



# Common Data Model for in situ observations

## C3S311a Lot 2: Global Land and Marine Observations Database

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# Copernicus Climate Change Service - 311a Lot 2

## Defining a Common Data Model

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### Summary

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

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

[https://github.com/glamod/common\\_data\\_model/tree/master/tables/tsv/](https://github.com/glamod/common_data_model/tree/master/tables/tsv/)

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## Contents

<b>1</b>	<b>Introduction</b>	<b>7</b>
1.1	Purpose of this document . . . . .	7
1.2	Scope . . . . .	7
1.3	Structure of this document . . . . .	7
<b>2</b>	<b>Background and existing standards</b>	<b>8</b>
2.1	Observational sources and requirements of the data model . . . . .	8
2.2	ECMWF Observations DataBase (ODB) . . . . .	9
2.3	BUFR and WIGOS Metadata Standard . . . . .	10
<b>3</b>	<b>Common Data Model</b>	<b>10</b>
3.1	Header table . . . . .	13
3.2	Observations table . . . . .	17
3.3	Station configuration . . . . .	21
3.4	Profile configuration . . . . .	30
3.5	Source configuration . . . . .	37
3.6	Sensor configuration . . . . .	44
3.7	Quality control flags . . . . .	57
3.8	Uncertainty budget . . . . .	57
3.9	Homogenisation data . . . . .	57
<b>4</b>	<b>Governance of the Common Data Model</b>	<b>58</b>
<b>5</b>	<b>Acknowledgements</b>	<b>58</b>
<b>6</b>	<b>References</b>	<b>59</b>
<b>7</b>	<b>Appendix</b>	<b>59</b>
7.1	Observed variable . . . . .	60
7.2	Other tables . . . . .	72
7.3	Code tables . . . . .	73



## List of Tables

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 . . . . .	9
2	header_table (NA) . . . . .	13
3	observations_table (NA) . . . . .	17
4	station_configuration (NA) . . . . .	21
5	station_configuration_optional (NA) . . . . .	23
6	kind (NA) . . . . .	23
7	station_configuration_fields (NA) . . . . .	23
8	station_configuration_codes (NA) . . . . .	26
9	profile_configuration (NA) . . . . .	30
10	profile_configuration_optional (NA) . . . . .	31
11	profile_configuration_fields (NA) . . . . .	31
12	profile_configuration_codes (NA) . . . . .	34
13	source_configuration (NA) . . . . .	37
14	source_configuration_optional (NA) . . . . .	39
15	source_configuration_fields (NA) . . . . .	39
16	source_configuration_codes (NA) . . . . .	40
17	sensor_configuration (NA) . . . . .	44
18	sensor_configuration_optional (NA) . . . . .	45
19	sensor_configuration_fields (NA) . . . . .	46
20	sensor_configuration_codes (NA) . . . . .	50
21	qc_table (NA) . . . . .	57
22	uncertainty_table (NA) . . . . .	57
23	homogenisation_table (NA) . . . . .	58
24	observed_variable (NA) . . . . .	60
25	adjustment (NA) . . . . .	72
26	contact (NA) . . . . .	72
27	conversion_flag (NA) . . . . .	72
28	conversion_method (NA) . . . . .	73
29	organisation (NA) . . . . .	73
30	application_area (WIGOS 2-01) . . . . .	73
31	automation_status (NA) . . . . .	74
32	calibration_status (WIGOS 5-08) . . . . .	74
33	communication_method (Various sources (WMO47, WIGOS, BUFR)) . . . . .	74
34	crs (BUFR 0 01 150) . . . . .	74
35	data_present (NA) . . . . .	75
36	data_policy_licence (WIGOS 9-02) . . . . .	75
37	duplicate_status (Simplified version of duplicate status flags from IMMA (ICODAS)) . . . . .	75
38	events_at_station (WIGOS 4-04) . . . . .	75
39	id_scheme (NA) . . . . .	75
40	instrument_exposure_quality (WIGOS 5-15) . . . . .	76
41	location_method (based on WIGOS 11-01 and BUFR 0 02 148) . . . . .	76
42	location_quality (NA) . . . . .	76
43	meaning_of_time_stamp (Based on simplified version of WIGOS 11-03) . . . . .	76



44	method_of_estimating_uncertainty (NA)	77
45	observation_code_table (NA)	77
46	observation_value_significance (based on BUFR 0 08 023)	77
47	observing_frequency (WMO47 - 0602)	78
48	observing_method (NA)	78
49	observing_programme (WIGOS 2-02)	78
50	platform_sub_type (based on WMO47, ICOADS, BUFR 0 02 149)	78
51	platform_type (IMMA (ICOADS) and BUFR 0 03 001 (0 - 31))	79
52	processing_code (NA)	79
53	processing_level (WIGOS 7-06)	79
54	product_level (NA)	79
55	product_status (NA)	79
56	profile_type (NA)	80
57	quality_flag (BUFR 0 33 020)	80
58	region (WIGOS 3-01)	80
59	report_processing_codes (NA)	80
60	report_processing_level (NA)	81
61	report_type (NA)	81
62	role (ISOTC211/19115 CIRoleCode)	81
63	sampling_strategy (WIGOS 6-03)	81
64	sea_level_datum (BUFR 0 01 151)	81
65	secondary_variable (NA)	82
66	source_format (NA)	82
67	spatial_representativeness (WIGOS 1-05)	82
68	standard_time (NA)	82
69	station_type (WIGOS 3-04)	83
70	sub_region (NA)	83
71	time_quality (NA)	83
72	time_reference (WIGOS: 7-10)	83
73	traceability (WIGOS 8-05)	83
74	units (NA)	84
75	update_frequency (NA)	84
76	z_coordinate_method (NA)	84
77	z_coordinate_type (NA)	84



## 1 Introduction

### 1.1 Purpose of this document

This document defines the initial version of the Common Data Model (CDM)<sup>1</sup> 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 a z-coordinate for each 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, as both the variable being reported and its value are 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 expendable bathythermograph (XBT) etc.
- Sensor level metadata: e.g. calibration history and status, sensor type / serial number etc.

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

### 1.3 Structure of this document

Section 2 of this document provides background information on the data model and existing 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.

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



## 2 Background and existing standards

### 2.1 Observational sources and requirements of the data model

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

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

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

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

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





## 2.2 ECMWF Observations DataBase (ODB)

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

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

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

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

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

Continued on next page



Table 1 adjustment (cont.)

header information				observation information		
record id	report id	obs id	date	location	parameter	value units
4	2	4	2012-01-01 18:00+0.0	POINT(-40.1 40.2)	sea level pressure	1013.2 hPa
End of table						

## 2.3 BUFR and WIGOS Metadata Standard

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

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

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

## 3 Common Data Model

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

- Source level metadata (*source\_configuration* table). This level contains detailed information on the source dataset, including: information on the product; whether any processing has been applied; the original data centre the data were sourced from; citation information; the data licence for the product; how to cite the data source etc.



- Station level metadata (*station\_configuration* table). This level contains detailed information on the station reporting the data including: station operator; the type of station; station / AWS model type; location; operating territory; reporting frequency etc.
- Profile level metadata (*profile\_configuration* table). This level contains detailed metadata for atmospheric and oceanic profiles, including: profile type; type of launcher; direction of profile; balloon / XBT type etc.
- Instrument (or sensor) level metadata (*sensor\_configuration* table). This level contains detailed information on the sensor used to make a particular observation, including: calibration status; sampling strategy; observing method; sensor housing and ventilation; instrument model and serial number etc.

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

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

- numeric: Any numeric value (integer or floating point).
- int: An integer value.
- varchar: A variable length character string.
- timestamp with time zone: A timestamp, e.g. "2017-07-01 00:00:0.0+00".
- []: 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 included but may be encoded 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.

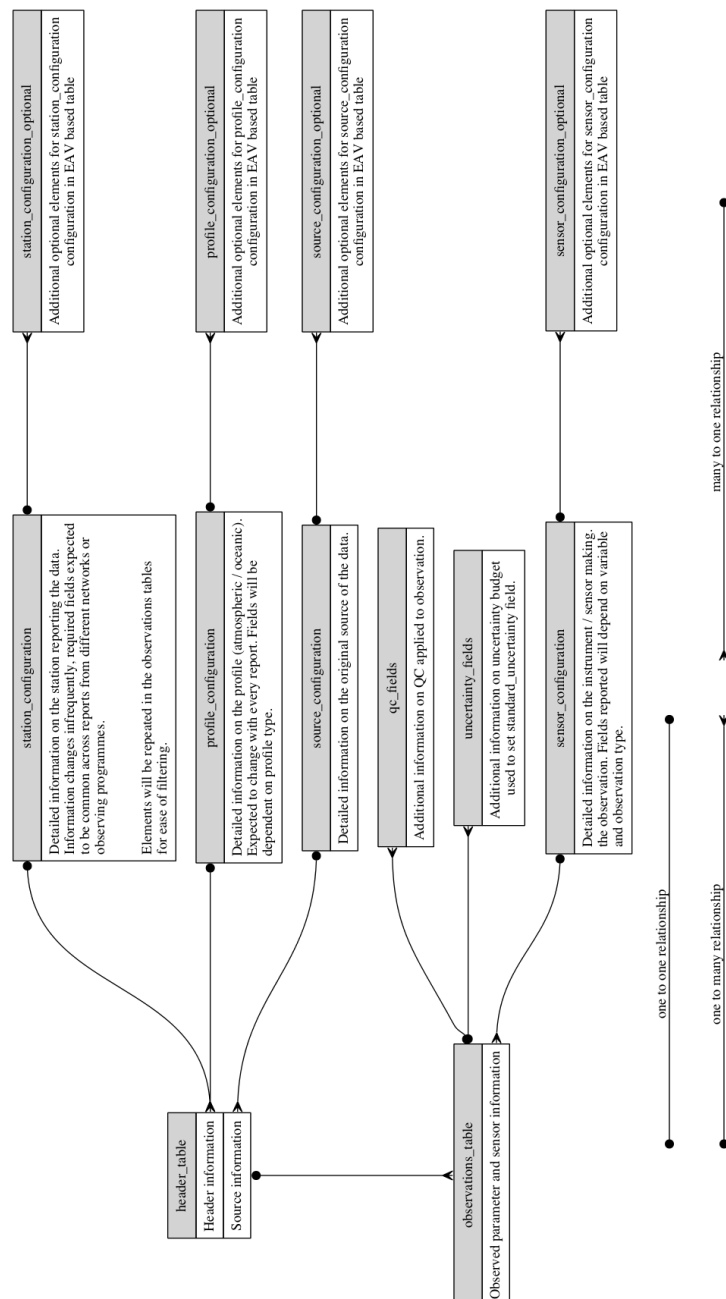


Figure 1: Simplified schematic showing overview of common data model



### 3.1 Header table

Table 2: header\_table (NA)

element_name	kind	external_table	description
report_id	varchar (pk)		Unique ID for report (unique ID given by combination of report_id and observation_id)
region	int	region:region	Region (WMO region / Ocean basin)
sub_region	int	sub_region:sub_region	Country / regional sea
application_area	int[]	application_area:application_area	WMO application area(s)
observing_programme	int[]	observing_programme:observing_programme	Observing programme, e.g. VOS
report_type	int	report_type:report_type	e.g. SYNOP, TEMP, CLIMAT, etc
station_name	varchar		e.g. GRUAN station name, ship name, site name etc
station_type	int	station_type:station_type	Type of station, e.g. land station, sea station etc
platform_type	int	platform_type:platform_type	Structure upon which sensor is mounted, e.g. ship, drifting buoy, tower etc
platform_sub_type	int	platform_sub_type:platform_sub_type	Sub-type for platform, e.g. 3m discuss buoy
primary_station_id	varchar	station_configuration:primary_id	Primary station identifier, e.g. WIGOS ID
station_record_number	int	station_configuration:record_number	Together with primary_station_id this forms a link to the station configuration table.

Continued on next page



Table 2 header\_table (cont.)

element_name	kind	external_table	description
primary_station_id_scheme	int	id_scheme: id_scheme	Scheme used for station ID
longitude	numeric		Longitude of station, -180.0 to 180.0 (or other as defined by station_crs)
latitude	numeric		Latitude of station, -90 to 90 (or other as defined by station_crs)
location_accuracy	numeric		Accuracy to which station location recorded (radius in km)
location_method	int	location_method	Method by which location determined
location_quality	int	location_quality	Quality flag for station location
crs	int	crs:crs	Coordinate reference scheme for station location
station_speed	numeric		Station speed over ground if mobile (m/s)
station_course	numeric		Station course over ground if mobile (degree true)
station_heading	numeric		Station heading if mobile
height_of_station_above_local_ground	numeric		Height of station above local ground (m)
height_of_station_above_mean_sea_level	numeric		Height of station above mean sea level (m), negative values for below sea level.
height_of_station_above_mean_sea_level_accuracy	numeric		Accuracy to which height of station known (m)
sea_level_datum	int	sea_level_datum:datum	Datum used for sea level

Continued on next page



Table 2 header\_table (cont.)

element_name	kind	external_table	description
report_meaning_of_time_stamp	int	meaning_of_time_stamp	Report time - beginning, middle or end of reporting period
e_stamp		:meaning	
report_time_stamp	timestamp with timezone		e.g. 1991-01-01 12:00:00+0
report_duration	int		Report duration (s), e.g. 86400 = daily obs, 3600 hourly etc
report_time_accuracy	numeric		Precision to which time was recorded (s)
report_time_quality	int	time_quality	Quality flag for report_timestamp
report_time_reference	int	time_reference	Reference Time (e.g. referenced to time server, atomic clock, radio clock etc)
profile_id	varchar	profile_configuration:profile_id	Information on profile (atmospheric / oceanographic) configuration. Set to Record ID for profile data or missing (NULL) otherwise.
events_at_station	int[]*	events_at_station:event	e.g. ship hove to, crop burning etc.
report_quality	int	quality_flag	Overall quality of report
duplicate_status	int	duplicate_status	E.g. no duplicates, best duplicate, duplicate, not checked.
duplicates	varchar[]*	header_table:report_id	Array of report_id's for duplicates
record_time_stamp	timestamp with timezone		Timestamp of revision for this record
history	varchar		Sequence of processing steps. Free text with timestamp 1 : history 1; timestamp 2 : history 2 etc.
processing_level	int	report_processing_level	Level of processing applied to this report

Continued on next page



Table 2 header\_table (cont.)

element_name	kind	external_table	description
processing_codes	int[]*	report_processing_codes:code	Processing applied to this report
source_id	varchar	source_configuration:source_configuration	Original source of data, link to external table
source_record_id	varchar		Record ID in source data, e.g. ID of event from GRUAN meta database
End of table			





### 3.2 Observations table

Table 3: observations\_table (NA)

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

Continued on next page



Table 3 observations\_table (cont.)

element_name	kind	external_table	description
secondary_variable	int	secondary_variable:variable	Secondary variable required to understand observation, e.g. chemical constituent. Set to NA / missing if not applicable.
observation_value	numeric		The observed value
value_significance	int	observation_value:significance	e.g. min, max, mean, sum
secondary_value	int	secondary_value:variable	value for the secondary variable. Set to NA or missing if not applicable.
units	int	units:units	Units for the observed variable
code_table	int	observation_code:code_table	Encode / decode table for variable (if encoded)
conversion_flag	int	conversion_flag:flag	Flag indicating whether original, converted or both values are available.
location_method	int	location_method:method	Method of determining location,
location_precision	numeric		Precision to which location is reported (radius km)
z_coordinate_method	int	z_coordinate_method:method	Method of determining z coordinate
bbox_min_longitude	numeric		Bounding box for observation, valid range given by CRS
bbox_max_longitude	numeric		Bounding box for observation, valid range given by CRS
bbox_min_latitude	numeric		Bounding box for observation, valid range given by CRS

Continued on next page



Table 3 observations\_table (cont.)

element_name	kind	external_table	description
bbox_max_latitude	numeric		Bounding box for observation, valid range given by CRS
spatial_representativeness	int	spatial_representativeness	Spatial representativeness of observation
quality_flag	int	quality_flag	Quality flag for observation
qc_passed	int		Number of quality control checks passed (see qc_table for more information)
qc_failed	int		Number of quality control checks failed (see qc_table for more information)
numerical_precision	int		Reporting precision of observation in units given by 'units' variable. Equivalent to BUFR scale factor
standard_uncertainty	numeric		Standard uncertainty in reported value
method_of_estimating_standard_uncertainty	int	method_of_estimating_standard_uncertainty	Method of estimating the standard uncertainty
sensor_id	varchar	sensor_configuration	NA
sensor_automation_status	int	sensor_automation_status	Automated, manual, mixed or visual observation
exposure_of_sensor	int	instrument_exposure_quality	Whether the exposure of the instrument will impact on the quality of the measurement
original_precision	int		Original reporting precision in units given by 'original_units'

Continued on next page



Table 3 observations\_table (cont.)

element_name	kind	external_table	description
original_units	int	units:units	Original units
original_value	numeric		Original value as reported or recorded in log book.
conversion_method	int	conversion_method	Link to table describing conversion process
processing_code	int[]*	processing_code	e.g. TRC (temperature radiation corrections) etc. Encoded in table.
processing_level	int	processing_level	Level of processing applied to observation.
adjustment_id	int	adjustment_id	Total adjustment applied to observation reported in observation value (observation_value = original + adjustment)
traceability	int	traceability	Whether observation can be traced to international standards.
advanced_qc	int	data_present:flag	Flag indicating whether advanced qc data are available
advanced_uncertainty	int	data_present:flag	Flag indicating whether advanced uncertainty estimates are available
advanced_homogenisation	int	data_present:flag	Flag indicating whether advanced homogenisation information is available

End of table



### 3.3 Station configuration

Table 4: station\_configuration (NA)

element_name	type	external_table	description
primary_id	varchar (pk)		Primary (e.g. WMO) ID for station
primary_id_scheme	int	id_scheme:scheme	Scheme used for primary ID
record_number	int (pk)		Record number for this station entry
secondary_id	varchar[]*		Secondary (e.g. local) ID for station
secondary_id_scheme	int[]*	id_scheme:scheme	Scheme used for secondary ID
station_name	varchar		Name of station (e.g. Tateno)
station_abbreviation	varchar		Abbreviation of station name (e.g. TAT)
alternative_name	varchar[]*		NA
station_crs	int	crs:crs	coordinate reference system used to report stations location
longitude	numeric		Report position for station if stationary or NULL if mobile. If more than one estimate record best here and additional values using optional fields.
latitude	numeric	NA	Report position for station if stationary or NULL if mobile
local_gravity	numeric	NA	Local gravity at station location (units ms-2)
start_date	timestamp		Date that the station first started reporting in this configuration
end_date	timestamp		Last data the station reported in this configuration
station_type	int	station_type:type	Type of reporting station
platform_type	int	platform_type:type	Generic type of observing platform
platform_sub_type	int	platform_sub_type:type	Specific type of observing platform

Continued on next page



Table 4 station\_configuration (cont.)

element_name	type	external_table	description
operating_institute	int	organisation:organisation	Institute operating the station (e.g. National Oceanography Centre)
operating_territory	int	sub_region:sub_region	Sub-region where station is located or country of registry for mobile station
city	varchar	NA	Nearest city / town to station location
contact	varchar[]	contact:contact_id	Contact for station
role	int[]	role:role	Role of contact
observing_frequency	int	observing_frequency:frequency	Typical frequency of observations for this station (reports per day). If irregular use reporting_time.
reporting_time	int[]	NA	Reporting hour(s) if non-standard / irregular hours used
telecommunication_method	int[]	communication_method:method	Method used to report observations
station_automation	int	automation_status:automation	Whether station is automated, manual or mixed
measuring_system_model	varchar[]	measuring_system_model	Station / AWS model type
measuring_system_id	varchar[]		ID or serial number of measuring system
observed_variables	int[]	observed_variable:variable	array indicating which variables are observed by this station
comment	varchar		Any other comments / footnotes
optional_data	int	data_present:flag	Flag indicating availability of additional data
End of table			



Table 5: station\_configuration\_optional (NA)

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

End of table

Table 6: kind (NA)

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

End of table

Table 7: station\_configuration\_fields (NA)

field_id	field_name	kind	description
0	AWS Entry and Display Software	int (fk)	See station_configuration_codes
1	AWS Entry and Display Software Version	int (fk)	See station_configuration_codes
2	AWS Model	int (fk)	See station_configuration_codes
3	AWS Model Version	int (fk)	See station_configuration_codes
4	AWS Software	int (fk)	See station_configuration_codes
5	AWS Software version	int (fk)	See station_configuration_codes

Continued on next page



Table 7 station\_configuration\_fields (cont.)

field_id	field_name	kind	description
6	Cargo height	numeric	Height of cargo above deck (m)
7	Distance of bridge from bow	numeric	(m)
8	Draught	numeric	(m)
9	Drogue type	int (fk)	See station_configuration_codes
10	Freeboard	numeric	NA
11	Lagrangian drifter drogue status	int (fk)	See station_configuration_codes
12	Length over-all of the ship, ignoring bulbous bow	numeric	NA
13	LogBook software and version	int (fk)	See station_configuration_codes
14	Maximum operating speed on normal service	numeric	NA
15	Moulded breadth	numeric	NA
16	Other instruments	int (fk)	See station_configuration_codes
17	Station status	int (fk)	See station_configuration_codes
18	Type of meteorological reporting ship	int (fk)	See station_configuration_codes
19	Surface cover	int (fk)	See station_configuration_codes
20	Surface cover scheme	int (fk)	See station_configuration_codes
21	Topography	int (fk)	See station_configuration_codes
22	Topography scheme	int (fk)	See station_configuration_codes
23	Soil type	int (fk)	See station_configuration_codes
24	Land use	int (fk)	See station_configuration_codes
25	Alternate longitude	numeric	NA
26	Alternate latitude	numeric	NA
27	Distance from road	numeric	Distance from nearest road (in km)

Continued on next page





Table 7 station\_configuration\_fields (cont.)

field_id	field_name	kind	description
28	Distance from water body	numeric	Distance from nearest water body (in km)

End of table

Draft



Table 8: station\_configuration\_codes (NA)

field_id	field_name	code_value	abbreviation	description
0	AWS Entry and Display Software			TBD
1	AWS Entry and Display Software Version			TBD
2	AWS Model			TBD
3	AWS Model Version			TBD
4	AWS Software			TBD
5	AWS Software version			TBD
9	Drogue type	NA		See BUFR code table 0 02 034
11	Lagrangian drifter drogue status	NA		See BUFR code table 0 22 060
11	LogBook software and version			TBD
16	Other instruments	0	BAT	Bathymeter.
16	Other instruments	1	BT	Bathymograph (towed).
16	Other instruments	2	FLM	Fluorometer.
16	Other instruments	3	LWR	Long wave radiation.
16	Other instruments	4	MAX	Maximum thermometer.
16	Other instruments	5	MIN	Minimum thermometer.

Continued on next page



Table 8 station\_configuration\_codes (cont.)

field_id	field_name	code_value	abbreviation	description
16	Other instruments	6	NTE	Nitrate sensor.
16	Other instruments	7	NTT	Nutrient sensor.
16	Other instruments	8	P	Pilot balloon equipment.
16	Other instruments	9	CO2	pCO2 system.
16	Other instruments	10	PLK	Plankton recorder.
16	Other instruments	11	PRS	Photosynthetic radiation sensor.
16	Other instruments	12	PYG	Pyrogeometer.
16	Other instruments	13	R	Radiosonde equipment.
16	Other instruments	14	RG	Rain gauge.
16	Other instruments	15	RSD	Radar storm and meteorological phenomena detection.
16	Other instruments	16	RT	Reversing thermometer.
16	Other instruments	17	SKY	Sky camera.
16	Other instruments	18	SLM	Solarimeter.
16	Other instruments	19	ST	Sea thermograph.
16	Other instruments	20	SWR	Short wave radiation.
16	Other instruments	21	TSD	Temperature/salinity/depth probe.

Continued on next page



Table 8 station\_configuration\_codes (cont.)

field_id	field_name	code_value	abbreviation	description
16	Other instruments	22	TUR	Turbidity sensor.
16	Other instruments	23	W	Radiowind or radarwind equipment.
16	Other instruments	24	WR	Wave Recorder
16	Other instruments	25	XBT	Expendable bathythermograph.
16	Other instruments	26	OT	Other (specify in footnote).
17	Station status	1		Planned
17	Station status	2		Pre-operational
17	Station status	3		Operational / Reporting
17	Station status	4		Partly reporting
17	Station status	5		Temporarily suspended
17	Station status	6		Closed
18	Type of meteorological reporting ship	0	70	Auxiliary ship
18	Type of meteorological reporting ship	1	75	Auxiliary ship (AWS)
18	Type of meteorological reporting ship	2	10	Selected
18	Type of meteorological reporting ship	3	15	Selected (AWS)
18	Type of meteorological reporting ship	4	40	Supplementary

Continued on next page



Table 8 station\_configuration\_codes (cont.)

<b>field_id</b>	<b>field_name</b>	<b>code_value</b>	<b>abbreviation</b>	<b>description</b>
18	Type of meteorological re- porting ship	5	45	Supplementary (AWS)
18	Type of meteorological re- porting ship	6	80	Third party
18	Type of meteorological re- porting ship	7	85	Third party (AWS)
18	Type of meteorological re- porting ship	8	99	Unknown
18	Type of meteorological re- porting ship	9	30	VOSClim - VOS Climate
18	Type of meteorological re- porting ship	10	35	VOSClim (AWS) - VOS Climate (AWS)
				End of table



3.4 Profile configuration

Table 9: profile\_configuration (NA)

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

End of table



Table 10: profile\_configuration\_optional (NA)

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

End of table

Table 11: profile\_configuration\_fields (NA)

field_id	field_name	type	description
0	include descent	int (fk)	See profile_configuration_codes
1	processing code	int (fk)	See profile_configuration_codes
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)	See profile_configuration_codes
B002003	type of measuring equipment used	int (fk)	See profile_configuration_codes
B002011	radiosonde sounding system	int (fk)	See profile_configuration_codes
B002011	radiosonde type	int (fk)	See profile_configuration_codes

Continued on next page



Table 11 profile\_configuration\_fields (cont.)

field_id	field_name	type	description
B002013	solar and in- frared radi- ation cor- rection	int (fk)	See profile_configuration_codes
B002014	tracking tech- nique	int (fk)	See profile_configuration_codes
B002015	radiosonde complete- ness	int (fk)	See profile_configuration_codes
B002017	humidity cor- rection al- gorithm	int (fk)	See profile_configuration_codes
B002066	radiosonde ground re- ceiving sys- tem	int (fk)	See profile_configuration_codes
B002080	balloon man- ufacturer	int (fk)	See profile_configuration_codes
B002081	balloon type	int (fk)	See profile_configuration_codes
B002083	type of bal- loon shelter	int (fk)	See profile_configuration_codes
B002084	type of gas used in bal- loon	int (fk)	See profile_configuration_codes
B002095	type of pres- sure sensor	int (fk)	See profile_configuration_codes
B002191	geopotential height cal- culation	int (fk)	See profile_configuration_codes
B003011	method of depth cal- culation	int (fk)	See profile_configuration_codes
B022056	profile di- rection	int (fk)	See profile_configuration_codes
B022067	instrument type for water temperature salinity profile	int (fk)	See profile_configuration_codes
B022068	water temper- ature profile recorder type	int (fk)	See profile_configuration_codes
B022178	XBT launcher type	int (fk)	See profile_configuration_codes

Continued on next page





Table 11 profile\_configuration\_fields (cont.)

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

End of table

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Table 12: profile\_configuration\_codes (NA)

field_id	field_name	code_value	abbreviation	description	start_date	end_date
0	include descent	0	NA	Descent excluded	NA	NA
0	include descent	1	NA	Descent included	NA	NA
1	processing code	0	cc	Calibration correction (of humidity sensors)	NA	NA
1	processing code	1	HRC	Humidity radiation correction	NA	NA
1	processing code	2	or	Outlier removal (remove temperature spikes)	NA	NA
1	processing code	3	pGPS	Combination of pressure and GPS	NA	NA
1	processing code	4	TL	Time-lag correction	NA	NA
1	processing code	5	TRC	Temperature radiation correction	NA	NA
B002003	type of measuring equipment used	0 - 15	NA	See BUFR table 0 02 003	NA	NA

Continued on next page



Table 12 profile\_configuration\_codes (cont.)

field_id	field_name	code_value	abbreviation	description	start_date	end_date
B002011	radiosonde sounding system	0 - 255	NA	See BUFR table 0 02 011	NA	NA
B002013	solar and infrared radiation correction	0 - 15	NA	See BUFR table 0 02 013	NA	NA
B002014	tracking technique	0 - 127	NA	See BUFR table 0 02 014	NA	NA
B002015	radiosonde completeness	0 - 15	NA	See BUFR table 0 02 015	NA	NA
B002017	humidity correction algorithm	0 - 31	NA	See BUFR table 0 02 017	NA	NA
B002066	radiosonde ground receiving system	0 - 63	NA	See BUFR table 0 02 066	NA	NA
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

Continued on next page



Table 12 profile\_configuration\_codes (cont.)

field_id	field_name	code_value	abbreviation	description	start_date	end_date
B002084	type of gas used in balloon	NA	NA	See BUFR table 0 02 084	NA	NA
B002095	type of pressure sensor	0 - 31	NA	See BUFR table 0 02 095	NA	NA
B002191	geopotential height calculation	0 - 15	NA	See BUFR table 0 02 191	NA	NA
B003011	method of depth calculation	0 - 3	NA	See BUFR table 0 03 011	NA	NA
B022056	profile direction	0 - 3	NA	See BUFR table 0 22 056	NA	NA
B022067	instrument type for water temperature salinity profile	0 - 1023	NA	See BUFR table 0 22 067	NA	NA
B022068	water temperature profile recorder type	0 - 127	NA	See BUFR table 0 22 068	NA	NA
B022178	XBT launcher type	0 - 255	NA	See BUFR table 0 22 178	NA	NA
B035035	reason for termination	0 - 31	NA	See BUFR table 0 35 035	NA	NA
End of table						



### 3.5 Source configuration

Table 13: source\_configuration (NA)

element_name	type	external_table	description
source_id	varchar (pk)		Unique record ID for dataset
product_id	varchar		ID for product
product_name	varchar		Name of source, e.g. International Comprehensive Ocean Atmosphere Data Set, RS92 GRUAN Data Product
product_code	varchar		Abbreviations / product code, e.g. ICOADS, RS92-GDP
product_version	varchar		Version number for dataset, e.g. Release 3.0.0
product_level	int	product_level	Level of product
product_uri	varchar		URI for product, either to original source or to CDS
description	varchar		Description of dataset / comments
product_references	varchar[]		References describing the dataset
product_citation	varchar[]		Citation to use when using this product
product_status	int	product_status	Status of product, draft, pre-release, release
source_format	int	source_format	Original format for data
source_format_at_version	varchar		Version of original data format
source_file	varchar		Filename for data from source
source_file_checksum	varchar		Checksum of source datafile
data_centre	int	organisation_id	Data centre from which data sourced

Continued on next page



Table 13 source\_configuration (cont.)

element_name	type	external_table	description
data_centre_url	varchar		URL for data centre
data_policy licence	int	data_policy_licence:policy	Data policy / licence
contact	varchar[]	contact:contact_id	contact for data source with role specified by role element
contact_role	int[]	role:role	role of contact
history	varchar		History of source
comments	varchar		Additional comments / footnotes
timestamp	timestamp with timezone		Date record created / created
maintenance_and_update_frequency	int	update_frequency:frequency	Frequency with which modifications and deletions are made to the data after it is first produced
optional_data	int	data_present:flag	Flag indicating availability of additional data
End of table			



Table 14: source\_configuration\_optional (NA)

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

End of table

Table 15: source\_configuration\_fields (NA)

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



Table 16: source\_configuration\_codes (NA)

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

Continued on next page





Table 16 source\_configuration\_codes (cont.)

field_id	field_name	code_value	description	extended_description
2	metadata source format	3	Output from digitisation project, semi-colon delimited format (1957 - 1967)	NA
2	metadata source format	4	Output from digitisation project, semi-colon delimited format (1968 - 1969)	NA
2	metadata source format	5	Fixed format (1970 - 1004)	NA
2	metadata source format	6	Semi-colon delimited format (1995 - 2001)	NA
2	metadata source format	7	Semi-colon delimited format (2002 - 2007 q1)	NA
2	metadata source format	8	Semi-colon delimited format (2007 - 2008)	NA
2	metadata source format	9	Semi-colon delimited format (2009 - 2014)	NA
3	observation source type	0	unknown	NA
3	observation source type	1	delayed mode - logbook (paper)	NA
3	observation source type	2	real time - national telecommunication channels	NA

Continued on next page



Table 16 source\_configuration\_codes (cont.)

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

Continued on next page



Table 16 source\_configuration\_codes (cont.)

field_id	field_name	code_value	description	extended_description
6	icoads source deck	NA	See ICOADS Source Deck	NA
7	icoads source id	NA	See ICOADS Source ID	NA
8	product level	2	Data read from original data file	NA
9	product status	1	Data approved	Data exist, read from chache, PTU + altitude columns available, all GC25 tests ok, all uncertainties as expected
End of table				



### 3.6 Sensor configuration

Table 17: sensor\_configuration (NA)

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



Table 18: sensor\_configuration\_optional (NA)

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

End of table

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Table 19: sensor\_configuration\_fields (NA)

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 - air temperature 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

Continued on next page



Table 19 sensor\_configuration\_fields (cont.)

field_id	field_name	parameter	type	description
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
CALREF	calibration reference	all	varchar	Reference instrument (make, model and serial number) used to perform calibration
CALDEV	calibration chamber	all	varchar	Calibration chamber (or device) used to perform the calibration
CALPRTY	calibration party	all	varchar	Who performed the calibration
CALRES	calibration result	all	varchar	Result of the calibration
CALCERT	calibration certificate	all	varchar	Certificate number of calibration certificate
FREQ	sampling frequency	all	numeric	time period (s) between successive measurements from sensor
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

Continued on next page



Table 19 sensor\_configuration\_fields (cont.)

field_id	field_name	parameter	type	description
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
STREAT	sample treatment	all	int (fk)	treatment of the sample prior to analysis
TSONDE	telemetry_sonde	sonde	int (fk)	NA

Continued on next page





Table 19 sensor\_configuration\_fields (cont.)

field_id	field_name	parameter	type	description
WGHT	weight	sonde	numeric	NA
STIME	sample times	all	timestamp	time of the samples used to calculate statistics
INSTDATE	installation date	all	timestamp	Date when sensor was installed
MNTDATE	maintenance date	all	timestamp	Date when maintenance performed (use MTNCE to summarise activities undertaken)
MNTMETH	maintenance	all	varchar	Summary of maintenance performed
MNTPRTY	maintenance party	all	varchar	Who performed the maintenance
MNTINT	maintenance interval	all	numeric	Maximum number of months recommended between maintenance activities
End of table				



Table 20: sensor\_configuration\_codes (NA)

field_id	field_name	parameter	code_value	abbreviation	description
B002033	sensor type - salinity	salinity	0 - 7		See BUFR table 0 02 033
B002038	sensor type - water temperature	water temperature	0 - 15		See BUFR table 0 02 038
B002038	sensor type - water temperature	water temperature	16		Bait tanks thermometer.
B002038	sensor type - water temperature	water temperature	17		electronic sensor
B002038	sensor type - water temperature	water temperature	18		implied bucket [note: applicable to early ICOADS data]
B002038	sensor type - water temperature	water temperature	19		Radiation thermometer.
B002038	sensor type - water temperature	water temperature	20		Through Hull sensor.
B002038	sensor type - water temperature	water temperature	21		Trailing thermistor
B002038	sensor type - water temperature	water temperature	22		unknown or non-bucket
B002051	sensor type - extremes	air temperature	0 - 15		See BUFR table 0 02 051

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
B002096	sensor type - air temperature	air temperature	0		See BUFR table 0 02 096
B002097	sensor type - humidity	humidity	0 - 31		See BUFR table 0 02 097
B002169	sensor type - wind speed	wind speed	0 - 15		See BUFR table 0 02 169
B002169	sensor type - wind speed	wind speed	16		Anemograph.
B002169	sensor type - wind speed	wind speed	17		Anemometer - type unspecified
B002169	sensor type - wind speed	wind speed	18		Beaufort force
B002169	sensor type - wind speed	wind speed	19		Cup anemometer and wind vane (combined unit).
B002169	sensor type - wind speed	wind speed	20		Cup anemometer and wind vane (separate instruments).
B002169	sensor type - wind speed	wind speed	21		Handheld anemometer.
B002169	sensor type - wind speed	wind speed	22		Other (specify in footnote).
B002169	sensor type - wind speed	wind speed	23		Propeller vane.
B002185	sensor type - evaporation	evaporation	0 - 15		See BUFR table 0 02 185
B003003	sensor housing - type	all	0 - 15		See BUFR table 0 03 003
B003004	sensor housing - radiation shielding	all	0 - 15		See BUFR table 0 03 004

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
B003008	sensor housing - ventilation	all	0 - 7		See BUFR table 0 03 008
B003020	sensor housing - material	all	0 - 7		See BUFR table 0 03 020
B003021	sensor housing - heating	all	0 - 4		See BUFR table 0 03 021
B003022	sensor owner	all	0 - 7		See BUFR table 0 03 022
B003023	sensor housing - configuration	all	0 - 7		See BUFR table 0 03 023
BARG	sensor type - barograph	pressure trend	0		Open Scale barograph with 1 day clock.
BARG	sensor type - barograph	pressure trend	1		Open Scale barograph with 2 day clock.
BARG	sensor type - barograph	pressure trend	2		Open Scale barograph with 3 day clock.
BARG	sensor type - barograph	pressure trend	3		Open Scale barograph with 4 day clock.
BARG	sensor type - barograph	pressure trend	4		Open Scale barograph with 5 day clock.
BARG	sensor type - barograph	pressure trend	5		Open Scale barograph with 6 day clock.
BARG	sensor type - barograph	pressure trend	6		Open Scale barograph with 7 day clock.
BARG	sensor type - barograph	pressure trend	7		Open Scale barograph with 8 day clock.
BARG	sensor type - barograph	pressure trend	8		Open Scale barograph with 9 day clock.
BARG	sensor type - barograph	pressure trend	9		Open Scale barograph.

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

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

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SLOC	sensor location - ship	all	4		Handheld.
SLOC	sensor location - ship	all	5		Main deck
SLOC	sensor location - ship	all	6		Mainmast yardarm
SLOC	sensor location - ship	all	7		Mainmast.
SLOC	sensor location - ship	all	8		Mast on wheelhouse top yardarm
SLOC	sensor location - ship	all	9		Mast on wheelhouse top.
SLOC	sensor location - ship	all	10		Meteorological mast.
SLOC	sensor location - ship	all	11		Not fitted.
SLOC	sensor location - ship	all	12		Other
SLOC	sensor location - ship	all	13		Pressurised wheelhouse (closed and not vented to the outside).
SLOC	sensor location - ship	all	14		Wheelhouse
SLOC	sensor location - ship	all	15		Wheelhouse, not pressurised (vented to the outside).
SRR	sensor type - precipitation	precipitation	NA		Place holder
SSIDE	sensor side - ship	all	0		Center
SSIDE	sensor side - ship	all	1		Port

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
SSIDE	sensor side - ship	all	2		Starboard
SSIDE	sensor side - ship	all	3		Windward side
SWV	sensor type - waves	waves	0		buoy
SWV	sensor type - waves	waves	1		other
SWV	sensor type - waves	waves	2		shipborne wave recorder
SWW	sensor type - present weather	present weather	0		Automatic, included (using WMO Codes 4677 and 4561)
SWW	sensor type - present weather	present weather	1		Automatic, included (using WMO codes 4680 amd 4531)
SWW	sensor type - present weather	present weather	2		Automatic, omitted (no observation, data not available)
SWW	sensor type - present weather	present weather	3		Automatic, omitted (no significant phenomenon to report)
SWW	sensor type - present weather	present weather	4		Manned, included
SWW	sensor type - present weather	present weather	5		Manned, omitted (no observation, data not available)
SWW	sensor type - present weather	present weather	6		Manned, omitted (no significant phenomenon to report)

Continued on next page



Table 20 sensor\_configuration\_codes (cont.)

field_id	field_name	parameter	code_value	abbreviation	description
TSONDE	telemetry_sonde		TBD		TBD
STREAT	sample treatment	all	TBD		TBD
SPROC	sample procedure	all	TBD		TBD
QCPROC	quality control procedure	all	TBD		TBD
CALMETH	Calibration method	all	TBD		TBD
End of table					





### 3.7 Quality control flags

A single QC flag is provided in the observations table for the observed value. Additional flags can be provided using the qc\_table and by setting the advanced\_qc flag to true in the observations\_table.

Table 21: qc\_table (NA)

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

End of table

### 3.8 Uncertainty budget

A single standard uncertainty value is provided for each observed value in the observations table. Additional values can be provided using the uncertainty\_table and by setting the advanced\_uncertainty to true in the observations\_table.

Table 22: uncertainty\_table (NA)

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

End of table

### 3.9 Homogenisation data



Table 23: homogenisation\_table (NA)

element_name	kind	external_table	description
observation_id	varchar	observation_s.table:observation_id	Link to observation this entry is for
homogenisation_method	int	homogenisation_method:method	Method used to homogenise data
homogenisation_adjustment	numeric	NA	Value applied to homogenise data (homogenised_value = original (+-/*) homogenisation_adjustment)
homogenisation_operator	int	homogenisation_operator:operator	Operator (+-/*) used to apply adjustment
homogenisation_order	int	NA	Order in which the adjustments are applied. Set to NA or missing if not applicable

End of table

## 4 Governance of the Common Data Model

A working group will be set up to manage the governance of the common data model. This group will operate remotely via email and regular teleconferences. Proposals to add new entries to the code tables or make changes to the structure of the common data model shall be made via email to email address TBD. Emails to this address will be distributed to all members of the working group.

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

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

The initial working group and contact details are listed in Table XX.

## 5 Acknowledgements

- Participants from Lot 1



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

## 6 References

Freeman et al., 2017 ...

GCOS, 2010 ...

Hersbach, H., P. Poli and D. Dee, 2015: The observation feedback archive for ICOADS and ISPD datasets. ERA Report Series No. 18, ECMWF, Reading, UK, 31pp.

Saarinen, S., 2004: ODB User guide (draft 1st edition), ECMWF, Reading, UK, 289pp.

WMO, 2015a: Manual On Codes (WMO-No 306), Volume I.2, Part B - Binary Codes, WMO, Geneva.

WMO, 2015b: Manual on the WMO Integrated Global Observing System: Annex VIII to the Technical Regulations (WMO-No 1160), WMO, Geneva.

## 7 Appendix

Draft



## 7.1 Observed variable

Table 24: observed\_variable (NA)

variable	parameter_group	domain	sub_do_main	name	units	description
0	aerosols			aerosol absorption optical depth	Dimensionless	Vertical column integral of spectral aerosol absorption coefficient: $AAOD = \exp(-K \cdot Dz)$ where K is the absorption coefficient [km <sup>-1</sup> ] and Dz the vertical path [km]
1	aerosols			aerosol column burden	g m <sup>-2</sup>	2D field of the column burden of condensed particles in the atmosphere
2	aerosols			aerosol dust concentration	g kg <sup>-1</sup>	3-D field of concentration of dust or sand in the atmosphere
3	aerosols			aerosol effective radius	micro m	3D field of mean aerosol particle size, defined as the ratio of the third and second moments of the number size distribution of aerosol particles. Requested in the troposphere (assumed height: 12 km) and as columnar average.
4	aerosols			aerosol extinction coefficient	m <sup>-1</sup>	3D field of spectral volumetric extinction cross-section of aerosol particles.
5	aerosols			aerosol mass mixing ratio	g kg <sup>-1</sup>	3D field of the mass mixing ratio of condensed particles in the atmosphere
6	aerosols			aerosol optical depth	Dimensionless	The AOD is the effective depth of the aerosol column from the viewpoint of radiation propagation: Vertical column integral of spectral aerosol extinction coefficient $AOD = \exp(-K \cdot Dz)$ where K is the extinction coefficient [km <sup>-1</sup> ] and Dz the vertical path [km]

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
7	aerosols		main	aerosol species mole fraction	moles per mole of dry air	3D field of the mole fraction of condensed-phase chemical species (e.g., sulfate, nitrate, ammonium, elemental carbon, organic carbon), in the atmosphere
8	aerosols			aerosol species total column burden	moles m <sup>-2</sup>	2D field of the total column burden concentration of condensed-phase chemical species (e.g., sulfate, nitrate, ammonium, elemental carbon, organic carbon), in the atmosphere
9	aerosols			aerosol type	coded	Selection, out of a pre-defined set of aerosol classes, that best fits an input data set (observed or modeled). The pre-defined set of aerosol classes includes specification of the particle composition, mixing state, complex refractive index, and shape as a function of particle size. The definition of aerosol type includes specification of all the classes as well as the algorithm used to choose the best fit to the input data.
10	aerosols			aerosol volcanic ash	g kg <sup>-1</sup>	3D field of mass mixing ratio of volcanic ash
11	aerosols			total column aerosol volcanic ash	g m <sup>-2</sup>	Field of total column mass of volcanic ash
12	aerosols			air conductivity	km	TBD
13	albedo			blue ice and snow albedo	percent	TBD

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
14	albedo		main	blue ice bidirectional reflectance	sr-1	TBD
15	albedo			clean glacier ice albedo	percent	TBD
16	albedo			dirty glacier ice albedo	percent	TBD
17	albedo			earth surface albedo	percent	Hemispherically integrated reflectance of the Earth surface in the range 0.4 - 0.7 micro-m
18	albedo			snow bidirectional reflectance	sr-1	TBD
19	cloud	atmospheric	upper-air	cloud base height	m	cloud base height (hb)
20	cloud	atmospheric	upper-air	cloud base lowest height	coded	Height above surface of the base of the lowest cloud seen (coded 0-9)
21	cloud	atmospheric	upper-air	cloud cover	Okta or percent	3D field of fraction of sky filled by clouds.
22	cloud	atmospheric	upper-air	cloud genus	Coded	Genus of cloud (0 - Cirrus to 9 - Cumulo-Nimbus)
23	cloud	atmospheric	upper-air	cloud genus base height	Coded or m	Height of base of cloud whose genus is c
24	cloud	atmospheric	upper-air	high cloud type	coded	type of high clouds (ch)

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
25	cloud	atmospheric	upper-air	low cloud type	coded	type of low clouds (cl)
26	cloud	atmospheric	upper-air	lowest cloud amount	Okta	low or (if low clouds don't exist) middle cloud amount
27	cloud	atmospheric	upper-air	middle cloud type	coded	type of middle clouds (cm)
28	cloud	atmospheric	upper-air	total cloud amount	Okta	total amount of clouds
29	evaporation	atmospheric		evaporation	mm	TBD
30	evaporation	atmospheric		evaporation	kg m-2 s-1	TBD
31	evaporation	atmospheric		potential evapotranspiration	mm day-1	Quantity of water evaporated from the soil and plants when the ground is at its natural moisture content.
32	evaporation	atmospheric		real evapotranspiration	mm day-1	TBD
33	humidity	atmospheric		absolute humidity	g m-3	TBD
34	humidity	atmospheric	surface; upper-air	dew point depression	K	Dew point depression is also called dew point deficit. It is the amount by which the air temperature exceeds its dew point temperature. Dew point temperature is the temperature at which a parcel of air reaches saturation upon being cooled at constant pressure and specific humidity.
36	humidity	atmospheric	surface; upper-air	dew point temperature	K	Dew point temperature is the temperature at which a parcel of air reaches saturation upon being cooled at constant pressure and specific humidity.
37	humidity	atmospheric	surface; upper-air	ice bulb temperature	K	TBD

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
38	humidity	atmospheric	surface; upper-air	relative humidity	percent	TBD
39	humidity	atmospheric	surface; upper-air	specific humidity	g kg <sup>-1</sup>	specific means per unit mass. Specific humidity is the mass fraction of water vapor in (moist) air.
40	humidity	atmospheric		water vapour pressure	hPa	TBD
41	humidity	atmospheric	surface; upper-air	wet bulb temperature	K	TBD
43	ice			ice thickness	m	Thickness of the ice sheet. It is related to sea-ice elevation and ice density
44	precipitation	atmospheric		accumulated precipitation	mm	accumulated precipitation over specified period
45	precipitation	atmospheric		fresh snow	mm	TBD
46	precipitation	atmospheric		hydrometeor type	Code table	3D field of the predominant form of condensed water in a volume of free atmosphere, including liquid cloud, rain, ice crystals, snow, graupel and hail. (This variable replaces "precipitation type").
47	precipitation	atmospheric		precipitation intensity	g m <sup>-2</sup> s <sup>-1</sup>	Precipitation (liquid or solid)
48	precipitation	atmospheric		precipitation intensity liquid	mm h <sup>-1</sup>	Precipitation intensity at surface (liquid or solid)
49	precipitation	atmospheric		precipitation intensity solid	mm h <sup>-1</sup>	Precipitation intensity at surface (solid)
50	precipitation	atmospheric		precipitation type	coded	Liquid, snow, hail, fog
51	precipitation	atmospheric		rainy days	Days	TBD
52	precipitation	atmospheric		snow cover	percent	Fraction of a given area which is covered by snow

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Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
53	precipitation	atmospheric	main	snow depth	cm	Vertical distance from the snow surface to the underlying surface (ground, glacier ice or sea ice).
54	precipitation	atmospheric		snow status	coded	Wet or dry
55	precipitation	atmospheric		snow water equivalent	mm	Surface snow amount
56	pressure	atmospheric	surface	adjunct temperature barometer	K	temperature of the adjunct thermometer to the barometer to reduce pressure to 0 degC
57	pressure	atmospheric	surface	air pressure	Pa	pressure of air column at specified height
58	pressure	atmospheric	surface	air pressure at sea level	Pa	sea level means mean sea level, which is close to the geoid in sea areas. Air pressure at sea level is the quantity often abbreviated as MSLP or PMSL.
59	pressure	atmospheric	surface	pressure tendency	Pa	pressure tendency
60	pressure	atmospheric	surface	pressure tendency characteristics	coded	characteristic of pressure tendency (used in synoptic maps)
61	radiation	atmospheric		diffuse radiation	W m-2	TBD
62	radiation	atmospheric		downward longwave irradiance at earth surface	W m-2	Flux density of radiation emitted by the gases, aerosols and clouds of the atmosphere to the Earth's surface

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
63	radiation	atmospheric	main	downward shortwave irradiance at earth surface	W m <sup>-2</sup>	Flux density of the solar radiation at the Earth surface
64	radiation	atmospheric		downward shortwave irradiance at toa	W m <sup>-2</sup>	Flux density of the solar radiation at the top of the atmosphere
65	radiation	atmospheric		earth surface short-wave bidirectional reflectance	percent	Reflectance of the Earth surface as a function of the viewing angle and the illumination angle in the range 0.4-0.7 microm . The distribution of this variable is represented by the Bidirectional Reflectance Distribution Function (BRDF)
66	radiation	atmospheric		fraction of absorbed par	percent	Fraction of PAR absorbed by vegetation (land or marine) for photosynthesis processes (generally around the 'red' )
67	radiation	atmospheric		global radiation	W m <sup>-2</sup>	TBD
68	radiation	atmospheric		longwave earth surface emissivity	percent	TBD
69	radiation	atmospheric		longwave radiation	W m <sup>-2</sup>	TBD
70	radiation	atmospheric		meteorological optical range	meteorological optical range	Meteorological optical range at surface
71	radiation	atmospheric		photosynthetically active radiation	W m <sup>-2</sup>	Flux of downwelling photons of wavelength 0.4-0.7 microm

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Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
72	radiation	atmospheric	main	shortwave cloud reflectance	percent	Reflectance of the solar radiation from clouds
73	radiation	atmospheric		shortwave radiation	W m <sup>-2</sup>	TBD
74	radiation	atmospheric		solar gamma ray flux	W m <sup>-2</sup>	Radiative flux integrated over the gamma-ray domain.
75	radiation	atmospheric		solar UV flux	W m <sup>-2</sup>	Integrated UV flux over the solar disk.
76	radiation	atmospheric		solar VIS flux	W m <sup>-2</sup>	Integrated VIS flux over the solar disk
77	radiation	atmospheric		solar X ray flux	W m <sup>-2</sup>	Integrated X-ray flux over the solar disk
78	radiation	atmospheric		sunshine duration	h	TBD
79	radiation	atmospheric		upward longwave irradiance at Earth surface	W m <sup>-2</sup>	Flux density of terrestrial radiation emitted by the Earth surface and the gases, aerosols and clouds of the atmosphere at the top of the atmosphere
80	radiation	atmospheric		upward longwave irradiance at TOA	W m <sup>-2</sup>	Flux density of terrestrial radiation emitted by the Earth surface and the gases, aerosols and clouds of the atmosphere at the top of the atmosphere
81	radiation	atmospheric		upward shortwave irradiance at TOA	W m <sup>-2</sup>	Flux density of solar radiation, reflected by the Earth surface and atmosphere, emitted to space at the top of the atmosphere

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Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
82	radiation	atmospheric	main	upward spectral radiance at TOA	W m <sup>-2</sup> nm <sup>-1</sup> sr <sup>-1</sup>	Upward radiant power measured at the top of the atmosphere per area unit, per solid angle, and per wavelength interval. Spectral range 0.2-200 micro m.
83	salinity	oceanic	surface; sub-surface	salinity	psu	ocean salinity (PSU)
85	temperature	atmospheric	surface; upper-air	air temperature	K	Air temperature is the bulk temperature of the air, not the surface (skin) temperature.
86	temperature	atmospheric		daily maximum air temperature	K	TBD
87	temperature	atmospheric		daily maximum air temperature with direct sun exposure	K	TBD
88	temperature	atmospheric		daily maximum grass temperature	K	Grass maximum thermometer is 5 cm above ground
89	temperature	atmospheric		daily minimum air temperature	K	TBD

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Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
90	temperature	atmospheric	main	daily minimum air temperature with direct sun exposure	K	TBD
91	temperature	atmospheric		daily minimum grass temperature	K	Grass minimum thermometer is 5 cm above ground
92	temperature	atmospheric		days with ground frost	Days	TBD
93	temperature	atmospheric		snow temperature	K	TBD
94	temperature	atmospheric		soil temperature	K	Lot 1 is using Ts - WMO abbrev.
95	temperature	oceanic	surface; sub-surface	water temperature	K	Water (sea, river, lake) temperature at depth indicated
96	visibility	atmospheric	surface	horizontal visibility in air	m	The visibility is the distance at which something can be seen.
97	weather			lightning detection	deg (lat, lon) and UTC	Detection of the time and location (latitude, longitude) of lightning events. Accuracy expressed in terms of Hit Rate and False Alarm Rate, which requires predetermination of a specific distance and time tolerance .
98	weather			lightning duration	s	TBD

Continued on next page



Table 24 observed\_variable (cont.)

variable	parameter_group	domain	sub_domain	name	units	description
99	weather		main	lightning horizontal distance	Km	TBD
100	weather	atmospheric	surface	past weather 1	coded	past weather 1 - most extreme phenomenon (w)
101	weather	atmospheric	surface	past weather 2	coded	past weather 2 - most frequent phenomenon (used in synoptic maps)
102	weather	atmospheric	surface	present weather	coded	present weather (ww)
103	weather			Total lightning density	Dimensionless	Total number of detected flashes in the corresponding time interval and the space unit. The space unit (grid box) should be equal to the horizontal resolution and the accumulation time to the observing cycle
104	wind	atmospheric	surface; upper-air	eastward wind speed	m s <sup>-1</sup>	Eastward indicates a vector component which is positive when directed eastward (negative westward). Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.)
105	wind	atmospheric	surface; upper-air	northward wind speed	m s <sup>-1</sup>	Northward indicates a vector component which is positive when directed northward (negative southward). Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.)
106	wind	atmospheric	surface; upper-air	wind from direction	degree	direction from which the wind is blowing Lot 1 uses dd - WMO abbrev.
107	wind	atmospheric	surface; upper-air	wind speed	m s <sup>-1</sup>	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.

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Table 24 observed\_variable (cont.)

variable	paramete r_group	domain	sub do main	name	units	description
108	wind	atmospheric	surface	wind speed of gust	m s-1	Speed is the magnitude of velocity. Wind is defined as a two-dimensional (horizontal) air velocity vector, with no vertical component. (Vertical motion in the atmosphere has the standard name upward air velocity.) The wind speed is the magnitude of the wind velocity. A gust is a sudden brief period of high wind speed. In an observed timeseries of wind speed, the gust wind speed can be indicated by a cell methods of maximum for the time-interval. In an atmospheric model which has a parametrised calculation of gustiness, the gust wind speed may be separately diagnosed from the wind speed. Lot 1 uses fx - WMO abbrev.
109	wind	atmospheric		wind speed max	m s-1	Maximum observed wind speed over specified period Lot 1 uses fm - WMO abbrev.
110				turbulence	J m-3	TBD

End of table



## 7.2 Additional tables

Table 25: adjustment (NA)

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

End of table

Table 26: contact (NA)

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

End of table

Table 27: conversion\_flag (NA)

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

End of table





Table 28: conversion\_method (NA)

element_name	kind	external_table	description
method	int		unique ID for entry
description	varchar		text description of conversion method
implementation	varchar		details of implementation
reference	varchar		reference / doi of document giving more details on conversion method

End of table

Table 29: organisation (NA)

element_name	kind	external_table	description
organisation_id	varchar (pk)	NA	unique ID for organisation
parent_organisation	varchar	organisation:organisation_id	Link to parent organisation (or NA/NULL or none)
name	varchar	NA	Name of organisation
abbreviation	varchar	NA	Abbreviated name (or NA/NULL)
address	varchar	NA	Road / building name
city	varchar	NA	City
admin_area	varchar	NA	County or admin region
region	int	region:region	WMO Region
country	int	sub_region:sub_region	Country
postal_code	varchar	NA	Postal / zip code
telephone	varchar	NA	Primary telephone number of organisation
url	varchar	NA	Link to organisation website
email	varchar	NA	Primary email contact for website

End of table

### 7.3 Code tables

Table 30: application\_area (WIGOS 2-01)

element_name	kind	external_table	description
application_area	int(pk)	NA	Unique ID for code entry
description	varchar	NA	Description of application area

Continued on next page



Table 30 application\_area (cont.)

element_name	kind	external_table	description
End of table			

Table 31: automation\_status (NA)

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

Table 32: calibration\_status (WIGOS 5-08)

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

Table 33: communication\_method (Various sources (WMO47, WIGOS, BUFR))

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

Table 34: crs (BUFR 0 01 150)

element_name	kind	external_table	description
crs	int	NA	primary key
description	varchar	NA	Decoded value / description of coordinate reference system
End of table			



Table 35: data\_present (NA)

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

Table 36: data\_policy\_licence (WIGOS 9-02)

element_name	kind	external_table	description
policy	int (pk)	NA	Primary key for table
name	varchar	NA	short name of data policy
description	varchar	NA	Description of data licence, usage rights and restrictions
End of table			

Table 37: duplicate\_status (Simplified version of duplicate status flags from IMMA (ICOADS))

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

Table 38: events\_at\_station (WIGOS 4-04)

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

Table 39: id\_scheme (NA)

element_name	kind	external_table	description
scheme	int(pk)	NA	Primary key for table
Continued on next page			



Table 39 id\_scheme (cont.)

element_name	kind	external_table	description
description	varchar	NA	Decoded value / description of ID scheme used to report the station ID
End of table			

Table 40: instrument\_exposure\_quality (WIGOS 5-15)

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

Table 41: location\_method (based on WIGOS 11-01 and BUFR 0 02 148)

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

Table 42: location\_quality (NA)

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

Table 43: meaning\_of\_time\_stamp (Based on simplified version of WIGOS 11-03)

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

Continued on next page



Table 43 meaning\_of\_time\_stamp (cont.)

meaning	name	description
3	middle	Date / time specified indicates the middle of the period over which the observation was made.

End of table

Table 44: method\_of\_estimating\_uncertainty (NA)

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

End of table

Table 45: observation\_code\_table (NA)

element_name	kind	external_table	description
code_table	int (pk)	NA	Primary key for table
scheme	varchar	NA	External scheme used for code table (e.g. BUFR)
code_table_id	varchar	NA	ID used to identify table within scheme (e.g. F XX YYY for BUFR tables)
value	int	NA	coded value
description	varchar	NA	decoded value / meaning of decoded value

End of table

Table 46: observation\_value\_significance (based on BUFR 008 023)

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

End of table



Table 47: observing\_frequency (WMO47 - 0602)

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

End of table

Table 48: observing\_method (NA)

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

End of table

Table 49: observing\_programme (WIGOS 2-02)

element_name	kind	external_table	description
observing_programme	int(pk)	NA	primary key for table
abbreviation	varchar	NA	Commonly used abbreviation for observing programme (e.g. VOS)
description	varchar	NA	Description or name of observing programme (e.g. Voluntary Observing Ships)
sponsor	varchar	NA	primary sponsor of observing programme (e.g. JCOMM)

End of table

Table 50: platform\_sub\_type (based on WMO47, ICOADS, BUFR 0 02 149)

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

End of table



Table 51: platform\_type (IMMA (ICOADS) and BUFR 0 03 001 (0 - 31))

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

Table 52: processing\_code (NA)

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

Table 53: processing\_level (WIGOS 7-06)

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

Table 54: product\_level (NA)

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

Table 55: product\_status (NA)

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

Continued on next page



Table 55 product\_status (cont.)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
End of table			

Table 56: profile\_type (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
type	int (pk)	NA	primary key for table
description	varchar	NA	type of profile measurements (atmo- spheric, oceanographic etc)
End of table			

Table 57: quality\_flag (BUFR 0 33 020)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
flag	int (pk)	NA	primary key for table
description	varchar	NA	meaning of quality flag
End of table			

Table 58: region (WIGOS 3-01)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
region	int(pk)	NA	primary key for table
WMO_region	int	NA	WMO region that this corresponds to
desription	varchar	NA	Definition of region
End of table			

Table 59: report\_processing\_codes (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
code	int (pk)	NA	primary key for table
abbreviation	varchar	NA	abbreviation used to indicate processing code
description	varchar	NA	definition of processing code
End of table			





Table 60: report\_processing\_level (NA)

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

End of table

Table 61: report\_type (NA)

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

End of table

Table 62: role (ISOTC211/19115 CIRoleCode)

element_name	kind	external_table	description
role	int(pk)	NA	primary key for table
description	varchar	NA	definition of role

End of table

Table 63: sampling\_strategy (WIGOS 6-03)

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

End of table

Table 64: sea\_level\_datum (BUFR 0 01 151)

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

Continued on next page



Table 64 sea\_level\_datum (cont.)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
End of table			

Table 65: secondary\_variable (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
variable	int(pk)	NA	part of primary key - indicator for secondary variable name
variable_	varchar	NA	name / description of secondary variable
name			
code_value	int(pk)	NA	coded value for secondary variable
symbol	varchar	NA	abbreviation or symbol used to represent decoded value, e.g. chemical symbol for atmospheric constituent
description	varchar	NA	Name or description of decoded value
End of table			

Table 66: source\_format (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
format	int(pk)	NA	primary key for table
description	varchar	NA	description of data format, e.g. NetCDF
End of table			

Table 67: spatial\_representativeness (WIGOS 1-05)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
representa	int (pk)	NA	primary key for table. coded value
tivenss			
description	varchar	NA	meaning / definition of decoded value
End of table			

Table 68: standard\_time (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
time	int(pk)	NA	primary key for table, encoded value
description	varchar	NA	decoded observing time, e.g. 12 UTC
End of table			



Table 69: station\_type (WIGOS 3-04)

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

End of table

Table 70: sub\_region (NA)

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

End of table

Table 71: time\_quality (NA)

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

End of table

Table 72: time\_reference (WIGOS: 7-10)

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

End of table

Table 73: traceability (WIGOS 8-05)

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

End of table



Table 74: units (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
units	int(pk)	NA	primary key
name	varchar	NA	name of units
abbreviation	varchar	NA	conventional abbreviation in ASCII
base_units	varchar	NA	definition in base units

End of table

Table 75: update\_frequency (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
frequency	int (pk)	NA	primary key
description	varchar	NA	Description of update frequency

End of table

Table 76: z\_coordinate\_method (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
method	int (pk)	NA	primary key, coded value
description	varchar	NA	description of method used to determine z location

End of table

Table 77: z\_coordinate\_type (NA)

<b>element_</b> <b>name</b>	<b>kind</b>	<b>external</b> <b>_table</b>	<b>description</b>
type	int(pk)	NA	primary key, coded value
description	varchar	NA	description of units / type of z coordinate

End of table

## 7.4 Code tables