RObotic NETwork	NASA?
17	ANTON	Antarctic Observing Network	WMO/GOS

Continued on next page



Table 36 observing_programme (cont.)

observing programme	abbreviation	description	sponsor
18	ASAP	Automated Ship-board Aerological Program	WMO/GOS
19	BSRN	Baseline Surface Radiation Network	WMO/GAW & GCOS
20	CASTNET	Clean Air Status and Trends Network	(National - USA)
21	CIS-LiNet	Lidar network for monitoring atmosphere over CIS regions	GALION ; WMO/GAW
22	CLN	CREST Lidar Network	GALION ; WMO/GAW
23	DART	Deep-ocean Assessment and Reporting of Tsunamis	NOAA Centre for Tsunamis Research
24	E-AMDAR	European - Aircraft Meteorological DATA Relay	EUMETNET ; WMO/GOS
25	E-ASAP	European - Automated Shipboard Aerological Program	EUMETNET ; WMO/GOS
26	E-GVAP	European - GNSS water vapour programme	EUMETNET ; WMO/GOS
27	E-PROFILE	European - wind profiles from radar	EUMETNET ; WMO/GOS
28	E-SURFMAR	European - Surface Marine Operational Service	EUMETNET ; WMO/GOS
29	EARLINET	European Aerosol Research Lidar Network	GALION ; WMO/GAW
30	GALION	GAW Aerosol Lidar Observation Network	WMO/GAW
31	GAW-PFR	GAW-Precision Filter Radiometers	WMO/GAW
32	German AOD Network	German Aerosol Optical Depth Network	WMO/GAW
33	GLOSS	Global Sea Level Observing System	JCOMM ; WMO/GOS
34	GRUAN	GCOS Reference Upper Air Network	GCOS
35	GSN	GCOS Surface Network	GCOS
36	GTN-G	Global Terrestrial Network - Glaciers	GCOS

Continued on next page



Table 36 observing_programme (cont.)

observing programme	abbreviation	description	sponsor
37	GTN-H	Global Terrestrial Network - Hydrology	WMO/CLW ; GCOS ; GTOS
38	GTN-P	Global Terrestrial Network - Permafrost	IPA ; GCOS ; GTOS
39	GUAN	GCOS Upper Air Network	GCOS
40	IAGOS-MOZAIC	Measurement of Ozone and Water Vapour on Airbus in-service Aircraft	IAGOS
41	LALINET	Latin America Lidar Network	GALION; WMO/GAW
42	MPLNET	Micro Pulse Lidar Network	GALION; WMO/GAW
43	NDACC	Network for the Detection of Atmospheric Composition Change	GALION; WMO/GAW
44	OPERA	European Weather Radar Project	EUMETNET; (WMO/GOS)
45	PIRATA	Prediction and Research Moored Array in the Atlantic	GOOS; WMO/GOS
46	PolarAOD	Polar Aerosol Optical Depth Measurement Network Project	WMO/GAW
47	RAMA	Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction	NOAA
48	RBCN	Regional Basic Climatological Network	WMO/GOS
49	RBON	Regional Basic Observing Network	WMO/GOS
50	RBSN	Regional Basic Synoptic Network	WMO/GOS
51	TAO	Tropical Atmosphere and Ocean Array	NOAA; GCOS
52	SKYNET	Aerosol -cloud-radiation interaction in the atmosphere project	WMO/GAW
53	SibRad	NA	WMO/GAW
54	SOOP	Ship of Opportunity	JCOMM ; WMO/GOS

Continued on next page



Table 36 observing_programme (cont.)

observing programme	abbreviation	description	sponsor
55	U.S. IOOS	United States Integrated Ocean Observing System	(National - USA)
56	VOS	Voluntary Observing Fleet	JCOMM ; WMO/GOS
57	VOSCLIM	Voluntary Observing Fleet (VOS) Climate Project	JCOMM ; WMO/GOS
58	WRAP	Worldwide Recurring ASAP Project	JCOMM ; WMO/GOS

End of table

Table 37: platform_sub_type (WMO47, ICOADS, BUFR 0 02 149)

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

Continued on next page



Table 37 platform_sub_type (cont.)

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

Continued on next page



Table 37 platform_sub_type (cont.)

platform_sub_type	platform_type	abbreviation	description
58	Ship	TR	Trawler fishing vessels.
59	Ship	TU	Tugs, including fire-fighting tugs, salvage tugs, pusher tugs, pilot vessels, tenders etc.
60	Ship	VC	Vehicle Carriers: dedicated multi deck ships for the carriage of new unladen road vehicles.
61	Ship	YA	Yachts and pleasure craft.
62	Ship	OT	Other (specify in footnote).
63	Land station		Synoptic network
64	Land station		Local Network
65	Ship		Ocean Weather Ship (on station)
66	Ship		Ocean Weather Ship (off station)
67	Coastal / Island		Other
68	Coastal / Island		Coastal-Marine Automated Network (C-MAN) (NDBC operated)
69	Drifting buoy		Unspecified drifting buoy
70	Drifting buoy		Standard Lagrangian drifter (Global Drifter Programme)
71	Drifting buoy		Standard FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy)
72	Drifting buoy		Wind measuring FGGE type drifting buoy (non-Lagrangian meteorological drifting buoy)
73	Ice buoy		Ice drifter
74	Drifting buoy		SVPG Standard Lagrangian drifter with GPS
75	Drifting buoy		SVP-HR drifter with high-resolution temperature or thermistor string
76	Subsurface float		Unspecified subsurface float
77	Profiling float		SOFAR
78	Profiling float		ALACE
79	Profiling float		MARVOR
80	Profiling float		RAFOS
81	Profiling float		PROVOR
82	Profiling float		SOLO
83	Profiling float		APEX
84	Moored buoy		Unspecified moored buoy
85	Moored buoy		Nomad
86	Moored buoy		3-metre discus
87	Moored buoy		10-12-metre discus
88	Moored buoy		ODAS 30 series
89	Moored buoy		ATLAS (e.g. TAO area)
90	Moored buoy		TRITON buoy
91	Moored buoy		FLEX mooring (e.g. TIP area)
92	Moored buoy		Omnidirectional waverider
93	Moored buoy		Directional waverider
94	Profiling float		Subsurface ARGO float
95	Profiling float		PALACE
96	Profiling float		NEMO
97	Profiling float		NINJA
98	Ice buoy		Ice buoy/float (POPS or ITP)
99	Moored buoy		Mooring oceanographic

Continued on next page



Table 37 platform_sub_type (cont.)

platform_sub_type	platform_type	abbreviation	description
100	Moored buoy		Mooring meteorological
101	Moored buoy		Mooring multidisciplinary (OceanSITES)
102	Moored buoy		Mooring tide gauge or tsunami buoy
103	Ice buoy		Ice beacon
104	Ice buoy		Ice mass balance buoy

End of table

Table 38: platform_type (IMMA (ICOADS) and BUFR 0 03 001)

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

End of table

Table 39: processing_level (WIGOS 7-06)

processing_level	name	description
0	Unknown	NA
1	Raw	NA
2	Level0	Analogue/digital electric signals

Continued on next page



Table 39 processing_level (cont.)

processing_level	name	description
3	LevelI	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	LevelII	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	LevelIII	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	LevelIV	NA

End of table

Table 40: product_level

product_level	description
2	Data read from original data file

End of table

Table 41: product_status

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

End of table



Table 42: profile_configuration_codes

field_id	field_name	code_value	abbreviation	description	start_date	end_date
0	include_descent	NA	NA	NA	NA	NA
1	processin g_code	0	cc	Calibration cor- rection (of hu- midity sensors)	NA	NA
1	processin g_code	1	HRC	Humidity radia- tion correction	NA	NA
1	processin g_code	2	or	Outlier removal (remove tem- perature spikes)	NA	NA
1	processin g_code	3	pGPS	Combination of pressure and GPS	NA	NA
1	processin g_code	4	TL	Time-lag cor- rection	NA	NA
1	processin g_code	5	TRC	Temperature radiation cor- rection	NA	NA
2	unwinder_type	NA	NA	STRING	NA	NA
B002003	type_of_mea- suring_equip- ment_used	0 - 15	NA	See BUFR ta- ble 0 02 003	NA	NA
B002011	radiosonde_sou- nding_system	0 - 255	NA	See BUFR ta- ble 0 02 011	NA	NA
B002013	solar_and_infr- ared_radiatio- n_correction	0 - 15	NA	See BUFR ta- ble 0 02 013	NA	NA
B002014	tracking_te- chnique	0 - 127	NA	See BUFR ta- ble 0 02 014	NA	NA
B002015	radiosonde_co- mpleteness	0 - 15	NA	See BUFR ta- ble 0 02 015	NA	NA
B002017	humidity_correc- tion_algorithm	0 - 31	NA	See BUFR ta- ble 0 02 017	NA	NA
B002066	radiosonde_g- round_receiv- ing_system	0 - 63	NA	See BUFR ta- ble 0 02 066	NA	NA

Continued on next page



Table 42 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_samplability_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 43: quality_flag (based on WIGOS 8-03-01 and BUFR 0 33 020)

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

End of table

Table 44: region (WIGOS 3-01)

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

End of table

Table 45: report_processing_codes

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

End of table

Table 46: report_processing_level

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

End of table



Table 47: report_type

report_type	abbreviation	description
0	SYNOP	NA
1	TEMP	NA
2	CLIMAT	NA
End of table		

Table 48: sampling_strategy (WIGOS)

sampling_strategy	description
1	Continuous
2	Discrete
3	Event
End of table	

Table 49: sea_level_datum (BUFR 0 01 151)

sea_level_datum	description
0	Earth Gravitational Model 1996
1	Baltic height system 1977
End of table	



Table 50: 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		implied 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-hu midity	humidity	0 - 31		See BUFR table 0 02 097
B002169	sensortype-wi ndspeer	wind speed	0 - 15		See BUFR table 0 02 169
B002169	sensortype-wi ndspeer	wind speed	16		Anemograph.
B002169	sensortype-wi ndspeer	wind speed	17		Anemometer - type unspecified
B002169	sensortype-wi ndspeer	wind speed	18		Beaufort force
B002169	sensortype-wi ndspeer	wind speed	19		Cup anemometer and wind vane (combined unit).
B002169	sensortype-wi ndspeer	wind speed	20		Cup anemometer and wind vane (separate instruments).

Continued on next page



Table 50 sensor_configuration_codes (cont.)

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

Continued on next page



Table 50 sensor_configuration_codes (cont.)

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

Continued on next page



Table 50 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SLOC	sensorlocati on-ship	all	6		Mainmast yardarm
SLOC	sensorlocati on-ship	all	7		Mainmast.
SLOC	sensorlocati on-ship	all	8		Mast on wheelhouse top yardarm
SLOC	sensorlocati on-ship	all	9		Mast on wheelhouse top.
SLOC	sensorlocati on-ship	all	10		Meteorological mast.
SLOC	sensorlocati on-ship	all	11		Not fitted.
SLOC	sensorlocati on-ship	all	12		Other
SLOC	sensorlocati on-ship	all	13		Pressurised wheelhouse (closed and not vented to the outside).
SLOC	sensorlocati on-ship	all	14		Wheelhouse
SLOC	sensorlocati on-ship	all	15		Wheelhouse, not pressurised (vented to the outside).
SRR	sensortype-pr ecipitation	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-pre sentweather	present weather	0		Automatic, included (using WMO Codes 4677 and 4561)
SWW	sensortype-pre sentweather	present weather	1		Automatic, included (using WMO codes 4680 amd 4531)
SWW	sensortype-pre sentweather	present weather	2		Automatic, omitted (no observa- tion, data not available)
SWW	sensortype-pre sentweather	present weather	3		Automatic, omitted (no significant phenomenon to report)

Continued on next page



Table 50 sensor_configuration_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SWW	sensortype-pre sentweather	present weather	4		Manned, included
SWW	sensortype-pre sentweather	present weather	5		Manned, omitted (no observation, data not available)
SWW	sensortype-pre sentweather	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 51: source_configuration_codes

field_id	field_name	code_value	description	extended_description
0	delayedmodeformat	0	IMMT version just prior to version number being included	NA
0	delayedmodeformat	1	IMMT-1 (in effect from 2 Nov. 1994)	NA
0	delayedmodeformat	2	IMMT-2 (in effect from Jan. 2003)	NA
0	delayedmodeformat	3	IMMT-3 (in effect from Jan. 2007)	NA
0	delayedmodeformat	4	IMMT-4 (in effect from Jan. 2011)	NA
0	delayedmodeformat	5	IMMT-5 (in effect from June 2012)	NA
1	metadatasource	0	COAPS	NA
1	metadatasource	1	WMO Publication 47	NA
2	metadatasourceformat	1	Output from digitisation project, semi-colon delimited format (1955)	NA
2	metadatasourceformat	2	Output from digitisation project, semi-colon delimited format (1956)	NA
2	metadatasourceformat	3	Output from digitisation project, semi-colon delimited format (1957 - 1967)	NA
2	metadatasourceformat	4	Output from digitisation project, semi-colon delimited format (1968 - 1969)	NA
2	metadatasourceformat	5	Fixed format (1970 - 1004)	NA
2	metadatasourceformat	6	Semi-colon delimited format (1995 - 2001)	NA
2	metadatasourceformat	7	Semi-colon delimited format (2002 - 2007 q1)	NA

Continued on next page



Table 51 source_configuration_codes (cont.)

field_id	field_name	code_value	description	extended_description
2	metadatasourceformat	8	Semi-colon delimited format (2007 - 2008)	NA
2	metadatasourceformat	9	Semi-colon delimited format (2009 - 2014)	NA
3	observationsourcetype	0	unknown	NA
3	observationsourcetype	1	delayed mode - log-book (paper)	NA
3	observationsourcetype	2	real time - national telecommunication channels	NA
3	observationsourcetype	3	delayed mode - national publications	NA
3	observationsourcetype	4	delayed mode - log-book (electronic)	NA
3	observationsourcetype	5	real time - global telecommunication system (GTS)	NA
3	observationsourcetype	6	delayed mode - International publications	NA
4	realtimeformat	0	previous to FM24-V	NA
4	realtimeformat	1	FM 24-V	NA
4	realtimeformat	2	FM 24-VI Ext.	NA
4	realtimeformat	3	FM 13-VII	NA
4	realtimeformat	4	FM 13-VIII	NA
4	realtimeformat	5	FM 13-VIII Ext.	NA
4	realtimeformat	6	FM 12-IX	NA
4	realtimeformat	7	FM 13-IX Ext.	NA
4	realtimeformat	8	FM 13-X	NA
4	realtimeformat	9	FM 13-XI	NA
4	realtimeformat	10	FM 13-XII Ext.	NA
4	realtimeformat	11	FM 13-XIII	NA
4	realtimeformat	12	FM 13-XIV Ext.	NA
5	sourceformat	0	IMMA - Version 0	NA
5	sourceformat	1	IMMA - Version 1	NA
6	icoadssourcedeck	NA	See ICOADS Source Deck	NA

Continued on next page



Table 51 source_configuration_codes (cont.)

field_id	field_name	code_value	description	extended_description
7	icoadssourceid	NA	See ICOADS Source ID	NA
8	productlevel	2	Data read from original data file	NA
9	productstatus	1	Data approved	Data exist, read from chache, PTU + altitude columns available, all GC25 tests ok, all uncertainties as expected

End of table



Table 52: source_format

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

End of table

Table 53: spatial_representativeness (WIGOS 1-05)

spatial_representativeness	description
0	Nil reason - None of the codes in the table is applicable in the context of the observed quantity or unknown, or not available information.
1	Microscale - An area or volume less than 100 m horizontal extent (for example, evaporation)
2	Toposcale, local scale - An area or volume of 100 m to 3 km horizontal extent (for example, air pollution, tornadoes)
3	Mesoscale - An area or volume of 3 km to 100 km horizontal extent (for example, thunderstorms, sea and mountain breezes)
4	Large scale - An area or volume of 100 km to 3000 km horizontal extent (for example, fronts, various cyclones, cloud clusters)
5	Planetary scale - An area or volume of more than 3000 km horizontal extent (for example, long upper tropospheric waves)
6	Drainage area - An area (also known as catchment) having a common outlet for its surface runoff, in km ²

End of table



Table 54: station_configuration_codes

field_id	field_name	code_value	abbreviation	description
0	AWSEntryandDisplaySoftware			TBD
1	AWSEntryandDisplaySoftwareVersion			TBD
2	AWSMModel			TBD
3	AWSMModelVersion			TBD
4	AWSSoftware			TBD
5	AWSSoftwareversion			TBD
9	Droguetype	NA		See BUFR code table 0 02 034
11	LagrangianDrifterIdroguestatus	NA		See BUFR code table 0 22 060
11	LogBooksoftwareandversion			TBD
16	Otherinstruments	0	BAT	Bathythermometer.
16	Otherinstruments	1	BT	Bathythermograph (towed).
16	Otherinstruments	2	FLM	Fluorometer.
16	Otherinstruments	3	LWR	Long wave radiation.
16	Otherinstruments	4	MAX	Maximum thermometer.
16	Otherinstruments	5	MIN	Minimum thermometer.
16	Otherinstruments	6	NTE	Nitrate sensor.
16	Otherinstruments	7	NTT	Nutrient sensor.
16	Otherinstruments	8	P	Pilot balloon equipment.
16	Otherinstruments	9	CO2	pCO2 system.
16	Otherinstruments	10	PLK	Plankton recorder.
16	Otherinstruments	11	PRS	Photosynthetic radiation sensor.
16	Otherinstruments	12	PYG	Pyrogeometer.
16	Otherinstruments	13	R	Radiosonde equipment.
16	Otherinstruments	14	RG	Rain gauge.
16	Otherinstruments	15	RSD	Radar storm and meteorological phenomena detection.
16	Otherinstruments	16	RT	Reversing thermometer.
16	Otherinstruments	17	SKY	Sky camera.
16	Otherinstruments	18	SLM	Solarimeter.
16	Otherinstruments	19	ST	Sea thermograph.
16	Otherinstruments	20	SWR	Short wave radiation.

Continued on next page



Table 54 station_configuration_codes (cont.)

field_id	field_name	code_value	abbreviation	description
16	Otherinstruments	21	TSD	Temperature/salinity/depth probe.
16	Otherinstruments	22	TUR	Turbidity sensor.
16	Otherinstruments	23	W	Radiowind or radarwind equipment.
16	Otherinstruments	24	WR	Wave Recorder
16	Otherinstruments	25	XBT	Expendable bathythermograph.
16	Otherinstruments	26	OT	Other (specify in footnote).
17	Stationstatus	1		Planned
17	Stationstatus	2		Pre-operational
17	Stationstatus	3		Operational / Reporting
17	Stationstatus	4		Partly reporting
17	Stationstatus	5		Temporarily suspended
17	Stationstatus	6		Closed
18	Typeofmeteorologi calreportingship	0	70	Auxiliary ship
18	Typeofmeteorologi calreportingship	1	75	Auxiliary ship (AWS)
18	Typeofmeteorologi calreportingship	2	10	Selected
18	Typeofmeteorologi calreportingship	3	15	Selected (AWS)
18	Typeofmeteorologi calreportingship	4	40	Supplementary
18	Typeofmeteorologi calreportingship	5	45	Supplementary (AWS)
18	Typeofmeteorologi calreportingship	6	80	Third party
18	Typeofmeteorologi calreportingship	7	85	Third party (AWS)
18	Typeofmeteorologi calreportingship	8	99	Unknown
18	Typeofmeteorologi calreportingship	9	30	VOSclim - VOS Climate
18	Typeofmeteorologi calreportingship	10	35	VOSclim (AWS) - VOS Climate (AWS)

End of table



Table 55: station.type (WIGOS 3-04)

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

End of table

Table 56: sub.region

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

Continued on next page



Table 56 sub.region (cont.)

sub.region	type	code	name
37	country	CA	CANADA
38	country	CC	COCOS (KEELING) ISLANDS
39	country	CD	CONGO, THE DEMOCRATIC RE- PUBLIC OF THE
40	country	CF	CENTRAL AFRICAN REPUBLIC
41	country	CG	CONGO
42	country	CH	SWITZERLAND
43	country	CI	COTE D'IVOIRE
44	country	CK	COOK ISLANDS
45	country	CL	CHILE
46	country	CM	CAMEROON
47	country	CN	CHINA
48	country	CO	COLOMBIA
49	country	CR	COSTA RICA
50	country	CU	CUBA
51	country	CV	CAPE VERDE
52	country	CX	CHRISTMAS ISLAND
53	country	CY	CYPRUS
54	country	CZ	CZECH REPUBLIC
55	country	DD	GERMAN DEMOCRATIC REPUBLIC
56	country	DE	GERMANY
57	country	DJ	DJIBOUTI
58	country	DK	DENMARK
59	country	DM	DOMINICA
60	country	DO	DOMINICAN REPUBLIC
61	country	DZ	ALGERIA
62	country	EC	ECUADOR
63	country	EE	ESTONIA
64	country	EG	EGYPT
65	country	EH	WESTERN SAHARA
66	country	ER	ERITREA
67	country	ES	SPAIN
68	country	ET	ETHIOPIA
69	country	FI	FINLAND
70	country	FJ	FIJI
71	country	FK	FALKLAND ISLANDS (MALVINAS)
72	country	FM	MICRONESIA, FEDERATED STATES OF
73	country	FO	FAROE ISLANDS
74	country	FR	FRANCE
75	country	GA	GABON
76	country	GB	UNITED KINGDOM
77	country	GD	GRENADA
78	country	GE	GEORGIA
79	country	GF	FRENCH GUIANA
80	country	GG	GUERNSEY
81	country	GH	GHANA
82	country	GI	GIBRALTAR
83	country	GL	GREENLAND

Continued on next page



Table 56 sub_region (cont.)

sub_region	type	code	name
84	country	GM	GAMBIA
85	country	GN	GUINEA
86	country	GP	GUADELOUPE
87	country	GQ	EQUATORIAL GUINEA
88	country	GR	GREECE
89	country	GS	SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS
90	country	GT	GUATEMALA
91	country	GU	GUAM
92	country	GW	GUINEA-BISSAU
93	country	GY	GUYANA
94	country	HK	HONG KONG
95	country	HM	HEARD ISLAND AND MCDONALD ISLANDS
96	country	HN	HONDURAS
97	country	HR	CROATIA
98	country	HT	HAITI
99	country	HU	HUNGARY
100	country	ID	INDONESIA
101	country	IE	IRELAND
102	country	IL	ISRAEL
103	country	IM	ISLE OF MAN
104	country	IN	INDIA
105	country	IO	BRITISH INDIAN OCEAN TERRITORY
106	country	IQ	IRAQ
107	country	IR	IRAN, ISLAMIC REPUBLIC OF
108	country	IS	ICELAND
109	country	IT	ITALY
110	country	JE	JERSEY
111	country	JM	JAMAICA
112	country	JO	JORDAN
113	country	JP	JAPAN
114	country	KE	KENYA
115	country	KG	KYRGYZSTAN
116	country	KH	CAMBODIA
117	country	KI	KIRIBATI
118	country	KM	COMOROS
119	country	KN	SAINT KITTS AND NEVIS
120	country	KP	KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF
121	country	KR	KOREA, REPUBLIC OF
122	country	KW	KUWAIT
123	country	KY	CAYMAN ISLANDS
124	country	KZ	KAZAKHSTAN
125	country	LA	LAO PEOPLE'S DEMOCRATIC REPUBLIC
126	country	LB	LEBANON
127	country	LC	SAINT LUCIA
128	country	LI	LIECHTENSTEIN
129	country	LK	SRI LANKA

Continued on next page



Table 56 sub_region (cont.)

sub_region	type	code	name
130	country	LR	LIBERIA
131	country	LS	LESOTHO
132	country	LT	LITHUANIA
133	country	LU	LUXEMBOURG
134	country	LV	LATVIA
135	country	LY	LIBYAN ARAB JAMAHIRIYA
136	country	MA	MOROCCO
137	country	MC	MONACO
138	country	MD	MOLDOVA, REPUBLIC OF
139	country	ME	MONTENEGRO
140	country	MF	SAINT MARTIN
141	country	MG	MADAGASCAR
142	country	MH	MARSHALL ISLANDS
143	country	MK	MACEDONIA, THE FORMER YU-GOSLAV REPUBLIC OF
144	country	ML	MALI
145	country	MM	MYANMAR
146	country	MN	MONGOLIA
147	country	MO	MACAO
148	country	MP	NORTHERN MARIANA ISLANDS
149	country	MQ	MARTINIQUE
150	country	MR	MAURITANIA
151	country	MS	MONTserrat
152	country	MT	MALTA
153	country	MU	MAURITIUS
154	country	MV	MALDIVES
155	country	MW	MALAWI
156	country	MX	MEXICO
157	country	MY	MALAYSIA
158	country	MZ	MOZAMBIQUE
159	country	NA	NAMIBIA
160	country	NC	NEW CALEDONIA
161	country	NE	NIGER
162	country	NF	NORFOLK ISLAND
163	country	NG	NIGERIA
164	country	NI	NICARAGUA
165	country	NL	NETHERLANDS
166	country	NO	NORWAY
167	country	NP	NEPAL
168	country	NR	NAURU
169	country	NU	NIUE
170	country	NZ	NEW ZEALAND
171	country	OM	OMAN
172	country	PA	PANAMA
173	country	PE	PERU
174	country	PF	FRENCH POLYNESIA
175	country	PG	PAPUA NEW GUINEA
176	country	PH	PHILIPPINES

Continued on next page



Table 56 sub_region (cont.)

sub_region	type	code	name
177	country	PK	PAKISTAN
178	country	PL	POLAND
179	country	PM	SAINT PIERRE AND MIQUELON
180	country	PN	PITCAIRN
181	country	PR	PUERTO RICO
182	country	PS	PALESTINIAN TERRITORY, OCCUPIED
183	country	PT	PORTUGAL
184	country	PW	PALAU
185	country	PY	PARAGUAY
186	country	QA	QATAR
187	country	RE	REUNION
188	country	RO	ROMANIA
189	country	RS	SERBIA
190	country	RU	RUSSIAN FEDERATION
191	country	RW	RWANDA
192	country	SA	SAUDI ARABIA
193	country	SB	SOLOMON ISLANDS
194	country	SC	SEYCHELLES
195	country	SD	SUDAN
196	country	SE	SWEDEN
197	country	SG	SINGAPORE
198	country	SH	SAINT HELENA
199	country	SI	SLOVENIA
200	country	SJ	SVALBARD AND JAN MAYEN
201	country	SK	SLOVAKIA
202	country	SL	SIERRA LEONE
203	country	SM	SAN MARINO
204	country	SN	SENEGAL
205	country	SO	SOMALIA
206	country	SR	SURINAME
207	country	ST	SAO TOME AND PRINCIPE
208	country	SU	USSR
209	country	SV	EL SALVADOR
210	country	SY	SYRIAN ARAB REPUBLIC
211	country	SZ	SWAZILAND
212	country	TC	TURKS AND CAICOS ISLANDS
213	country	TD	CHAD
214	country	TF	FRENCH SOUTHERN TERRITORIES
215	country	TG	TOGO
216	country	TH	THAILAND
217	country	TJ	TAJIKISTAN
218	country	TK	TOKELAU
219	country	TL	TIMOR-LESTE
220	country	TM	TURKMENISTAN
221	country	TN	TUNISIA
222	country	TO	TONGA
223	country	TR	TURKEY
224	country	TT	TRINIDAD AND TOBAGO

Continued on next page



Table 56 sub_region (cont.)

sub_region	type	code	name
225	country	TV	TUVALU
226	country	TW	TAIWAN, PROVINCE OF CHINA
227	country	TZ	TANZANIA, UNITED REPUBLIC OF
228	country	UA	UKRAINE
229	country	UG	UGANDA
230	country	UM	UNITED STATES MINOR OUTLYING ISLANDS
231	country	US	UNITED STATES
232	country	UY	URUGUAY
233	country	UZ	UZBEKISTAN
234	country	VA	HOLY SEE (VATICAN CITY STATE)
235	country	VC	SAINT VINCENT AND THE GRENADINES
236	country	VE	VENEZUELA
237	country	VG	VIRGIN ISLANDS, BRITISH
238	country	VI	VIRGIN ISLANDS, U.S.
239	country	VN	VIET NAM
240	country	VU	VANUATU
241	country	WF	WALLIS AND FUTUNA
242	country	WS	SAMOA
243	country	YE	YEMEN
244	country	YT	MAYOTTE
245	country	YU	YUGOSLAVIA
246	country	ZA	SOUTH AFRICA
247	country	ZM	ZAMBIA
248	country	ZW	ZIMBABWE
249	country	ZZ	THIRD PARTY SUPPORT SHIPS

End of table

Table 57: time_quality

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

End of table

Table 58: time_reference (WIGOS: 7-10)

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

End of table



Table 59: traceability (WIGOS 8-05)

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

End of table

Table 60: units

units	name
1 - 1024	See BUFR Common Code Table C-6

End of table

Table 61: update_frequency ()

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

End of table

Table 62: z_coordinate_method

z_coordinate_method	description
0	Value from chart

End of table

Table 63: z_coordinate_type

z_coordinate_type	description
0	height (m) above sea level

End of table