WORLD METEOROLOGICAL ORGANIZATION

INTER-COMMISSION COORDINATION GROUP ON THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM

AD-HOC WORKSHOP ON WEATHER RADAR METADATA

Locarno, Switzerland, 19-21 June 2017

FINAL REPORT

DISCLAIMER

Regulation 42

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

Regulation 43

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

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EXECUTIVE SUMMARY

The Ad-Hoc Workshop on Weather Radar Metadata was held at Locarno, Switzerland, from 19 to 21 June 2017. The session was chaired by Mr J.Klausen (Switzerland), co-Chair of the Task Team on WIGOS Metadata (TT-WMD) of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS).

The Workshop set together for the first time representatives of the various weather radars groups, the WMO Inter-Programme Expert Team on Operational Weather Radars (IPET-OWR), the WMO Radar Database (WRD), the European Programme OPERA, which allowed sharing of different approaches and the challenges of the various groups with the ICG-WIGOS TT-WMD.

A major task of the Workshop was to make a first attempt towards mapping the metadata elements across the various systems, using the WIGOS Metadata Standard, which is a WMO official reference used in OSCAR/Surface, in comparison with the tables of the IPET-OWR, the tables of WRD and the OPERA database.

Discussions concluded that the WRD can and should be expanded to be aligned with the WMDS and become a primary source of metadata for weather radars, to allow feeding the OSCAR/Surface database.

Other outcomes include identification of some key radar variables (precipitation intensity, upper wind, radar reflectivity and hail probability) and also the need to further discuss and agree on the best common schema/format for the exchange of radar data and metadata. Finally, some actions were identified for the TT-WMD, for the radar community and for the WMO Secretariat.

GENERAL SUMMARY

1. SET THE SCENE

1.1. Welcome address

The Ad-Hoc Workshop on Weather Radar Metadata was opened by Dr Jörg Klausen (Switzerland) co-Chair of the Task Team on WIGOS Metadata (TT-WMD) of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), at 09:00 hours on Monday, 19 June 2017, at MeteoSvizzera, Via ai Monti 146, Locarno, Switzerland.

Mr Stefano Zanini, head of the Locarno regional meteorological centre (South), welcomed the participants and briefly explained MeteoSwiss organization and where they are located; The Locarno-Monti centre was founded in 1935, for weather forecasting and since the 1950s they became a radar research centre. He mentioned that radar metadata is a basic requirement to achieve, so he wished all the success to the Workshop and a pleasant stay in Locarno.

The participants introduced themselves; The list of participants is given in the Appendix I.

1.2. Objectives of workshop, adoption of agenda, practical arrangements

The following objectives, previously proposed, were agreed:

- To develop the WIGOS Metadata Standard (WMDS) in such a way that radar (and other ground-based remote sensing) observations are well represented,
- To review the WMO Radar DB (WRD) metadata model and to map it to the WMDS and the WMD exchange format (XML schema), as well as to the OPERA metadata model, and to identify potential deficiencies in any of those,
- To establish a work plan for the production of WMD schema – compatible XML files to be able to update OSCAR/Surface with operational weather radar information,
- To agree on a (meta)data flow for weather radar information, such that information has a clear source and is only edited in one place,
- Related to the above, to agree on a workflow such that OPERA and WRD play well together with regards to metadata.

1.3. Introduction to WIGOS

Mr Luís Nunes, from the WIGOS Project Office (WMO Secretariat) delivered a presentation on WIGOS with the following topics: What is WIGOS and why we need it; WIGOS and the Rolling Review of Requirements (RRR) and the need for observational metadata; How to implement WIGOS; The pre-operational phase of WIGOS with particular focus on OSCAR/Surface, on WIGOS Data Quality Monitoring System (WDQMS) and on Regional WIGOS Centres. In the follow-up discussion the merge of the Manual on the Global Observing System (GOS) into the Manual on WIGOS was mentioned. The WIGOS editorial board, who is in charge of this, will meet in the Fall 2017.

1.4. Introduction to WIGOS Metadata Standard and OSCAR/Surface

Mr Jörg Klausen, from Switzerland, delivered a presentation on the WMDS, which has been developed by the ICG-WIGOS Task Team on WIGOS Metadata, and the OSCAR/Surface which is the WMO repository for observational metadata from all surface-based (non-satellite) stations/platforms developed by MeteoSwiss and WMO, following the WMDS as a reference.

1.5. Weather radar at MeteoSwiss

Mr Marco Boscacci, from Switzerland, Chief of MeteoSwiss radar network, delivered a presentation on the Weather radar at MeteoSwiss; The primary objective for radar operations is to contribute to avoid damage and injury caused by severe weather; The network consists of 5 C-band Doppler radars, dual-polarization at 1000, 1600 and almost 3000 m asl; The challenge in mountainous terrain is to assess what precipitation observed at 6000 m makes it to the ground. Communication is based on radio-links but optical fibre is planned. Calibration was mentioned as a critical activity. They perform clutter removal, hydrometeor classification with a timeliness less than 1minute. All polar and Cartesian products are permanently archived, as well as some reduced raw data.

1.6. Introduction to Radar activities at WMO and Outcome of IPET-OWR-1

Mr Daniel Michelson, from Canada, Chair of the Inter-Programme Expert Team on Operational Weather Radars (IPET-OWR) delivered via WebEx, a presentation on Radar activities and the outcome of IPET-OWR-1 (13-16 March 2017; Tokyo, Japan). He mentioned the organization of radar within WMO, where Radar activities from two Technical Commissions (CBS and CIMO) have now been reconciled in one IPET-OWR, expected to cover most of radar activities in WMO. He summarized the recent activities and other information as follows:

- The activities of IPET-OWR represent the emergence of weather radar as an emerging global resource under the coordination and governance of WMO;

- There is new regulatory material recently approved for the Manual on GOS;

- A significant set of material on weather radar is also available on the Guide to Meteorological Instruments and Methods of Observation;

- Data representation has been tackled by the Task Team on Weather Radar Data Exchange (TT-WRDE), now integrated in IPET-OWR, focused on real-time data exchange;

- This workshop should discuss what metadata should be in the database and what metadata should be exchanged in near real time; Many metadata elements are very dynamic and need to be exchanged with the data;

- Emerging technologies include phased array;

- Open-source Software (OSS) can help;

- A survey of Members requirements has been established;

- RQQI, a CIMO activity on radar quality control and inter-comparisons has been discontinued, but the idea of conducting some form of inter-comparison is included in IPET-OWR;

- IPET-OWR wants to develop a Best Practices Guide;

1.7. Introduction to OPERA and GCOS radar activities

Mrs. Elena Saltikoff, from Finland, introduced via WebEx, the OPERA Programme and the GCOS radar related activities. On the OPERA Programme she mentioned the following topics:

- It is an European effort, not limited to EUMETNET Members;

- Has its own metadata DB and own data model ODIM, can be expressed in BUFR and HDF5, which has some metadata elements;

- Need metadata to make use of own radar data, make use of radar data from others, provide contact information (but most people know each other);

- Biggest users seem to be NWP centres; Data assimilation, 4D VAR needs a lot of metadata;

- Some radars overlap in Europe, sometimes a neighbouring country may have better data for a particular event;

- ODIM_H5 can contain a lot of metadata, some are constant (e.g., beam width), some change with each volume scan (e.g., Nyquist velocity, number of range bins, DualPRF ratio);

- Constants today can be variables tomorrow (!)

- Metadata elements mentioned: Age, band, manufacturer, …

- Radars are optimized for different applications that normally need different radar networks, which is not affordable for most countries; Emphasis is on most important applications (aviation, severe weather warnings, NWP);

- The OPERA Programme will continue to be more important for RA VI Members; link with/to WRD not addressed in the work plan, but recognized and led to this workshop;

- Issue of keeping station ID when it is moved into a new site;

- The OPERA metadata DB is open to everybody to read, but only the DB manager (Barbara Vodarić Šurija, from Croatia) can write to it.

On the GCOS/AOPC activities she mentioned the following:

- Radar requirements, including metadata, for climate are expected by end of 2017:

> Record system updates (history!);

> Define terminology: clutter removed is totally ambiguous

1.8. Introduction to WIGOS metadata model and exchange standard

Mr Jörg Klausen, from Switzerland, delivered a presentation on the WIGOS metadata representation and exchange model.

1.9. Introduction to WMO Radar DB and WRD metadata model

Mr Mustafa Sert and Mr Ali Doğan, from Turkey introduced the WMO Radar Database (WRD) and its metadata model:

- WRD project started in 2009 jointly between CBS and CIMO;
- Provides comprehensive overview, including information on radio frequency spectrum used;
- Currently, 894 active radars, plus 13 passive, plus 16 removed, plus 8 planned;
- WRD and OSCAR/Surface metadata models are largely incompatible at present; For example, Dates/Times of installation do not exist, just the year;
- The governance structure of WRD needs to be clarified (Action for Secretariat).

1.10. Introduction to OPERA DB and metadata model

Ms. Barbara Vodarić Šurija, from Croatia, introduced the OPERA database and metadata model:

- What can we get from Radar Data? Precipitation, Severe convection, Wind phenomena, Hail, Dry area;
- Includes 224 radars (16 X, 177 C, 31 S-band) active and archive;
- The average life time of a Radar is approximately 20 years;
- National weather services are upgrading radar networks;
- ODIM Information Model and Data Model are different things! Information Model is related to requirements and Data Model is a follow-up step, e.g. the data-flow; The third step is related to formats;
- Users fill in information on FMI Agora wiki, then .xls is converted to .json and uploaded to a web server
- Metadata model:

  > What, where, how, dataset1, dataset2, …; Dataset consists of where, data1, …, data n;

- Comparison/mapping across OPERA, WMDS and OSCAR/Surface is needed;
- The OPERA DB has been sent to WMO (Dean Lockett), presumably for updating the WRD, but this has not happened – need to follow-up (Secretariat).

2. MAP EXISTING METADATA MODELS AND IDENTIFY GAPS

Mr Michelson introduced the documents he had shared prior to workshop (Appendix II, Appendix III and Appendix IV).

- Primary objective is data and metadata exchange in a near real time context;
- Information model and data model are not the same thing:

  > The WMO Information Model for Radial Radar and Lidar Data (document "WMO_IM_Radar_and_Lidar_radial_v1.1.docx"), describes the characteristics of radar data and metadata (Table background in light-blue are mandatory);

- The WMO Data Model for Radial Radar and Lidar Data (document "WMO_DM_Radar_and_Lidar_radial_v0.5" specifies data type representations for the information conveyed in the information model;
- The document "CfRadialDoc-v2.0-draft-20170602.docx" is consolidated with the Information

Model and with the Data Model; Roughly the same types and groups that ODIM already has; where ODIM is unique, it plugs into CF conventions to represent radar and lidar data in radial coordinates;

- Document “WMO use of CfRadial 2.docx”: Specifies how Members should use the CfRadial2 Data File Format;

- These documents will be submitted to CBS and CIMO for approval at a later stage; The intended audience is the radar community; Regulatory material should specify which data representation should be used.

What we need to achieve is to serve the requirements of WMO and, ideally, also OPERA, so documenting observations will enable adequate use in a distant future; Will also enable description of capabilities of radars and adequate scientific use;

HDF5 format includes metadata and data, but a metadata database is still considered a valuable asset.

A Radar DB should inform about where and when radars were in operation, including frequencies, etc; The challenges relate to updating the metadata: Who and when/how often?

Regarding the (meta)data workflow, MeteoSwiss prefers to interact directly with OPERA database and this one could have a workflow for delivering metadata to WRD, which is relatively static.

The latest edition of the Manual on the GOS prescribes delivery of non-real-time metadata into the WRD; WRD appears ready to expand, but there is a need for adaptation of the its data model, which requires review of governance of WRD and OPERA appears ready to serve as a central source for WRD.

The structure of OPERA consists of 2 groups, one for real-time composite activities, led by UKMO / MeteoFrance and another one for DB activities (Italy is not a member of OPERA). ODIM files already contain all of the fields proposed for CfRadial 2.0 data format by IPET-OWR, which mandate is to achieve a single global standard - the question is who controls/governs this.

WMO is developing a standard jointly with ISO (where Ms Saltikoff is a core member). Data representation points to the proposal by IPET-OWR (CfRadial 2.0); Potential work-flow involves WRD extracting and managing radar metadata from CfRadial files, then OPERA and OSCAR databases would pick it up from there.

As regards the radar activities in the WMO Regions, RA II, under coordination of JMA, is progressing towards a composite map of precipitation for South-East Asia under the auspices of ASEAN; In RA III there are ambitions, but no real advancement yet.

3. WHERE ARE WE, WHERE ARE WE GOING?…

The following points were highlighted during the discussions:

- Historical metadata is becoming important;

- Not all metadata can or should be included in the data files, at least some of the more static metadata should be available separately (for researchers, technical staff for exchange of information in planning setup of new radar);

- The following steps should be taken toward improving the situation:

> To expand the WRD metadata model, by Q2/2018, subject to approval by TSMS,

> To expand OPERA, discussion and decision in September 2017 at OPERA expert meeting, would allow expansion to be quicker;

> To extract metadata from ODYSSEY level during operations

* OPERA is currently drafting requirements for next phase of OPERA, 2019-2023, that could include metadata extraction in the work program, which could possibly start in 2019;

* A MoU between WMO and OPERA could support this

- In the Caribbean a radar composite mapping exists, but the US and Canada make ad-hoc data exchange using native formats. China considers location of radars classified information.

- Acceptance of CfRadial 2.0 by OPERA is not on the agenda, OPERA has ODIM

- IPET-OWR, following previously work by the Task Team on Weather Radar Data Exchange (TT-WRDE) will be proposing the CfRadial 2.0 as the single global standard for radar in radial coordinates - a decision will have to be made;

- Development of the CfRadial standard is planned by Q4/2017, documentation to be completed within IPET-OWR in Q2/2018, to be submitted for endorsement by CBS (special session planned for Spring 2018) and also by CIMO 17th session in 2018;

4. WRAP-UP AND CLOSURE

- Review of the suggested tasks:

> Identify variables that can be observed by weather radar: precipitation intensity, upper wind (vertical wind profile on 30-40 km range and vertical resolution of 100-500 m), Radar reflectivity (because it is assimilated directly by NWP models), Hail probability.

> Identify key weather radar characteristics (i.e., metadata) for different radar products: left open, action to be developed by radar community to see what is useful; OPERA expert meeting to decide and pass on to IPET-OWR.

> Map WRD with OPERA metadata model and identify differences in approaches, gaps to be eliminated: The results of the mapping across the WMDS, the IPET-OWR tables, the WRD and OPERA database, developed during this Workshop are presented in Appendix II.

> Review WMDS and WMD exchange format, identify missing elements: How can WMD schema and CfRadial can play hand in hand. Can NetCDF4 be expressed in XML? CfRadial plugs into CF conventions, most likely WMD model uses different naming conventions.

> Develop a minimal set of metadata elements necessary to characterize weather radars ("describe observations to enable adequate use"): Minimal set is probably described in OPERA;

- Action for TT-WMD: revisit OPERA model and mapping to see what elements are missing in WMDS and/or schema; Also review the contents of code table 9.2.

> Cross-check results with needs from other ground-based remote-sensing techniques (e.g., wind profilers, microwave radiometers, spectrophotometers): Action for TT-WMD.

> Review approaches to describe weather radar capabilities (in the RRR sense), based on Michelson et al. paper: Action for OPERA [Saltikoff] to provide requirements for radar reflectivity to IPET-OSDE; Action to TT-WMD to encourage generation of one or more radar examples (Switzerland, Croatia, Canada, Finland, Turkey).

- Michelson et al paper provides a concrete approach how radar capabilities can be expressed in systems like OSCAR/Surface: Software generating these capabilities now computes beam blockage based on topography. Measurement uncertainty related to precipitation intensity is dependent on weather, so associated radar capabilities should be expressed in terms of reflectivity.

- The WRD can be expanded and become a primary source of metadata for weather radars:

> Action for WMO Secretariat is to investigate the governance structure of WRD (needed to expand WRD metadata model).

> Secretariat suggests that RA VI discusses the quality monitoring activities for radars to use the existing OPERA infrastructure.

The workshop was closed by Mr Klausen at 12:30 on Wednesday 21 June 2017.

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Mapping of WMDS elements with IPET-OWR tables, WRD and OPERA DB

based on mapping performed by Jeffery Karn and Daniel Michelson, ECCC

WMDS						IPET-OWR		WRD	OPERA	Example
Category	**Element #**	**Element Name**	**Requirement M/C/O**	**Phase**	**Code Table #**	**Radar Code Table No.**	**Radar Table ID**	**Element Name**		**Precipitation intensity**
Observed Variable	1-01	Observed Variable	M	2016	1-01-49, 1-01-50, 1-01-53	16 (split table into sampling and instrument characteristics?)	any in Table 16	None		
	1-02	Measurement Unit	C	2016	1-02-29, 1-02-43. 1-02-80, 1-02-81, 1-02-86	16 (split table into sampling and instrument characteristics?)	any in Table 16			
	1-03	Temporal Extent	M	2016	not available	1	1.2, 1.3	Instalation year (end of works, start of operations)	Start year (of present configuration) and finish year	
	1-04	Spatial Extent	M	2016	not available	Product of lenght of bin and number of bins	2.0-2.6, 5.1, 8.0, 8.1, 11.0	Lowest and highest angles	Max range	Coverage
	1-05	Representativeness	O	2017-2018	1-05-1 to 1-05-4	processed downstream	not applicable			Mesoscale
Purpose of Observation	2-01	Application Area(s)	M	2016	2-01-5	not applicable	not applicable			
	2-02	Program/Network Affiliation	M	2016	2-02-10, 2-02-44	not applicable	not applicable			
Station/Platform										
	3-01	Region or Origin of Data	C	2016	All	1	1.1		None	
	3-02	Territory of Origin of Data	C	2016	e.g. 3-02-33	1	1.1		None	
	3-03	Station/Platform Name	M	2016	not available	1	1.1	Radar name	"Location"	
	3-04	Station/Platform Type	M	2017-2018	3-04-1	1	1	Should be added	Not maintained, just commented	
	3-05	Station/Platform model	M	2019-2020	not available	1, 3	1.5, 3.8			
	3-06	Station/Platform Unique Identifier	M	2016	not available	1	1.1	WMO Id	Station ID	In some cases only "ODIM Code"
	3-07	Geospatial Location	M	2016	not available	2	2.0-2.5	Latitude / Longitude / Ground height / ~~Tower~~	Coordinates+height of station	

								~~height~~		
	3-08	Data Communication Method	O	2017-2018	none match	not applicable	not applicable	None		
	3-09	Station Status	M	2016	3-09-3	Not applicable for Radar	Not applicable for Radar	Not applicable for Radar	Not applicable for Radar	
Environment	4-01	Surface Cover	C	2019-2020		Not available	Not available	Not available	Not available	
	4-02	Surface Cover Classification	C	2019-2020		Not available	Not available	Not available	Not available	
	4-03	Topography/Bathymetry	C	2019-2020		Not available	Not available	Not available	Not available	
	4-04	Events at Station/Platform	O	2017-2018		Not available	Not available	Not available	Not available	
	4-05	Site Information	O	2017-2018		Not available	Not available	Not available	Not available	
Instruments and Methods of Observations	5-01	Source of Observation	M	2016	5-01-1	not applicable	not applicable			Default value from Code table: Instrumental automatic
	5-02	Measurement/Observing Method	M	2016	not available	1	1.0	Weather radar		
	5-03	Instrument Specifications	M	2016	not available	3, 6	All of Tables 3 and 6	Band, Beam width, Frequency, Pulse width(s), PRFs, TX Type, Power, RX Type, Polarization, MDS		
	5-04	Instrument Operating Status	O	2019-2020	5-04-1	1	1.7	Active / Passive / Planned / Removed	Reporting/Non reporting to OPERA	
	5-05	Vertical Distance of Sensor	C	2016	not available	2	2.4	Tower height	Height of antenna	
	5-06	Configuration of Instrumentation	C	2019-2020	not available	6	6.7, 6.8	None	None	
	5-07	Instrument Control Schedule	C	2019-2020	not available	Not available	Not available	Not available	Not available	
	5-08	Instrument Control Result			calibrated (y/n)	6	All of Table 6	MDS	None	
	5-09	Instrument model and serial number	C	2019-2020	not available	3	3.8	Not available	Not available	
	5-10	Instrument Routine Maintenance	C	2019-2020	not available	Not available	Not available	Not available	Not available	
	5-11	Maintenance Party	O	2017-2018	not available	Not available	Not available	Not available	Not available	
	5-12	Geospatial Location	C	2017-2018	not available	2	2.0, 2.1, 2.2	Latitude / Longitude / Ground height + Tower height	Coordinates+height of antenna	
	5-13	Maintenance Activity	O	2019-2020	not available	Not available	Not available	Not available	Not available	
	5-14	Status of Observation	O	2019-2020	5-14-*	not applicable	not applicable			Default value is "official"
	5-15	Exposure of Instrument	C	2017-2018	5-04-1	not applicable	not applicable	not applicable	not applicable	not applicable

Sampling	6-01	Sampling Procedures	O	2019-2020	not available	1, 5	1.2-1.4, 5.0-5.4	Frequency, Beam width, Pulse width(s), PRFs, Lowest Angle, Highest Angle		
	6-02	Sample Treatment	O	2019-2020	not available	5, 8	Most of these tables			
	6-03	Sampling Strategy	O	2019-2020	6-03-1 or 6-03-2	1, 5	1.2-1.4, 5.0-5.4			
	6-04	Sampling Time Period	M	2019-2020	not available	1, 8	1.2, 1.3, 8.2	To be confirmed (meaning of task cycle)	Not available	
	6-05	Spatial Sampling Resolution	M	2017-2018	not available	8, 11	8.3, 11.0	Not available	Not available	
	6-06	Temporal Sampling Interval	M	2019-2020	not available	not applicable	not applicable	To be confirmed (meaning of task cycle)	Not available	
	6-07	Diurnal Base Time	M	2016	not available	not applicable	not applicable	not applicable	not applicable	
	6-08	Schedule of Observation	M	2016	not available	Not available	Not available	Not available	Not available	Default value should be "Continuous"
Data processing and reporting	7-01	Data processing methods and algorithms	O	2019-2020	not available	5,8 (14)	Most of these tables	ZR Summer, ZR Winter, ZR Other	Not available	
	7-02	Processing/Analysis Centre	O	2017-2018	not available	1	1.1	Not available	Available	
	7-03	Temporal Reporting Period	O	2017-2018	not available	1	1.2, 1.3	Not available	Not available	
	7-04	Spatial Reporting Interval	C	2016	not available	not applicable	not applicable	Task Cycle Time Min, Task Cycle Time Max		
	7-05	Software/Processor and Version	O	2019-2020	not available	3	3.9, 3.10	Signal Processor		
	7-06	Level of Data	O	2017-2018	not available	(Type 2)	(in format)			
	7-07	Data Format	M	2019-2020	not available	(CfRadial)	(in format)	Data format (in 3 places)	Available	
	7-08	Version of Data Format	M	2019-2020	not available	2	(in format)		Available	
	7-09	Aggregation Period	M	2017-2018	not available	Table 1	1.3 minus 1.2	Not available	Not available	
	7-10	Reference Time	M	2017-2018	7-10-1	Table 1	1.2, 1.3	Not available	Not available	
	7-11	Reference Datum	C	2016	not available	2	2.3	Not available	Not available	
	7-12	Numerical resolution	O	2019-2020	not available	(in data model)	(in data model)			
	7-13	Latency of Reporting	M	2019-2020	not available	Not available	Not available	Not available	Not available	
Data quality	8-01	Uncertainty of Measurement	C	2017-2018	not available	processed downstream	processed downstream	Not available	Not available	
	8-02	Procedure to estimate uncertainty	C	2017-2018	not available	determined downstream	determined downstream			
	8-03	Quality Flag	M	2017-2018	8-03-*	12, 13	12.8, All of Table 13	Not available	Not available	Variable dependent; Available in near real time, e.g. Odissey
	8-04	Quality Flagging System	M	2017-2018	8-04-*	13	All of Table 13	Not available	Not available	Variable dependent; Available in near real time, e.g. Odissey

	8-05	Traceability	C	2017-2018	8-05-1	tbd (ISO-WMO)	tbd	Not available	Not available	Available at NMHSs
Ownership and data policy	9-01	Supervising Organization	M	2017-2018	not available	1	1.1	Owner (Organization and FP)	Available	
	9-02	Data Policy/Use Contraints	M	2016	9-02-*	Not available	Not available	Not available	Not available	For ECOMET products could be WMOOther
Contact	10-01	Contact	M	2016	not available	1	1.1	FP	FP	