WORLD METEOROLOGICAL ORGANIZATION

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

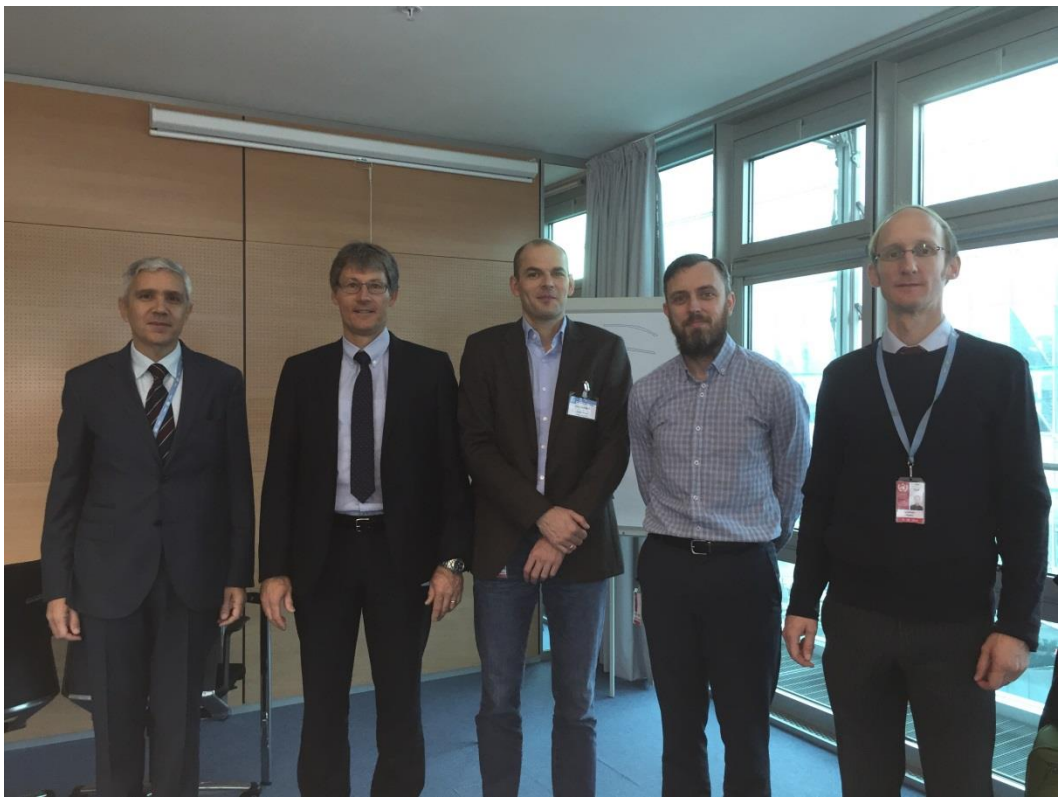
TASK TEAM ON WIGOS METADATA

Ad hoc Workshop

on WIGOS Metadata for space-based observations

Geneva, Switzerland, 29 September – 1 October 2015

FINAL REPORT



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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

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EXECUTIVE SUMMARY

The ad hoc workshop on WIGOS Metadata for space-based observations, in the scope of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS) Task Team on WIGOS Metadata (TT-WMD) was held at WMO headquarters in Geneva, Switzerland, from 29 September to 1 October 2015. The session was Chaired by Mr J. Klausen (Switzerland) co-Chair, TT-WMD.

Following the decisions and guidance by Cg-17 and EC-67 the workshop aimed at ensuring full applicability of the WIGOS Metadata Standard (WMDS). Some satellite experts were invited to represent different groups, such as the CBS/OPAG-IOS IPET-SUP (Inter-Programme Expert Team on Satellite Utilization and Products), CBS/OPAG-IOS ET-SAT (Expert Team on Satellite Systems) and EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites).

As a major outcome the workshop concluded that the WMDS is applicable and should be used by the meteorological satellites community, after a few additions and small adjustments that were identified. Specific results of the workshop include the following: for space-based observations the WMDS should be applicable to both level one and level two data; a few additional metadata elements are needed in the WMDS to accommodate all the variables existing in OSCAR/Requirements and all the fields currently existing in OSCAR/Space database; some use cases should be developed and included in the WMDS, to illustrate the usage of the WMDS to space-based observations.

The results of the workshop serve as input for discussions during 4th session of TT-WMD to be held from 20-23 October 2015 at Alanya, Turkey. The workshop developed a list of actions to be developed, some by the satellite experts, and others by TT-WMD in order to ensure full applicability of the WMDS to all observations from space-based systems.

GENERAL SUMMARY

1. ORGANIZATION OF THE MEETING

The Ad hoc Workshop on WIGOS Metadata for Space-based Observations, in relation to the work of the Task Team on WIGOS Metadata (TT-WMD) of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS) was opened by the Mr Jörg Klausen (Switzerland) co-Chair of TT-WMD, at 11:00 hours on Tuesday, 29 September 2015, at the WMO Headquarters in Geneva.

Mr Peiliang Shi, Director of the WMO Information System Branch, welcomed the participants to the WMO Headquarters. He mentioned the approval by Congress 17 of the WIGOS Metadata Standard (WMDS) and praised the TT-WMD for the work developed so far; Dr P.Shi recalled the participants the importance of this workshop to verify the special needs of metadata for space-based observations in order to ensure that the WMDS is fully applicable and used by the meteorological satellites community. He further mentioned that the expected outcomes of this workshop should constitute a significant contribution for the fourth session of TT-WMD (20-23 October, Alanya, Turkey).

2. INTRODUCTION/BACKGROUND

Mr J.Klausen referred to the need of engaging the experts of space-based observations in the further development of the WMDS, as the only way to ensure integration of metadata from all types of observations. He mentioned the feedback from CBS/OPAG-IOS IPET-SUP (Inter-Programme Expert Team on Satellite Utilization and Products), that TT-WMD received in 2014, regarding a previous version of the WMDS, and the need to revisit those comments.

Mr Jérôme Lafeuille underlined that the OSCAR/Space database focuses on instruments rather than on observation products and he referred to the need to articulate with the work of the CGMS (Coordination Group for Meteorological Satellites) task team on WIS discovery metadata.

Mr Leon Majewski mentioned the multidisciplinary of satellite observations and the variety of users leading to different needs of metadata; He also mentioned the importance of interoperable systems.

Mr Stephan Bojinski presented some key questions for the discussion: the level of granularity of space-based observations to be described by the WMDS, and the relation to the WIS discovery metadata.

Mr Steve Foreman stated that the WMDS is about the meaning of observations, not about finding them (WIS) and they should be applicable to all types of observations.

Mr J.Klausen mentioned the experience from developing GAW-SIS (Global Atmosphere Watch Station Information System) a metadata database integrated with OSCAR. He noted that orbit is one of the specific parameters for satellites that are not currently described by WMDS, the metadata element for geospatial location being based on latitude/longitude coordinates, which is not adequate to describe orbits. He also mentioned that the WMDS is a semantic standard, the formalization of which has recently started by IPET-MDRD (CBS OPAG/ISS Inter-Programme Expert Team on Metadata and Data Representation Development) in a joint meeting together with TT-WMD co-chairs, last June in Melbourne, Australia.

Mr J.Lafeuille wished a clarification about the practical implementation of the WMDS, such as who should benefit of this standard in first instance (space agencies, satellite users) and what would be the respective commitments; Mr Luis Nunes recalled that space agencies act on behalf of WMO Members, who are responsible for supplying information about their observing networks, e.g. to the OSCAR/Surface which corresponds to one repository of global metadata, according to the WMDS.

Mr Lars Peter Riishojgaard mentioned the GRUAN (GCOS Reference Upper-Air Network) as surface-based observations that are post-processed, leading to changes in metadata, in a similar way of satellite products.

Mr L.Majewski stated that considering space-based observations the WMDS should be applicable to both data level one and data level two.

3. REVIEW OF THE OSCAR/Space ALIGNMENT WITH THE WMDS, INCLUDING THE CURRENT REVISION OF THE "INSTRUMENT CHARACTERIZATION"

Mr J.Lafeuille delivered a presentation on the OSCAR/Space online database for space-based capabilities (http://www.wmo-sat.info/oscar/spacecapabilities) and described the new instrument characterization schema as a scientific and objective tool for the assessment of the potential of satellite instruments to enable the measurement of geophysical variables. .

Mr L.P.Riishojgaard noted the importance of such a characterization schema for the gap analysis process.

Mr L.Nunes mentioned that the WMDS requires a timestamp for every metadata record/change; Mr J.Lafeuille noted that the way OSCAR/Space manages changes of metadata over time, doesn't allow for historical analysis of the metadata time series.

The remote sensing frequencies, as well as the telecommunication frequencies for data transmission from satellites, were discussed, and it was agreed that this information need to be captured by WMDS. The telecommunication frequencies are recorded in OSCAR/Space in searchable fields. For the remote sensing frequencies, only the bands (EU, UV, VIS, NIR, …C-band, Ka-Band, Ku-Band, etc.) are searchable fields in the new scheme, but the individual frequencies, which can be numerous for a single instrument, are recorded in complex text fields together with other spectral characteristics. The way those elements could be included in the WMDS depends on the kind of search required for users of this metadata; It was mentioned that searchable fields need encoded data according to standard formats.

It was also mentioned that the OSCAR/Requirements contains the primary list of geophysical variables to be considered for WMDS.

Mr J.Lafeuille mentioned the need to ensure compatibility of OSCAR/Requirements with the WMDS and indicated that a "machine-to-machine" mechanisms for the extraction of metadata was not part of the initial specifications of OSCAR/Space.

Mr S.Bojinski introduced the Product Access Guide (PAG), a webpage maintained by WMO to facilitate access to satellite-based geophysical datasets (mostly "level 2" products or higher): http://www.wmo-sat.info/product-access-guide/. He also mentioned the "Product Access Guide Concept and Specifications V 1.0" document (http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_PAG-concept-v1.0-final.pdf) which lists the minimum metadata that shall be associated with each product in a product collection (specification S9, page 10).

The meeting developed a table with the results of mapping the OSCAR/Space metadata fields against the WMDS elements, which is presented in Appendix II.

It was noted that the rating of instruments, such as produced by the OSCAR/Space instrument characterization, is not captured by the WMDS.

Mr L.Majewski mentioned the need to distinguish metadata of different channels from the same instrument; Mr J.Lafeuille underlined that depending on the instruments, different parameters were used to characterize each channel (central wavelength, bandwidth, NE∆T, SNR, polarization, etc.) Mr J.Klausen concluded that the WMDS should be expanded to include the channels and their frequencies, noting that the satellite community should provide the definitions for these additional elements

4. REVIEW OF THE WMDS (WIGOS METADATA STANDARD) - DISCUSS THE RESULTS OF THE REVIEW (TO BE) DONE BY SATELLITE EXPERTS

Mr. Guillaume Aubert delivered a presentation on the Submission Information Package (SIP) for the EUMETSAT long-term archive. He mentioned the metadata for “Earth Observation Products” being OGC compliant with some extensions to the ISO O&M (Observations and Measurements) Standard. The SIP applies to granular data, i.e. 3 minutes sampled data.

It was suggested that a mapping exercise should be made between the SIP metadata fields and the WMDS elements and that the documentation regarding this schema should be made available to the participants in this workshop. Mr G.Aubert noted that this mapping should benefit to have beforehand the developed uses cases for satellite observations.

The meeting reviewed the comments provided by IPET-SUP to the TT-WMD in 2014, about a previous version of the WMDS; The results of the discussions concerning these comments are listed below:

- Comment 1 = agreed, this is a task to be developed;
- Comments 2 and 3 = agreed, the notes should be improved to better explain how element 1-04 applies to space-based observations; Also the development of some use cases to add to the WMDS, was agreed, as a way to illustrate the usage of the WMDS to space-based observations;
- Comments 4, 5 = ok, nothing to add;
- Comment 6 = agreed and done, vocabulary changed in code table 5-04;
- Comment 7 = checked, this relates to the implementation of element 7-04, which should be taken in a simple way;
- Comment 8 = already included;
- Comment 9 = relates to the implementation of element 8-01, which should be taken in a simple way;
- Comment 10 = already included;
- Comment 11 = relates to the implementation of element 8-05, which should be taken with some flexibility for space-based observations;
- Comment 12 = there could be more than one owner of the observation/dataset;
- Comment 13 = a new entry should be added to code table 9-02: “No limitation”
- Comment 14 = already included.

The meeting also agreed to correct and expand the code table 3-08 of the WMDS, some of the changes were made on session, but some more should be made after input from Mr S.Bojinski.

Ms Lihang Zhou joined the workshop on videoconference, via WebEx connection, and her first statement was to consider the WMDS a good document to be used as a standard for satellite observations; Then she guided the participants through her comments on the WMDS. From the discussions the following conclusions were reached:

- Comments 1, 2 = agreed, to be added to the WMDS by TT-WMD;
- Comment 3 = agreed, this is an implementation issue;
- Comments 4, 5 = agreed, it is recognized that code table 1-01 is far from being comprehensive; It needs to be reviewed and the OSCAR/Surface table of variables should be considered;
- Comment 6 = agreed, TT-WMD to better describe the meaning of matrix;
- Comment 7 = TT-WMD to remove the column “Mode of Observation (I, V, P)”;
- Comment 8 = agreed, definitions are to be completed by TT-WMD to code table 2-01;
- Comment 9 = agreed, definitions are to be completed by TT-WMD to code table 4-01;

Ms L.Zhou mentioned that NOAA draft Standards document for satellite data delivery and integration which includes a chapter on metadata that refers to NETCDF format; She promised to prepare a use case for the application of the WMDS by the NOAA satellites.

The process of updating/expanding the WMDS was discussed and Mr S.Foreman mentioned that the fast track procedure could be used, through which the PRs are consulted by correspondence; The same applies to the approval of the implementation schema (based on the logical data model being developed by IPET-MDRD), which will be essential for the development and publication of guidance material for the Members to implement the WMDS.

5. IDENTIFICATION OF ISSUES AND ACTIONS NEEDED TOWARDS THE FULL APPLICABILITY OF THE WMDS TO THE SPACE-BASED OBSERVATIONS

In order to check the applicability of the WMDS to space-based observations the meeting considered a set of examples of satellites/instruments and worked on developing the contents for each of the WMDS elements; The results are presented in Appendix III, and its analysis revealed several elements that should not be applicable to space-based observations. Some conclusions are listed below:

- In Code table 3-08, entry 3-08-01 is wrong (ARGOS is LEO, not GEO), 3-08-04 is too specific (should address all GEO DCPs, not only the DCPs of JMA/GMS), and 3-08-08 should differentiate voice or data transmission.
- Code table 5-02 needs to be developed; Mr J.Klausen will share the OSCAR list for “Measuring/observing methods”;
- A new entry “Stand by” needs to be added to code table 3-09;
- Element 5-05 needs clarification; This is an action for TT-WMD;
- Code table 5-08 needs to be reviewed/expanded
- For the elements dealing with calibration:
    a) it was agreed that they apply only to major changes; for very frequent changes on parameters, a specific link to external source should be provided;
    b) the notes should be improved to better explain what is expected in these elements for space-based observations, including what is mentioned in a) above;
- It was agreed that the following elements are not applicable for space-based observations, a nil reason being acceptable (n/a): 5-10, 5-11, 5-12, 5-13; (for 5-12 the reason being that the geospatial location is the same as the platform);

- The following code tables should be revisited by TT-WMD: 3-09, 5-04, 5-14;
- An URL could be accepted for element 4-04, besides code table 4-04;

Mr Karl Monnik joined the workshop on videoconference, via WebEx connection. He was briefed on the progress of the workshop and he noted the critical importance of guidance for Members implementation of the WMDS, so for each metadata elements clear description and guidance should be developed. He added that discussions should focus on the purpose of the WMDS.

Some more results were reached by the discussion, as listed below:

- It was agreed that element 5-02 should allow for multiple instruments, so TT-WMD should take an action on this.
- For element 5-04 the entry “testing/commissioning” should be added;
- The following elements are not applicable for space-based observations, a nil reason being acceptable (n/a): 5-05, 5-06*, 5-14, 5-15, 6-01*, 6-02, 6-03*, 6-05, 6-06, 6-07, 6-08, 7-01*;
  (* for space-based observations an URL could be provided)

6. CONCLUSIONS AND RECOMMENDATIONS

The meeting recognized the benefits of all observing systems, surface and space-based, adopting the WMDS to ensure interoperability. It was recognized that a strengthened collaboration between WIGOS and WIS metadata development would allow for an optimized the implementation of the WMDS.

To ensure that the space-based community embraces the WMDS it was also recognized that it needs to be improved, according to what was discussed, to allow for an easy use and understanding by the space agencies; It was agreed to promote the (improved) WMDS in the major satellite-related events to come, such as the CGMS session in mid-2016.

It was mentioned that the work of TT-WMD should focus on the varying dynamics of certain elements and how these should be addressed in the future.

The list of agreed actions, with deadlines and responsible, is provided in Appendix IV.

The workshop was considered very fruitful and the feedback from satellite experts valuable.

7. ANY OTHER BUSINESS

Nothing to report.

8. CLOSURE OF THE MEETING

Mr L.Nunes, on behalf of WMO Secretariat, thanked the experts for their participation and wished safe return to their home countries.

Mr J.Klausen, also thanked the participants for their contribution and closed the session at 12:54 hours, on Thursday, 1 October 2015.

Appendix I

LIST OF PARTICIPANTS

Dr Jörg Klausen (Co-Chair, TT-WMD)	MeteoSwiss Krähbühlstrasse 58 8044 Zürich Switzerland Tel.: +41 (0)44 256 9223 Fax: +41 (0)44 256 9278 Email: joerg.klausen@meteoswiss.ch	Present from: 29.Sep-1.Oct
Mr Karl Monnik (Co-Chair, TT-WMD)	Bureau of Meteorology 700 Collins Street G.P.O. Box 1289K MELBOURNE, VIC 3001 Australia Tel.: +61 (3) 9669 4205 Fax: +61 (2) 9669 4168 Email: k.monnik@bom.gov.au	Not present: Participated via WebEx on 1.Oct (AM - Geneva)
Mr Leon Majewski (Satellite expert)	Bureau of Meteorology 700 Collins Street G.P.O. Box 1289K MELBOURNE, VIC 3001 Australia Tel.: +61 (3) 9669 4205 Fax: +61 (2) 9669 4168 Email: l.majewski@bom.gov.au	Present from: 29.Sep-1.Oct
Mr Guillaume Aubert (Satellite expert)	EUMETSAT Postfach 100555 D-64205 DARMSTADT Germany Fax: +49 6151 807 426 Tel: +49 6151 807 7196 Email: guillaume.aubert@eumetsat.int	Present from: 30.Sep-1.Oct
Mrs Lihang Zhou (Satellite expert)	National Oceanic and Atmospheric Administration, Satellite and Information Service, Center for Satellite Applications and Research (STAR) Camp Springs, Maryland, USA Email: lihang.zhou@noaa.gov	Not present: Participated via WebEx on 30.Sep (PM - Geneva)

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Appendix II

MAPPING OF OSCAR/SPACE VS WIGOS METADATA STANDARD

Category	Id	Name		MCO	Phase	Mapping	Comments
Observed variable	1-01	Observed variable – measurand	Variable intended to be measured or observed or derived, including the biogeophysical context	M*	1	Tentative evaluation of measurements	Associated to each instrument, note: it can be a list of variables
	1-02	Measurement unit	Real scalar quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number [VIM3, 1.9]	C*	1	Measuring Units	In OSCAR/Requirements Linked to OSCAR/Space through : Evaluation of measurements/ Gap analysis / Measurement timeline for …
	1-03	Temporal extent	Time period covered by a series of observations inclusive of the specified date-time indications (measurement history)	M*	1	*Instrument status:* Start date, EOL date	
	1-04	Spatial extent	Typical georeferenced volume covered by the observations	M*	1	*Instrument:* Coverage /Cycle	There is a complex relationship between instrument and sampled volume, depending on the remote sensing principle
	1-05	Representativeness	Spatial extent of the region around the observation for which it is representative	O	2		
Purpose of observ.	2-01	Application area(s)	Context within, or intended application(s) for which the observation is primarily made or which has/have the most stringent requirements	M*	1	*Instrument:* Purpose *Satellite:* Details/Satellite Description	
	2-02	Programme/Network affiliation	The global, regional or national Programmes/network(s) that the station/platform is associated with	M	1	*Satellite:* details/Satellite Description	
Station/platform	3-01	Region of origin of data	WMO Region	C*	1		
	3-02	Territory of origin of data	Country or territory name of the location of the observation	C*	1		
	3-03	Station/platform name	Official name of the station/platform	M	1	Satellite details/Full name	
	3-04	Station/platform type	A categorization of the type of environmental monitoring facility at which an observed variable is measured	M*	2	Satellite	

	3-05	Station/platform model	The model of the monitoring equipment used at the station/platform	M*#	3	Satellite details/Associated satellite programme	
	3-06	Station/platform unique identifier	A unique and persistent identifier for an environmental monitoring facility (station/platform), which may be used as an external point of reference	M*	1	Satellite details/Acronym	
	3-07	Geospatial location	Position in space defining the location of the environmental monitoring station/platform at the time of observation	M*	1		Need to accommodate: the type of orbit (ref.table), altitude, equatorial crossing time (ECT), longitude, inclination. A further entity is needed for the orbit details (free text)
	3-08	Data communication method	Data communication method between the station/platform and some central facility	O	2	Satellite details/Data access information	
	3-09	Station Status	Declared reporting status of the station	M	1	Satellite details/Status	Code table 3-09 needs to cope with station type
Environment	4-01	Surface cover	The observed (bio)physical cover on the earth's surface in the vicinity of the observation	C	3	N/A	
	4-02	Surface cover classification scheme	Name and reference or link to document describing the classification scheme	C	3	N/A	
	4-03	Topography or bathymetry	The shape or configuration of a geographical feature, represented on a map by contour lines	C	3	N/A	
	4-04	Events at station/platform	Description of human action or natural event at the station or at the vicinity that may influence the observation	O	2	*Instrument status:* Calibration and events	
	4-05	Site information	Non-formalized information about the location and its surroundings at which an observation is made and that may influence it	O	2	N/A	
Instruments and methods of observation	5-01	Source of observation	The source of the dataset described by the metadata	M	1		
	5-02	Measurement/observing method	The method of measurement/observation used	M#	1	*Instrument:* Type of instrument	
	5-03	Instrument specifications	Intrinsic capability of the measurement/observing method to measure the designated element, including range, stability, precision, etc	M*#	1	*Instrument:* Acronym, Full name, Short description, Detailed characteristics	Suggest additional field for spectral characteristics

	5-04	Instrument operating status	The status of an instrument with respect to its operation	O	3	*Instrument status:* Status	
	5-05	Vertical distance of sensor	Vertical distance of the sensor from a (specified) reference level such as local ground, or deck of a marine platform at the point where the sensor is located; or sea surface	C*	1	N/A	
	5-06	Configuration of instrumentation	Description of any shielding or configuration/setup of the instrumentation or auxiliary equipment needed to make the observation or to reduce the impact of extraneous influences on the observation	C#	3		
	5-07	Instrument control schedule	Description of schedule for calibrations or verification of instrument	C	3	*Instrument status:* Calibration and events	
	5-08	Instrument control result	The result of an instrument control check, including date, time, location, standard type and period of validity	C#	3		
	5-09	Instrument model and serial number	Details of manufacturer, model number, serial number and firmware version if applicable	C#	3		
	5-10	Instrument routine maintenance	A description of maintenance that is routinely performed on an instrument	C#	3		
	5-11	Maintenance party	Identifier of the organization or individual who performed the maintenance activity	O	2		
	5-12	Geospatial location	Geospatial location of instrument/sensor	C*	2	See 3-07	
	5-13	Maintenance Activity	Description of maintenance performed on instrument	O	3		
	5-14	Status of observation	Official status of observation	O	3		
	5-15	Exposure of instruments	The degree to which an instrument is affected by external influences and reflects the value of the observed variable	C	2		
Sampling	6-01	Sampling procedures	Procedures involved in obtaining a sample	O	3		
	6-02	Sample treatment	Chemical or physical treatment of sample prior to analysis	O	3		
	6-03	Sampling strategy	The strategy used to generate the observed variable	O*	1		
	6-04	Sampling time period	The period of time over which a measurement is taken	M#	3		

	6-05	Spatial sampling resolution	Spatial resolution refers to the size of the smallest observable object. The intrinsic resolution of an imaging system is determined primarily by the instantaneous field of view of the sensor, which is a measure of the ground area viewed by a single detector element in a given instance in time	M#	2	*Instrument:* Resolution	
	6-06	Temporal sampling interval	Time period between the beginning of consecutive sampling periods	M	3	*Instrument:* Coverage /Cycle	
	6-07	Diurnal base time	Time to which diurnal statistics are referenced	M	1		
	6-08	Schedule of observation	Schedule of observation	M	1		
Data processing and Reporting	7-01	Data processing methods and algorithms	A description of the processing used to generate the observation and list of algorithms utilized to derive the resultant value	O	3		
	7-02	Processing/analysis center	Center at which the observation is processed	O	2		
	7-03	Temporal reporting period	Time period over which the observable variable is reported	M*	1		
	7-04	Spatial reporting interval	Spatial interval at which the observed variable is reported	C*	1		
	7-05	Software/processor and version	Name and version of the software or processor utilized to derive the element value	O	3		
	7-06	Level of data	Level of data processing	O	2		
	7-07	Data format	Description of the format in which the observed variable is being provided	M	3		
	7-08	Version of data format	Version of the data format in which the observed variable is being provided	M	3		
	7-09	Aggregation period	Time period over which individual samples/observations are aggregated	M	2		
	7-10	Reference time	Time base to which date and time stamps refer	M	2		
	7-11	Reference datum	Reference datum used to convert observed quantity to reported quantity	C	1		
	7-12	Numerical resolution	Measure of the detail in which a numerical quantity is expressed	O	3		
	7-13	Latency (of reporting)	The typical time between completion of the observation or collection of the datum and when the datum is reported	M	3		

Data quality	8-01	Uncertainty of measurement	Non-negative parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the observation/measurand	C*#	2		
	8-02	Procedure used to estimate uncertainty	A reference or link pointing to a document describing the procedures / algorithms used to derive the uncertainty statement	C*#	2		
	8-03	Quality flag	An ordered list of qualifiers indicating the result of a quality control process applied to the observation	M#	2		
	8-04	Quality flagging system	Reference to the system used to flag the quality of the observation	M#	2		
	8-05	Traceability	Statement defining traceability to a standard, including sequence of measurement standards and calibrations that is used to relate a measurement result to a reference [VIM 3 2.4.2]	C*#	2	*Instrument status:* Calibration and events	Link to Agencies' web pages coordinated by GSICS
Ownership and data policy	9-01	Supervising organization	Name of organization who owns the observation	M	2	Satellite details/Space agency	
	9-02	Data policy/use constraints	Details relating to the use and limitations surrounding data imposed by the supervising organization	M*	1		
Contact	10-01	Contact (Nominated Focal Point)	Principal contact (Nominated Focal Point, FP) for resource	M	1		

Appendix III

EXAMPLES OF WMDS APPLIED TO SPACE-BASED OBSERVATIONS

WMDS				questions	HW-8 Brightness temperature at 10.3um	
Category	Id	Name	Definition			
Observed variable	1-01	Observed variable – measurand	Variable intended to be measured or observed or derived, including the biogeophysical context	units that we measure that are not present	Brightness Temperature	
	1-02	Measurement unit	Real scalar quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number [VIM3, 1.9]	unitless quantities? enumerated types (cloud type)	kelvin	1-02-5
	1-03	Temporal extent	Time period covered by a series of observations inclusive of the specified date-time indications (measurement history)	end date could be the end of a processing system	7/7/2015	
	1-04	Spatial extent	Typical georeferenced volume covered by the observations		GEOS @ 140.7 (80N-80S, 60E-220E)	
	1-05	Representativeness	Spatial extent of the region around the observation for which it is representative	I expect we could ignore - or specify the spatial resolution	NA	

Purpose of observ.				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
	2-01	Application area(s)	Context within, or intended application(s) for which the observation is primarily made or which has/have the most stringent requirements		Nowcasting, General forecasting; ocean applications	2-01-3; 2-01-5; 2-01-7
	3-01	Region of origin of data	WMO Region	NilReason		
Station/platform	3-02	Territory of origin of data	Country or territory name of the location of the observation	NilReason		
	3-03	Station/platform name	Official name of the station/platform	is this the full name?	Himawari-8	173
	3-04	Station/platform type	A categorization of the type of environmental monitoring facility at which an observed variable is measured			satellite
	3-05	Station/platform model	The model of the monitoring equipment used at the station/platform	perhaps cosmic is better ex. most hw platforms are different (except 8 9)	Himawari-8	
	3-06	Station/platform unique identifier	A unique and persistent identifier for an environmental monitoring facility (station/ platform), which may be used as a external point of reference	WMO ID	173	
Station/platform	3-07	Geospatial location	Position in space defining the location of the environmental monitoring station/platform at the time of observation	space/orbit; what about drift in orbit NOAA-15 into terminator?		
					moving	space based
					Orbit type	GEO
					Central longitude	140.7
					height	38500

				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
Station/platform	3-09	Station Status	Declared reporting status of the station	Do not include gaps of a day or two = covered by data set level metadata. Do we need a standby status	Operational	3-09-3
Environment	4-01	Surface cover	The observed (bio)physical cover on the earth's surface in the vicinity of the observation		NA	4-01-01-00
	4-02	Surface cover classification scheme	Name and reference or link to document describing the classification scheme			
	4-03	Topography or bathymetry	The shape or configuration of a geographical feature, represented on a map by contour lines			
	4-04	Events at station/platform	Description of human action or natural event at the station or at the vicinity that may influence the observation	space weather (specify start/stop)	can be realized as a specific URL pointing to this information	
	4-05	Site information	Non-formalized information about the location and its surroundings at which an observation is made and that may influence it			
Instruments and methods of observation	5-01	Source of observation	The source of the dataset described by the metadata		automatic	5-01-1
	5-02	Measurement/observing method	The method of measurement/observation used	add to table form - hierarchy of methods for review (surface bias). Verify that these match	Moderate-resolution optical imager	

Instruments and methods of observation				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
	5-04	Instrument operating status	The status of an instrument with respect to its operation	perhaps add satellite termino-logy such as "commissioning"	operational	5-04-1
	5-05	Vertical distance of sensor	Vertical distance of the sensor from a (specified) reference level such as local ground, or deck of a marine platform at the point where the sensor is located; or sea surface	NA for satellite.		
	5-06	Configuration of instrumentation	Description of any shielding or configuration/setup of the instrumentation or auxiliary equipment needed to make the observation or to reduce the impact of extraneous influences on the observation	NA	NA or a URL	
	5-07	Instrument control schedule	Description of schedule for calibrations or verification of instrument	In case of AVHRR this could be each scan (PRT-bb) - no, this is data. MODIS lunar calibration is more appropriate	generic short statements and/or URL	
	5-08	Instrument control result	The result of an instrument control check, including date, time, location, standard type and period of validity	Perhaps the table could be expanded -	URL to where this info can be found	
	5-09	Instrument model and serial number	Details of manufacturer, model number, serial number and firmware version if applicable		Advanced Himawari Imager - 01	
	5-10	Instrument routine maintenance	A description of maintenance that is routinely performed on an instrument		NilReason=not applicable	

				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
Instruments and methods of observation	5-12	Geospatial location	Geospatial location of instrument/sensor	NA	same as geolocation of platform	
	5-13	Maintenance Activity	Description of maintenance performed on instrument	Station keeping, calibration	NilReason=not applicable	
	5-14	Status of observation	Official status of observation		n/a	
	5-15	Exposure of instruments	The degree to which an instrument is affected by external influences and reflects the value of the observed variable		n/A	
Sampling	6-01	Sampling procedures	Procedures involved in obtaining a sample		optional, can be a URL	
	6-02	Sample treatment	Chemical or physical treatment of sample prior to analysis		n/a	
	6-03	Sampling strategy	The strategy used to generate the observed variable		optional, can be a URL	
	6-04	Sampling time period	The period of time over which a measurement is taken		instantateous, repeat every 10	
	6-05	Spatial sampling resolution	Spatial resolution refers to the size of the smallest observable object. The intrinsic resolution of an imaging system is determined primarily by the instantaneous field of view of the sensor, which is a measure of the ground area viewed by a single detector element in a given instance in time		n/a	
	6-06	Temporal sampling interval	Time period between the beginning of consecutive sampling periods		N/a	
	6-07	Diurnal base time	Time to which diurnal statistics are referenced		n/a	
	6-08	Schedule of observation	Schedule of observation		n/a	

				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
Data processing and Reporting	7-02	Processing/analysis center	Center at which the observation is processed		ABOM	
	7-03	Temporal reporting period	Time period over which the observable variable is reported		10-minute	
	7-04	Spatial reporting interval	Spatial interval at which the observed variable is reported		2x2	
	7-05	Software/processor and version	Name and version of the software or processor utilized to derive the element value	Provider would know		AGLS r5700 (svn revision ID or git)
	7-06	Level of data	Level of data processing		L1	7-06-3
	7-07	Data format	Description of the format in which the observed variable is being provided		NetCDF	
	7-08	Version of data format	Version of the data format in which the observed variable is being provided	Provider would know	AGLS_data-product-specification_rev01.05	
	7-09	Aggregation period	Time period over which individual samples/observations are aggregated	?		
	7-10	Reference time	Time base to which date and time stamps refer		1/1/1970	
	7-11	Reference datum	Reference datum used to convert observed quantity to reported quantity	what about geoid?		
	7-12	Numerical resolution	Measure of the detail in which a numerical quantity is expressed			1dp
	7-13	Latency (of reporting)	The typical time between completion of the observation or collection of the datum and when the datum is reported			8 mins

				questions	HW-8 Brightness temperature at 10.3um	
	Id	Name	Definition			
Data quality	8-02	Procedure used to estimate uncertainty	A reference or link pointing to a document describing the procedures / algorithms used to derive the uncertainty statement			
	8-03	Quality flag	An ordered list of qualifiers indicating the result of a quality control process applied to the observation			
	8-04	Quality flagging system	Reference to the system used to flag the quality of the observation	?		
	8-05	Traceability	Statement defining traceability to a standard, including sequence of measurement standards and calibrations that is used to relate a measurement result to a reference [VIM 3 2.4.2]	difficult to specify	GSICS	
Ownership and data policy	9-01	Supervising organization	Name of organization who owns the observation	code table?	ABOM+JMA	
	9-02	Data policy/use constraints	Details relating to the use and limitations surrounding data imposed by the supervising organization		None	9-02-4
Contact	10-01	Contact (Nominated Focal Point)	Principal contact (Nominated Focal Point, FP) for resource		ABOM	

WMDS		SARAL SLA		MTSAT-2 CSR		
Category	Id					
Observed variable	1-01	Sea Level Anomaly		Clear sky radiance (Brightness Temperatures at multiple wavelengthts), % of area that is clear, Standard Deviation of brightness temperatures within box		
	1-02	m	1-02-1	kelvin, %, kelvin	1-02-5	
	1-03	2012-		2009-		
	1-04	Global		GEOS @ 145 (80N-80S, 65E-225E)		
	1-05	NA		NA		
Purpose of observ	2-01	Ocean	2-01-7	GNWP	2-01-1	
	2-02	?		?		
Station/platform	3-01					
	3-02					
	3-03	Satellite with ARGOS and AltiKa	441	Himawari-7	172	
	3-04		satellite		satellite	
	3-05	Satellite with ARGOS and AltiKa		Himawari-7		
	3-06	441		172		
	3-07					
		moving	space based	moving	space based	
		Orbit type	LEO	Orbit type	GEO	
		Sun synchronous	yes	Central longitude	145	
		Equator crossing time (ascending)	6:00	height	35800	
		height	800			
	3-08	Global downlink	3-08-XX	rebroadcast via MTSAT-1R	3-08-XX	
	3-09	Operational	3-09-3	Operational	3-09-3	

WMDS		SARAL SLA		MTSAT-2 CSR		
Category	Id					
Environment	4-01	NA	4-01-01-00	NA	4-01-01-00	
	4-02					
	4-03					
	4-04					
	4-05					
Instruments and methods of observation	5-01	automatic	5-01-1	automatic	5-01-1	
	5-02	Radar Altimiter		Moderate-resolution optical imager		
	5-03					
	5-04	operational	5-04-1	operational	5-04-1	
	5-05					
	5-06			?		
	5-07			?		
	5-08					
	5-09	ALTIKA (but also MWR)		IMAGER		
	5-10					
	5-11					
	5-12					
	5-13					
	5-14					
	5-15					
Sampling	6-01					
	6-02					
	6-03	Pulse		Continuous		
	6-04	20 Hz		instantateous, repeat every 60		
	6-05	point, 7km apart		60x60		
	6-06					

WMDS		SARAL SLA		MTSAT-2 CSR		
Category	Id					
Sampling	6-07					
	6-08	every second		hourly full disk		
Data processing and Reporting	7-01					
	7-02	AVISO/RADS		JMA		
	7-03	1-second		Hourly		
	7-04	7km along track		60x60		
	7-05		RADS v4			
	7-06	L2	7-06-4	L2	7-06-4	
	7-07	NetCDF		BUFR		
	7-08	RADS v4				
	7-09	1s				
	7-10	1/1/1980		1/1/1970		
	7-11					
	7-12		0.001m		1dp	
	7-13		2 days		30 mins	
Data quality	8-01	?mm		?		
	8-02					
	8-03					
	8-04					
	8-05	multi-sensor and GPS buoys		depends on cloud mask product, GSICS		
Ownership data policy	9-01	ISRO		JMA		
	9-02	Restricted	9-02-4	WMO	9-02-1	
Contact	10-01	RADS		JMA		

Appendix IV

WORKSHOP ON WIGOS METADATA FOR SPACE-BASED OBSERVATIONS - ACTIONS

No.	Action/Recommendation	Comments	Deadline	Assigned to
1	To add a list of Acronyms to the WMDS document	Proposed by Lihang Zhou	TT-WMD-4	Secretariat
2	Define M, C, O before or on top of table 2	Proposed by Lihang Zhou	TT-WMD-4	Secretariat
3	Define/clarify the meaning of Matrix	Proposed by Lihang Zhou	TT-WMD-4	Secretariat
4	Eliminate column “Mode of observation”, when completing code table 1-01 (entries existing in OSCAR/Surface are to be used) Circulate the OSCAR/Surface tree of variables and method to TT-WMD-4	Proposed by Jörg Klausen	TT-WMD-4	TT-WMD-4
5	Complete the list of definitions in code tables 2-01, 4-01-01 and others	Proposed by Lihang Zhou	TT-WMD-4	TT-WMD-4
6	Circulate the NOAA draft document, which includes a section on Metadata “standard”		ASAP TT-WMD-4	Lihang Zhou
7	Mapping of the Eumetsat Medatata model against the WMDS (finish examples and mention corresponding O&M element against WMDS)	For this action, it would be helpful to have the use cases for satellite use of the WMDS developed beforehand	ASAP TT-WMD-4	Guillaume Aubert
8	Develop a use case for the application of WMDS to NOAA satellites		TT-WMD-4	Lihang Zhou; Luis to share latest version

9	Expand/complete the entries in code table 3-08	Some changes have been made on session	ASAP	Stephan Bojinski
10	Add notes / explanations in WMDS related to calibration / instrument section		TT-WMD-4	Leon to lead
11	Update code tables according to discussions of meeting		TT-WMD-4	Luis to highlight in WMDS
12	Adequate representation of TT-WMD in IPET-MDRD meeting 10-12 Nov 2015, Geneva			Guillaume to contact chair
12	Present updated WMDS / formal standard to CGMS in June 2016		CGMS	WMO Space Office