WORLD METEOROLOGICAL ORGANIZATION

WMO INTEGRATED GLOBAL OBSERVING SYSTEM

Ad hoc OSCAR project requirements workshop

(OSCAR1)

Geneva, Switzerland, 3-4 September 2014

FINAL REPORT

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CONTENTS

Agenda		p. 5
General Summary		p. 6 - p. 13
Annex I	List of Participants	p. 14
Annex II	List of action items arising from the workshop	p. 17
Annex III	Basic information on the WMO Weather Radar Database (WRD)	p. 18
Annex IV	Outcome of the OSCAR Project Teleconference on Surface Weather Radars Requirements	p. 22
Acronyms		p. 27

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AGENDA

1. Opening

2. Background information on the OSCAR Platform Project

   2.1 Guidance of ICT-IOS Chair
   2.2 Guidance of IPET-OSDE Chair

3. Observational user requirements

4. WIGOS Metadata Standard, and OSCAR

5. Priorities for implementing platform types in OSCAR/Surface

6. Representation of the surface-based capabilities by platform type

7. Algorithms for the RRR critical review

8. User monitoring information (e.g. NWP)

9. Quality monitoring of OSCAR content

10. Interfaces with existing databases

11. Any other business

12. Close

GENERAL SUMMARY

1. Opening

1.1 The *ad hoc* OSCAR project requirements workshop was held at the WMO Headquarters in Geneva, Switzerland from 3 to 4 September April 2014 and was chaired by Rainer März (Germany).

1.2 The Chair welcomed the participants, and recalled the goal of the meeting as follows:

How to represent surface observing systems capabilities within the surface Observing Systems component (OSCAR/Surface) of the Observing System Capability Analysis and Review Tool (OSCAR), including surface weather radars, in such a way that we can easily collect metadata from the operators of these systems, and use the metadata collected with automatic algorithms in order to express such capabilities in quantities that can be combined and averaged for comparing those capabilities with the technology free observational user requirements recorded quantitatively in the OSCAR/Requirements database for an observed variable, geographic region, vertical layer, horizontal domain, and application area ?

1.3 The Director of the Observing and Information Systems Department, Dr Wenjian Zhang, welcomed the participants to Geneva, and recalled the importance of the OSCAR tool as a component of the WIGOS Information Resource (WIR), which development is one of the Key Activity Area of the WIGOS Framework Implementation Plan (WIP).

2. Background information on the OSCAR Platform Project

2.1 Background information on the OSCAR Platform Project

The Secretariat provided a brief overview of the OSCAR Platform Project, including its goal, benefits, functions, and status.

2.2 Guidance of ICT-IOS Chair

2.2.1 The Chair of the Commission for Basic Systems (CBS) Implementation/Coordination Team on Integrated Observing Systems (ICT-IOS) and of the CBS Inter Programme Expert Team on WIGOS Framework Implementation (IPET-WIFI), Mr Jochen Dibbern (Germany), provided his guidance by teleconference on behalf of both Teams. He recalled that OSCAR has gained substantial attention and visibility among the WMO Members and that the migration of the operational hosting of OSCAR from the WMO Secretariat to MeteoSwiss is appreciated.

2.2.2 He recalled the critical need to routinely collect the WIGOS metadata from the observing systems operators, and to record them, and make them available through the OSCAR platform. He stressed that a large number of groups is involved within CBS with responsibility for providing oversight and review of OSCAR, as reflected in the table below. Therefore CBS is asked at the coming meeting in Paraguay, 08-12 September 2014, to endorse that IPET-WIFI should coordinate the input during the development phase.

CBS Team	***Role***	***Reporting to***
ICT-IOS	Lead	ICG-WIGOS

IPET-WIFI	1) Overall coordination and leadership at the technical level 2) Regulatory Materials and metadata required in liaison with ICG-WIGOS and its dedicated Task Teams	ICT-IOS
IPET-OSDE	1) Functional requirements with regard to the tools required for the RRR process 2) Review content required for the RRR process including the observational requirements from application areas	IPET-WIFI
ET-SAT	Space-based observing systems capabilities (programmatic and technical updates)	IPET-WIFI
ET-SUP	Space-based observing systems capabilities (user assessments)	IPET-WIFI
ET-ABO	Aircraft-based observing systems capabilities	IPET-WIFI
ET-SBO	Surface-based observing systems capabilities	IPET-WIFI

Table 1: Proposed responsibility within CBS for the oversight and review of OSCAR (as submitted for discussion at CBS Ext. (2014))

2.2.3 Mr Dibbern also explained that the draft document on the Representation of surface-based observing systems capabilities was a good starting point for the discussion, and encouraged the participants to elaborate a proposal taking some of the ideas in the document into account.

2.2.4 He further noted that the document describing the observing platforms types required for OSCAR/surface included an indication of the primary application areas targeted by each type. He stressed that in the WIGOS Framework Implementation, the plan is to go away from the concept of observing stations dedicated to a particular application area, and was more to introduce integrated multi-purpose observing stations. This should be reflected in the table.

⇨ WMO Secretariat to update the Platform Type document accordingly.

2.2.5 Finally, Mr Dibbern explained that Quality Assurance is an important aspect that needs to be taken into account for the future operations and long term maintenance of the OSCAR Platform to secure sustained integrity of the data base. Therefore roles and responsibilities for editing Metadata and appropriate fault correction procedures must be agreed.

2.3 Guidance of IPET-OSDE Chair

2.3.1 Dr John Eyre (United Kingdom), Chair of the CBS Inter Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE), summarised by teleconference the ways in which the activities of IPET-OSDE would benefit from OSCAR/Surface: (a) by describing observing systems capabilities, which is a key component of the RRR process and allows gaps between present/planned capabilities and user requirements for observations to be assessed and addressed; (b) by permitting the monitoring of observing systems so that their strengths and weakness can be understood, and hence contribute to the monitoring of Actions in EGOS-IP; and (c) by providing a general resource for information on observing systems, in parallel with the important and widely used resource already provided by OSCAR/Space.

2.3.2 He then commented on the characteristics of OSCAR/Surface that would be important for the RRR process. Observing system capabilities should be expressed in terms of the geophysical variables measured, and in a manner consistent with OSCAR/Requirements.

For each variable, the RRR process needs information on horizontal, vertical and temporal resolution, on uncertainty and on timeliness. Of these, the most important and the most difficult is horizontal resolution, because this cannot be assessed at station/platform level. It was most important for RRR to describe the characteristics of data actually delivered to users. However, for WIGOS activities as a whole, it was also important to describe the characteristics of the planned observing systems. He highlighted the important role of information from operational monitoring centres. Information from NWP monitoring was already used, but more use could be made of these data within WIGOS and similar monitoring information should be obtained from operational activities other than NWP.

2.3.3 He also provided some comments on details of the document "Representation of surface observing system capabilities in OSCAR" for consideration under agenda item 6.

3. Observational user requirements

The meeting reviewed how observational user requirements are recorded quantitatively in the OSCAR database, noting that the observing systems capabilities need to be consistently compared on a variable by variable basis (from different observing system types) with the user requirements for the critical review of the Rolling Review of Requirements and gap analysis.

4. WIGOS Metadata Standard, and OSCAR

4.1 Dr Jörg Klausen (Switzerland) provided an overview of the WIGOS Metadata Standard (WMS) and related requirements for the development of the OSCAR Platform.

4.2 He then listed the benefits for Members of the OSCAR Platform as follows:

- Know what you have: Structured overview of Member's own observing systems
- Know what they have: Same structured overview of observing systems in neighboring countries and region
- Peace of mind: Safe and secure archiving of metadata
- Know where you should improve: Objective assessment of gaps
- More value for money through collaboration: Enhanced valorization of one Member's existing observations through use by another Member (and vice versa)

4.3 Finally, Dr Klausen stressed on the following needs and challenges ahead:

- (medium risk) Need unambiguous terminology that is globally understood
- (low risk) Need to be able to specify requirements on all scales for all Application Areas, such that Members can benefit from RRR;
- Need to be able to document capabilities such that (i) the critical review is possible (low risk), (ii) operational services see a benefit in engaging (medium risk), and (iii) the scientific communities see a benefit (medium risk);
- Need to develop algorithms that support the gap analysis on all scales for all Application Areas;
- (medium risk) Need to link to existing metadata sources;
- (high risk) Need sufficient resources to build the application; and
- (high risk) Need to be ready by Cg-17.

5. Priorities for implementing platform types in OSCAR/Surface

5.1 The workshop noted that observing stations metadata of interest to WIGOS should eventually be included in OSCAR. However, some will be implemented in Phase 1 (i.e. by mid-2015) of the OSCAR Platform development project, and others in Phase 2 (i.e. by mid-2016) or later.

5.2 The workshop discussed priorities for implementing the metadata from various types of surface observing station networks into OSCAR/Surface for Phase 1. After discussion, and taking into account the existing sources of metadata (and monitoring data), and how each type can potentially impact the OSCAR Platform data model, the workshop agreed to recommend the following list by order of priority:

1. GAW
2. Vol A (RBCN, RBSN, AWS, Upper Air, aeromet, agromet, radiation stations)
3. Aircraft
4. Marine (DB, MB, Profiling floats, Ships)
5. Surface weather radars
6. Wind profilers
7. Aeronautical stations (METAR with ICAO IDs)
8. Marine (Surface gliders, Tide gauges, Tsunameters)

5.3 The workshop, also agreed to recommend to shift the inclusion of hydrological observing stations metadata to Phase 2 of the OSCAR Platform development (i.e. by mid-2016).

5.4 The workshop also agreed on the following action items:

- ⇨ WMO Secretariat to investigate what are the sources of radiation observing sites data and metadata (e.g. the source of the Baseline Surface Radiation Network – BSRN - is PANGEA at the Alfred Wegener Institute but this is not be the only one);
- ⇨ J. van der Meulen to investigate how to access metadata of Aeronautical Stations of ICAO for OSCAR.

6. Representation of the surface-based capabilities by platform type

6.1 The workshop discussed the representation of the surface-based capabilities for specific types of observing stations. It noted that the following aspects have to be considered:

- How to represent and store the observing platform capabilities ?
- How to query and display the capabilities from the database ? (see item 6 below)

6.2 The workshop agreed with the following principles and guidelines regarding the first aspect:

- For being able to compile the capabilities from various types of observing systems in a consistent way, all observations should be represented as virtual observing points.
- Representativeness of an observations is application dependant and can be ignored for assessing the observing systems capabilities in the critical review;
- OSCAR should be able to provide the option of either computing the stated capabilities (i.e. those based on the WIGOS metadata) or the actual capabilities when available (i.e. those based on the monitoring data). However, both sets are not necessarily consistent to each other, and this adds complexity to the system, which will have to be addressed. For

example, fields may be locked if monitoring info is available or another suggestion is to have two fields (one user supplied stated capabilities, other one for the monitoring centre supplied capabilities. However, but this would have to be exposed to the RRR interface.

Point observations

- Virtual observing point = observing platform nominal position

Slow moving observing stations

- Virtual observing point = observing platform position as a given time (snapshot of an observing network, e.g. monthly).

Fast moving observing stations (focus on AMDAR)

- The workshop discussed the compatibility of the AMDAR systems with the current draft OSCAR data model and noted some potential incompatibilities with the level of detail needed for AMDAR programme managers to maintain the information in OSCAR. However, the data model is in principle compatible provided a conversion from a different datamodel is undertaken. This requires effort, though.

- Virtual observing points = One can either use actual observation positions from the data flow, or use a simple model to simulate observations on the basis of a description of (i) the routes that aircrafts are normally flying, including positions of end points, and the frequency at which they are flown, and (ii) a description of the frequency at which the observations are made by an aircraft flying on a route.

  ⇨ ET-ABO to finalize and specify the AMDAR metadata required for OSCAR, and the methodology for representing the capabilities in line with the guidance from the OSCAR workshop (deadline 30 Sept.)

Surface-based remote sensing observing systems (focus on Surface weather radars, and wind profilers)

- Virtual observing points = One can either use actual observation positions from the data flow, or use a simple model to simulate observations (a cloud of observing points) on the basis of a description of the variation of the radar 3D product uncertainty, HR, and VR as a function of the distance from the radar and height. A digital elevation (terrain) model could also be used to mask the observations that are hidden by orography. The workshop noted that the use of clutter map from radar operators would be too complex to implement and probably unrealistic for getting the metadata from them.
- The radar operators may have to eventually submit more information that what is currently done with the Weather Radar Database (WRD) operated by Turkey, and will therefore also impact the WRD data model and system.
- For wind profilers, it is recommended to use OSCAR as the primary systems for collecting and recording the wind profiler metadata. BUFR templates may play some role in this, but they are not consistent over all Members.
- For wind profilers and other similar remote sensing observing systems, a similar approach as for the surface weather radars could be proposed, i.e. a simple model providing the variation of uncertainty, and VR as a function of height.

  ⇨ ET-SBO to propose to propose simple models (using less than 3 coefficients per platform) for surface weather radars and wind profilers describing the variation of uncertainty, HR, VR, as a function of distance from the observing platform and height. Deadline 30 September 2014.

6.3 The meeting noted that the capabilities of some observing systems can be season dependent (e.g. some AWS operated by Australia), or vary during the diurnal cycle (some radio-soundings only made at noon, or AMDAR flight patterns). The workshop agreed that it would be useful if the OSCAR critical review module could take this into account, and agreed with the following action item:

⇨ MeteoSwiss to explore feasibility of developing the following requirements for phase 1 and then to agree with the Secretariat whether they'll have to be included in the Project: (i) seasonal variability of the capabilities will have to be implemented; and (ii) day/night granularity for the diurnal cycle.

6.4 The meeting noted that OSCAR Project Teleconference on Surface Weather Radars Requirements was planned on 8 September 2014. The outcome of this teleconference will be included in this OSCAR workshop final report in due course as Annex IV.

7. Algorithms for the RRR critical review

7.1 The workshop discussed algorithms to be used for the Rolling Review of Requirements (RRR) critical review.

7.2 The workshop agreed with the following principles and guidelines:

- The meeting noted that capabilities are normally queried in relation to the observational user requirements of an application area, and therefore agreed with the principle to assess and display the capabilities according to a grid (boxes), which size (resolution) is decided by the user querying the database (e.g. a factor of the horizontal and vertical resolutions required by the application area).
- The horizontal resolution in each box can simply be obtained by using the following formula:

$$\sqrt{\frac{Box\ area}{Number\ of\ observations}}$$

- Temporal resolution is an issue. Some people want to capture temporal aspects on a per field basis (monitoring, observing cycle, timeliness). This makes the RRR more complex and we do not have the needed concepts. A clarification of the semantic understanding is needed (for example: does seasonal capability mean this capability was available on all days of the season or only theoretically on that day? It gets even more complicated when we consider monitoring).

8. User monitoring information (e.g. NWP)

8.1 The workshop agreed that it was critical to use monitoring information from various centres (e.g. NWP monitoring centres) for assessing the capabilities of the WIGOS observing stations within OSCAR. Once could for example record information about data available to end users at each analysis time with an indication station identifier, observation date and time, location, reception time (for timeliness), and availability of specific variable observations (y/n).

8.2 The workshop noted that an NWP Monitoring Workshop was planned in Geneva from 10 to 12 December 2014, and recommended that the OSCAR Platform requirements be discussed at that workshop.

9. Quality monitoring of OSCAR content

9.1. As advised by the ICT-IOS Chair under agenda item 2, the workshop agreed that Quality Assurance is an important aspect that needs to be taken into account for the future operations and long term maintenance of the OSCAR Platform to secure sustained integrity of the data base.

9.2 However, the workshop didn't find the time to discuss this issue in details, and invited the IPET-WIFI to provide further guidance, and make recommendations on the roles and responsibilities for editing metadata and appropriate fault correction procedures.

10. Interfaces with existing databases

Weather Radar Database

10.1 Mr Oguzhan Sireci (Turkey) provided an overview of the Surface Weather Radar Database (WRD), which is operated by the Turkish State Meteorological Service (TSMS) on behalf of the WMO. Details are provided in Annex III.

10.2 The workshop agreed with the following:

- The WRD should continue to operate in parallel of OSCAR, and should be seen as the primary source of surface weather radar metadata form OSCAR;
- The network of weather radar national focal points should therefore be kept, and continue to submit their metadata to the WRD;
- The OSCAR national contacts will therefore have to work in close coordination with the WRD national focal points in order to avoid conflicting information to be provided to OSCAR for such platforms.
- The OSCAR project development team will coordinate with Turkey to make sure that the required evolutions of the WRD can be implemented.

  ⇨ Turkey to keep abreast of the required evolution of the OSCAR platform requirements, and to implement the required evolutions of the WRD (i.e. additional required metadata), including the user interface

JCOMMOPS

10.3 Mr Belbéoch (JCOMMOPS) provided an overview of the JCOMM in situ Observations Programme Support Centre (JCOMMOPS) Information System.

10.4 The workshop agreed with the following:

- JCOMMOPS should continue to operate in parallel of OSCAR, and should be seen as the primary source of marine observing systems metadata form OSCAR (except for VOS/Pub47 metadata);
- The OSCAR project development team will coordinate with JCOMMOPS to make sure that the required evolutions of the JCOMMOPS Information System can be implemented.

- ⇨ JCOMMOPS to keep abreast of the required evolution of the OSCAR platform requirements, and to implement the required evolutions of the JCOMMOPS Information System (i.e. additional required metadata), including the user interface
- ⇨ M. Belbéoch to prepare a mapping of JCOMMOPS & OSCAR variables.

11. Any other business

Terminology

11.1 The workshop agreed that clarification is needed on the terminology used for the OSCAR Platform, as this is an important topic.

- ⇨ J. Klausen to prepare a document providing basic information on OSCAR, including in particular Terminology.

WIGOS Station Identifiers

11.2 The workshop noted the development of WIGOS Station Identifiers, and agreed that they ought to be used with the OSCAR Platform as primary and unique keys for the WIGOS Observing Platforms which metadata are recorded in OSCAR. Other existing (not necessarily unique) identifiers may also in addition be implemented in the system as additional field(s).

12. Close

12.1 The chair thanked all participants and the Secretariat for their contributions. The meeting closed at 16:00 on 4 September 2014. Action items arising from the workshop are summarized in Annex 2.

ANNEX I

LIST OF PARTICIPANTS

(OSCAR1, Geneva, Switzerland, 3-4 September 2014)

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ANNEX II

LIST OF ACTION ITEMS ARISING FROM THE WORKSHOP

No.	***By whom***	***Action item***	***Deadline***
1	Secretariat (ECh)	To update the Platform Type document accordingly.	ASAP
2	Secretariat (ECh)	To investigate what are the sources of radiation observing sites data and metadata (e.g. the source of the Baseline Surface Radiation Network – BSRN - is PANGEA at the Alfred Wegener Institute but this is not be the only one).	30/9/2014
3	J. van der Meulen	To investigate how to access discover, and validate metadata of Aeronautical Stations of ICAO for OSCAR.	31/10/2014
4	Secretariat (DL)	To request ET-ABO finalize and specify the AMDAR metadata required for OSCAR, and the methodology for representing the capabilities in line with the guidance from the OSCAR workshop.	30/9/2014
5	Secretariat (DL)	To request ET-SBO propose to propose simple models (using less than 3 coefficients per platform) for surface weather radars and wind profilers describing the variation of uncertainty, HR, VR, as a function of distance from the observing platform and height.	30/9/2014
6	J. Klausen	To explore with MeteoSwiss the feasibility of developing the following requirements for phase 1 and then to agree with the Secretariat whether they'll have to be included in the Project: (i) seasonal variability of the capabilities will have to be implemented; and (ii) day/night granularity for the diurnal cycle.	ASAP
7	Oguzhan Sireci	To discuss with TSMS and to keep abreast of the required evolution of the OSCAR platform requirements, and to implement the required evolutions of the WRD (i.e. additional required metadata), including the user interface.	31/5/2015
8	M. Belbéoch	To keep abreast of the required evolution of the OSCAR platform requirements, and to implement the required evolutions of the JCOMMOPS Information System (i.e. additional required metadata), including the user interface.	31/5/2015
9	M. Belbéoch	To prepare a mapping of JCOMMOPS & OSCAR variables.	30/9/2014
10	J. Klausen	To prepare a document providing basic information on OSCAR, including in particular Terminology.	30/9/2014

Annex III

Basic information on the WMO Weather Radar Database
(as of 09.09.2014)

A global survey on weather radars has been conducted by WMO to establish a ***"fully comprehensive up-to-date web-based metadata database"*** of the global use of weather radars between 2008 and 2010.

Main reasons for establishing this database were :

- Presenting a *comprehensive web-based database* for radar network planning information and resource allocation for all members,
- Assisting a wide spread *international exchange of radar data*,
- Gathering radar information to *protect radio-frequency spectrum allocation*,
- Presenting *common issues/problems and potential solutions* gathered by questionnaire.

Milestones of WRD

- Preparing questionnaire + distribution (2009)
- Gathering first replies (2010)
- Establishing database web page + report (2011)
- Organizing focal points + establishing accounts (2012)
- Updating and adding new radars together FPs (2013-)
- New functions have been added. (Radar history, Radar status etc.)

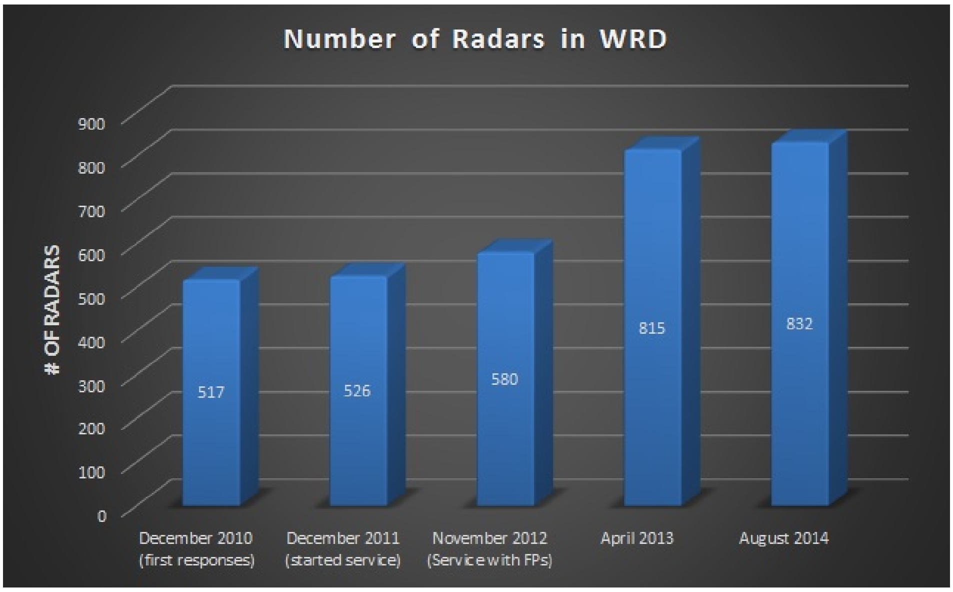
The number of weather radars is changing continuously. So a survey which is carried out in a certain period represents only that time's condition. ***With the help of a web-based database keeping the DB up-to-date can be possible by adding and updating radars.*** Currently there are 727 radars of 86 NMHS and 105 radars of other owners. ***Totally 815 weather radars have been included in WRD currently. "WMO Radar Database Procedures for Updating Weather Radar Metadata"*** can be accessible for focal points after log in to the WRD web page. Currently 54 FPs have been assigned by PRs. WRD has been operated by Turkish Met Service since 2011.

WRD Web Page

- URL address of the web page is ***http://wrd.mgm.gov.tr*** and there is a link for WRD in WMO Weather Radar Observations page.
- Features like basic search, search based on countries, parameters of individual radars, materials, statistics with graphs are active currently. Basic search can be done by following parameters: Country, Band, TX Type, and Polarization.
- The web page can run with all platforms with current infrastructure. Executability with all platforms and being simple were main principles during development of the web page.
- Statistics in the web page dynamically use up-to-date in database.
- Images of the radars can be seen by the links of radar images, if they are added by focal points. (links added to virtual earth too)
- English and Turkish Languages are active currently. Language is selected automatically according to used operating system. Other languages can be able to add later by help of

focal points or WMO. (by filling an excel sheet with corresponding ones for each word in their language)

- Data transfer from OPERA have been carried out manually (excel sheet) so far.
- WMO Information Systems (WIS) is able to download up to date DB regularly/ automatically from web page currently.
- Country networks can be seen on Virtual Earth application (added in February 2013).



FOCAL POINTS

- The Focal Point has been thought as responsible for ***initial metadata entry and routine maintenance of the database*** under instruction from WMO and the database administrator. Details of assigned Focal Points can be found at WMO Weather Radar Observations page. (http://www.wmo.int/pages/prog/www/WRO/index_en.html)
- Accounts for each FP have been created since November 2012.
- ***Updates and adding new radars by FPs have been carried out successfully. Radars have been added by using radar adding tool of WMO WRD web page by FPs. (Argentina, Korea, New Zealand, France, Ireland, Malaysia, Saudi Arabia, Taiwan, UAE, etc.). Update tools also have been used by FPs periodically.***
- Networks with the large number of radars have been added by requesting excel spreadsheets. This method is easier at the beginning for that kind of large networks.
- FPs can access their own network by user name and password. They can update their present network and add new radars to the network by e-mail and online options. They can change passwords.
- Currently when FPs make updates and add new radars, those updates and new radars are checked by WRD web page administrators, after that database is changed by using online update and adding new radar tool. This tool can be used by FPs after some experience since it affects DB directly.

System information of WRD

	Current	Planned
Server	Virtual Private Server	Virtual Private Server with Raid back-up
Operation System	Windows Web Server2008 R2	Windows Web Server2008 R2
Platform	Framework 4.0, C# & VB	Framework 4.5, C# & VB
Database	MsSQL 2008	MsSQL 2012
HTML	XHTML 1.0 & CSS 2.1	HTML 5.0 & CSS 3 with jQuery support

Tables of WRD

Tables	Content
Radars	Table contains detailed information regarding with all radars
Radar History	Table almost same as “Radars” table. This table keeps registry of updates of “Radars” table.
Radar History (Manual inputs)	Manual inputs by focal points to the “Radar History” like radar calibration etc.
Countries	Official names of all countries, status in WRD
Materials – Movies	Registry of all movies regarding with radars. There are fields for all official languages for document names and explanations
Users	User(Focal point) communication information, user name and password, authorizations
Users – actions	Logs of actions of users (adding, updating radar etc.)
Users – logins	Logs of user logins to the WRD
Announcements	Announcements through WRD

Fields of Radar Table

Field	Type	Range
radar id	int(11)	Primary key, Identity
wmo id	varchar(12)	String
country	char(2)	String
owner id	varchar(4)	String
owner	nvarchar(64)	String
radar name	nvarchar(50)	String
lat degree	tinyint(2)	0 - 90
lat minute	tinyint(2)	0 - 59
lat second	tinyint(2)	0 - 59
lat direction	char(1)	“N” or “S”
lon degree	tinyint(3)	0 - 180
lon minute	tinyint(2)	0 - 59
lon second	tinyint(2)	0 - 59
ground height	float	0 - 5000
tower height	Float	0 - 100
Bands	varchar(2)	String

beamwidth	Float	0 - 3
frequency	Float	0 - 10000
pulse width 1	Float	0 - 50
pulse width 2	Float	0 - 50
pulse width 3	Float	0 - 50
pulse width 4	Float	0 - 50
prf min	smallint(4)	0 - 5000
prf max	smallint(4)	0 - 5000

Field	**Type**	**Range**
Power	Float	0 - 1500
signal processor	nvarchar(36)	String
tx type	nvarchar(16)	String
polarization	char(1)	"S" or "D"
manufacturer	nvarchar(48)	String
lowest angle	Float	(-6) – (+10)
highest angle	Float	0 – 185
cycle time min	Float	0 – 600
cycle time max	Float	0 – 600
mds dbm	smallint(4)	(-130) – (-90)
mds dbz	smallint(3)	(-90) – (+5)
zr summer	varchar(180)	String
zr winter	varchar(180)	String
zr others	varchar(180)	String
image link	varchar(180)	String
install year	smallint(4)	1900 - 2100
transaction date	bigint(12)	
notes	nvarchar(MAX)	-

In the future:

- Weather Radar Survey performed in 2009 was very comprehensive. Some parts of the survey can be focused and new online surveys can be done by help of focal points via WRD web page.
- Data transfer process can be automatized after OPERA DB is transferred to a new server.
- More FPs should be assigned by PRs.
- Although number of radar in DB has been increasing rapidly, there is a gap to be filled.
- New fields for parameters can be added to DB to assist radar data exchange like data types and formats, communication and also OSCAR requirements.

Annex IV

Outcome of the OSCAR Project Teleconference on Surface Weather Radars Requirements
(Geneva, 8 Sept. 2014, 15:00 – 16:00)

Participants

Name	***E-mail***	***Expertise***
Daniel Michelson (Sweden)	daniel.michelson@smhi.se	Surface Weather Radars
Jörg Klausen (Switzerland)	joerg.klausen@meteoswiss.ch	MeteoSwiss project lead, and GAWSIS
Paolo Ambrosetti (Switzerland)	Paolo.Ambrosetti@meteoswiss.ch Urs.Germann@meteoswiss.ch	IPET-OSDE
Oguzhan Sireci (Ankara, Turkey)	osireci@mgm.gov.tr	Weather Radar Database / Conceptual
Rainer März (Germany)	Rainer.Maerz@dwd.de	IPET-WIFI sub-group on OSCAR
Etienne Charpentier	echarpentier@wmo.int	Secretariat / WMO project lead, and IPET-OSDE
Timo Proescholdt	tproescholdt@wmo.int	Secretariat / WMO project co-lead
Dean Lockett	DLockett@wmo.int	Secretariat / ET-SBO

Discussion and outcome

1. Opening

The teleconference started at 15:00 on 8 September 2014. The participants quickly reviewed the purpose of the teleconference, which was essentially be to following up from the ad hoc OSCAR project requirements workshop (Geneva, 3-4 Sept. 2014), and address the following issue from the surface weather radars perspective:

> *How to represent surface observing systems capabilities within OSCAR/Surface, including surface weather radars, in such a way that we can easily collect metadata from the operators of these systems, and use the metadata collected with automatic algorithms in order to express such capabilities in quantities that can be combined and averaged for comparing those capabilities with the technology free observational user requirements recorded quantitatively in the OSCAR/Requirements database for an observed variable, geographic region, vertical layer, horizontal domain, and application area ?*

2. Background information on the OSCAR Platform Project

The Secretariat provided an overview on the OSCAR Platform Project and status, as well as requirements for representing the surface-based observing systems capabilities.

3. Observational user requirements

The teleconference reviewed how the observational user requirements are quantitatively represented in the OSCAR database. This information was useful to then discuss how to conduct the Rolling Review of Requirements (RRR) critical review and gap analysis by consistently comparing the observing systems capabilities of various types with the user requirements.

4. WIGOS Metadata Standard, and OSCAR

Jörg Klausen provided an overview of the WIGOS Metadata Standards, which is used as a basis for the representation of WIGOS metadata to be recorded in OSCAR.

5. Representation of capabilities of surface weather radars, and algorithms for the RRR critical review

This item consisted of the core of the discussion for the teleconference.
The participants agreed with the following principles:

- *Quantitative Precipitation Estimation (QPE) products (e.g. Combi-Precip of Switzerland), when available, based on the combination of precipitation observation from various sources, including surface weather radars and precipitation gauges can be regarded as an additional type of observing system, which metadata should then be recorded in OSCAR. Such QPE shall then preferably be used for the RRR critical review when available as they show the increased performance of such networks when their data are combined. In the contrary, metadata from surface weather radars, and precipitation gauges shall be used individually.*
- For consistency with the WIGOS metadata standard, and comparability with the capabilities of other observing systems types (e.g. point observations such as those from AWS), it is feasible and accepted to represent the capabilities of a surface weather radar as a cloud of virtual observing points in a 3D shape.
- Each virtual point should be characterized by its Horizontal Resolution, Vertical Resolution, Uncertainty, Timeliness, and Observing Cycle.
- The participants agreed that a simple mathematical model could be proposed for deriving the cloud of virtual points on the basis of the surface weather radar capabilities. Actual weather conditions influence radar quality (resolution, uncertainty), but cannot be considered for practical reasons so a more simple model based for example on climatology and should be proposed. They agreed that such characterization should remain relatively simple (e.g. based on bulk uncertainty of precipitation or qualitative indicators – to be discussed) in order to come up with a scheme which will be realistic to implement, and relatively straight forward for the radar operators to provide the required metadata. So the problem is three-fold:

  (i) documenting the science behind the model (***Action:*** D. Michelson by 12 Sept. 2014),

  (ii) defining the mathematical model itself (e.g. see below1), i.e. HR = F_1 (x,y,z, metadata), VR = F_2 (x,y,z, metadata), OC = F_3 (x,y,z, metadata), Timeliness = F_4 (x,y,z, metadata), and Uncertainty = F_5 (x,y,z, metadata), and the list of required metadata (***Action:*** ET-SBO, ASAP), and

  (iii) practically implementing the model into OSCAR and generating the cloud of points from the model (***Action:*** D- Michelson to provide a test case cloud of points with supporting information material by 15 Oct. 2014). It was noted that the amount of generated points may impact the technical solution to be chosen for their representation and use in OSCAR; this will be up to the OSCAR project team to discuss and decide at some later stage.

1 Characterization as proposed here http://git.baltrad.eu/trac/wiki/cookbook/RADVOL-QC_BROAD , although weather dependant (so averages or climatology ought to be used for the purpose of OSCAR), could be used as a basis for defining such a model.

6. Interfaces with the WMO Weather Radar Database (WRD)

This item was not discussed at depth during the teleconference but the participants agreed that the WRD was critical for the success of OSCAR, should be preserved, and interfaces between the WRD and OSCAR implemented. Some evolution of the WRD will be needed in order to accommodate additional metadata that may be required for the representation of the surface weather radar capabilities within OSCAR.

7. Any other business

The was no other business discussed during the teleconference.

8. Close

The following action items were agreed upon:

No.	***Action item***	***By whom***	***Deadline***
1	Documenting the science behind the model	D. Michelson	12 Sept. 2014
2	Defining the mathematical model and algorithms for the variation of HR, VR, OC, Timeliness, and Uncertainty as a function of (x,y,z) and some metadata to be defined	ET-SBO	ASAP
3	To provide a test case cloud of points with supporting information material	D. Michelson	15 Oct. 2014

The teleconference closed at 16:20.

ANNEX of ANNEX IV – Examples of related surface radar products

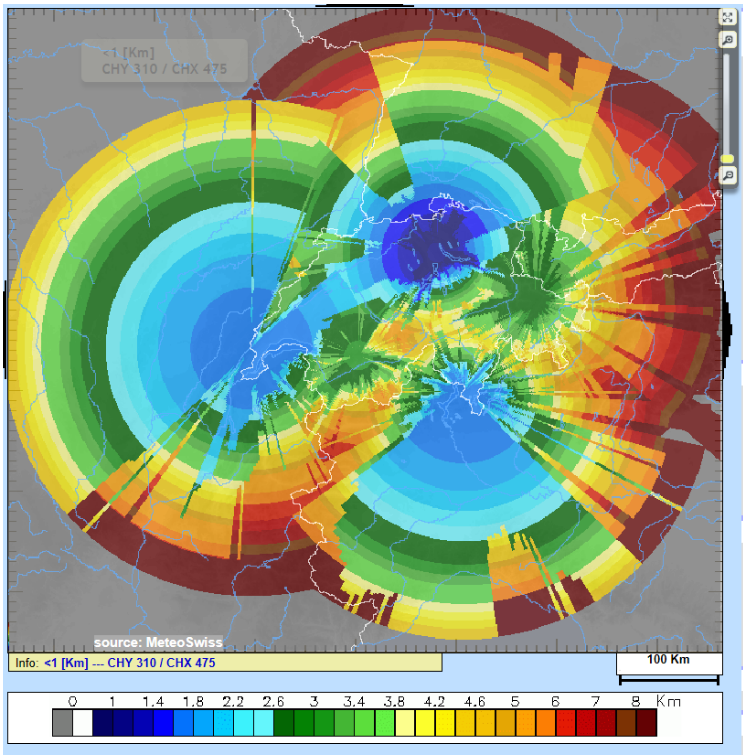


Figure 1: Visibility of the Swiss weather radar network; orography effect is quite apparent

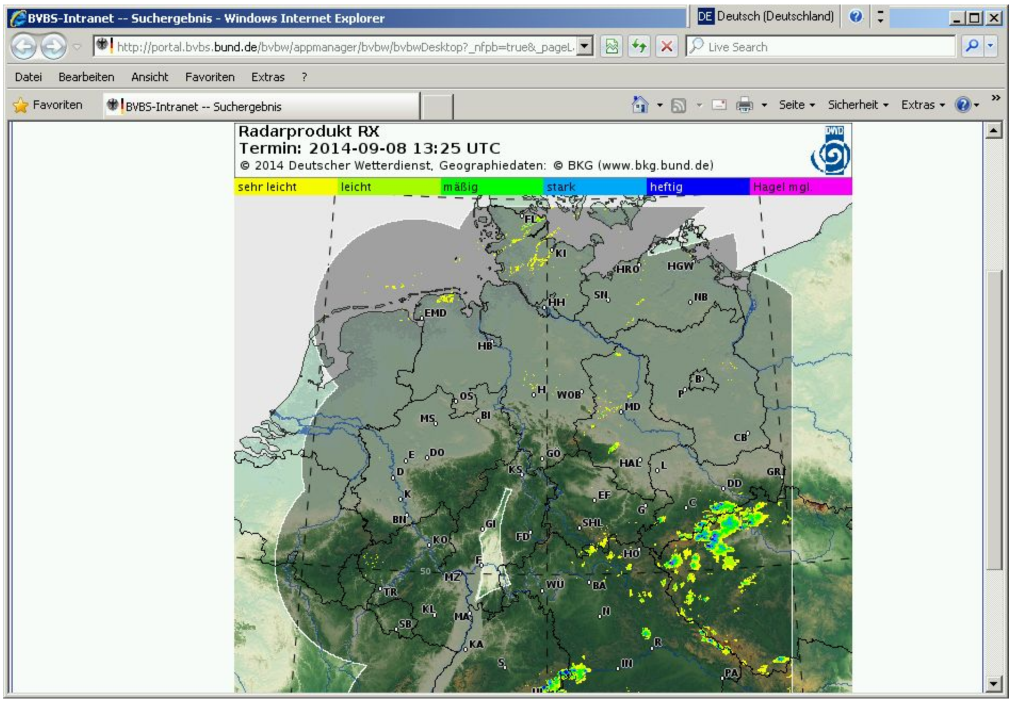


Figure 2: Visibility of the DWD surface weather radar

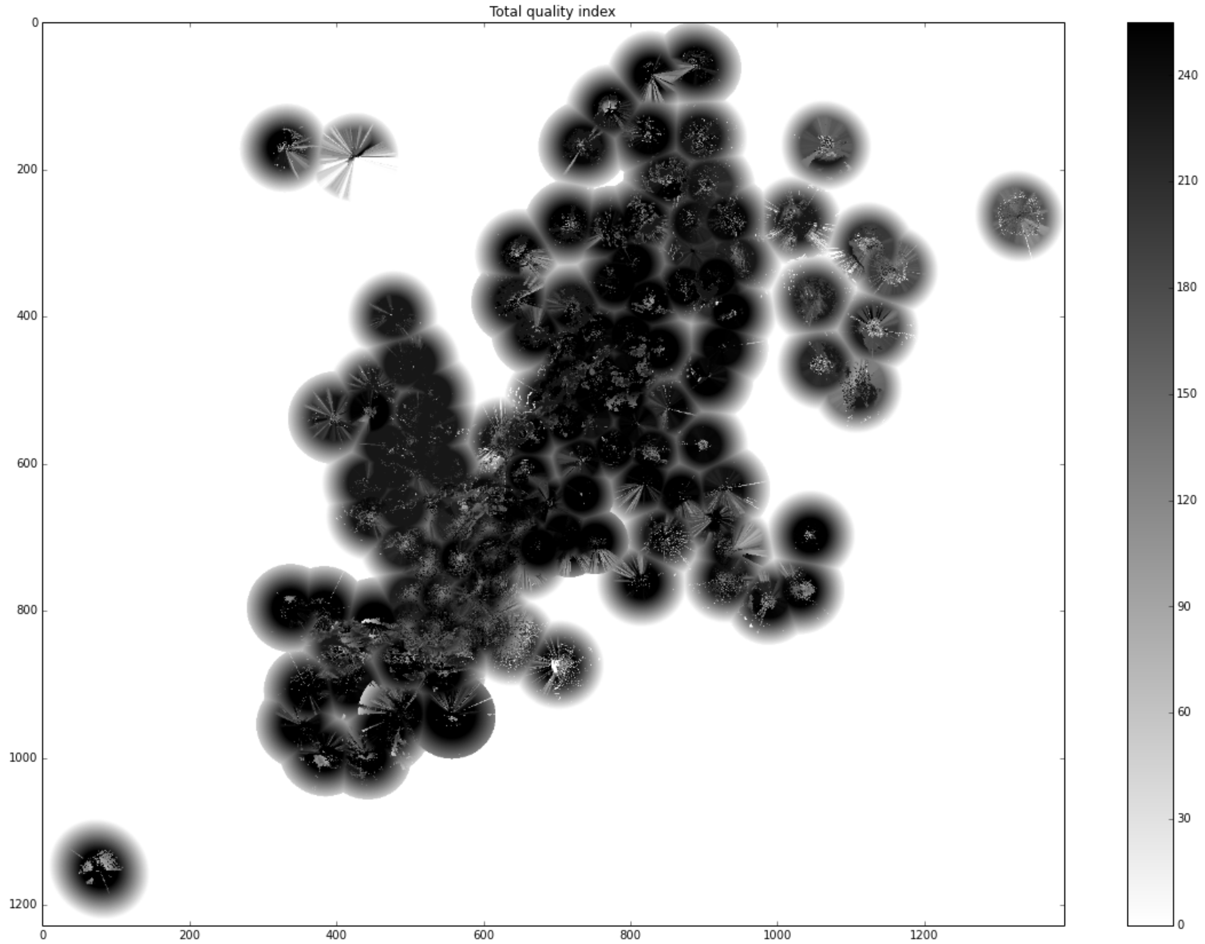


Figure 3: "Total data quality" field associated with a composite image using data from 138 European radars. Darker shades indicate higher quality, lighter shades indicate lower quality. This quality field includes quality indicators that are independent of weather (beam broadening effects, topographical beam blockage) along with weather-dependent indicators (probability of non-precipitation, attenuation by precipitation). 22 August 2014, 06:00 UTC.

ACRONYMS

AA	Application Area
AMDAR	Aircraft Meteorological Data Relay
AMMA	African Monsoon Multidisciplinary Analyses
AMV	Atmospheric Motion Vector
AntON	Antarctic Observing Network
AOPC	Atmospheric Observation Panel for Climate
ASAP	Automated Shipboard Aerological Programme
ASECNA	Agency for Aerial Navigation Safety in Africa and Madagascar
AWS	Automatic Weather Station
CAeM	Commission for Aeronautical Meteorology
CAgM	Commission for Agricultural Meteorology
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CBS-LC-GCOS	CBS Lead Centres for GCOS
CCl	Commission for Climatology
CD	Capacity Development
CEOS	Committee on Earth Observation Satellites
Cg	Congress
CGMS	Coordination Group for Meteorological Satellites
CHy	Commission for Hydrology
CIMO	Commission for Instruments and Methods of Observation
CM	Climate Monitoring
CMA	China Meteorological Administration
CryoNet	Core network of GCW surface measurement sites
DAOS	Data Assimilation and Observing Systems working group
DoD	US Department of Defense
E-AMDAR	EIG EUMETNET AMDAR programme
E-ASAP	EIG EUMETNET Automated Shipboard Aerological Programme
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecast
EC-PORS	Executive Council Panel of Experts on Polar Observations, Research and Services
ECV	Essential Climate Variable
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
E-GVAP	EIG EUMETNET GNSS water vapour programme
EIG	Economical Interest Group
E-PROFILE	EIG EUMETNET Radar Wind Profilers and Backscatter Lidars programme
E-SURFMAR	EIG EUMETNET Surface Marine observation programme
ET-ABO	OPAG-IOS Expert Team on Aircraft-Based Observing Systems
ET-EGOS	Former OPAG-IOS Expert Team on the Evolution of Global Observing Systems
ET-ODRRGOS	Former OPAG-IOS Expert Team on Observational Data Requirements and Redesign of the Global Observing System
ET-OPSLS	CBS/CCl Expert Team on Operational Predictions from Sub-Seasonal to Longer-Time Scales
ET-SAT	OPAG-IOS Expert-Team on Satellite Systems
ET-SBO	OPAG-IOS Expert Team on Surface-Based Observing Systems
ETSI	the JCOMM Expert Team on Sea-Ice
ET-SUP	OPAG-IOS Expert Team on Satellite Utilization and Products
EUMETNET	EIG Grouping of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
E-WINPROF	EIG EUMETNET Operational Networking of Wind Profilers in Europe
FAO	Food and Agriculture Organization of the United Nations
FCDR	Fundamental Climate Data Record
FSO	Forecast Sensitivity to Observation

GAW	Global Atmosphere Watch
GCM	GCOS Cooperation Mechanism
GC-Net	Greenland Climate Network
GCOS	WMO-IOC-UNEP-ICSU Global Climate Observing System
GCW	Global Cryosphere Watch
GCW-IP	GCW Implementation Plan
GEO	Group on Earth Observations
GEO	Operational geostationary satellites
GEWEX	Global Energy and Water Exchanges Project
GFCS	Global Framework for Climate Services
GLAS	GEWEX Global Land/Atmosphere System Study
GNSS	Global Navigation Satellite System
GNSSRO	GNSS Radio Occultation
GNWP	Global NWP
GOOS	IOC-WMO-UNEP-ICSU Global Ocean Observing System
GOS	Global Observing System
GPS	Global Positioning System
GPSRO	GPS Radio Occultation
GRUAN	Global Reference Upper Air Network
GSG	GCW Steering Group
GSICS	Global Satellite Intercalibration System
GSN	GCOS Surface Network
GSNMC	GSN Monitoring Centre
GTN-P	Global Terrestrial Network for Permafrost
GTOS	FAO-WMO-UNESCO-UNEP-ICSU Global Terrestrial Observing System
GTS	Global Telecommunications System
GUAN	Global Upper Air Network
HRNWP	High Resolution NWP
IAVWOPSG	International Airways Volcano Watch Operations Group
IBCS	Intergovernmental Board on Climate Services
ICAO	International Civil Aviation Organization
ICG-WIGOS	Inter-Commission Coordination Group on WIGOS
ICT-IOS	CBS Implementation Coordination Team on Integrated Observing Systems
ICT-SW	WMO Inter-Programme Coordination Team on Space Weather
IGOS	Integrated Global Observing Strategy
IPET-OSDE	OPAG-IOS Inter-Programme Expert Team on the Observing System Design and Evolution
IPET-WIFI	OPAG-IOS Inter-Programme Expert Team on WIGOS Framework Implementation Matters
IPO	International Project Office
ITU	International Telecommunication Union
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
JPO	Junior Professional Officer
JWGC	Joint Working Group on Climate
KAA	Key Activity Area
KNMI	Royal Netherlands Meteorological Institute
LAM	Limited Area Model
LEO	Operational low-Earth orbit satellites
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NCEP	NOAA National Centers for Environmental Prediction
NFP	National Focal Point
NMHSs	National Meteorological and Hydrological Services
NOAA	US National Oceanic and Atmospheric Administration
NVSRF	Nowcasting and Very Short Range Forecasting

NWP	Numerical Weather Prediction
OCG	JCOMM Observations Coordination Group
OPA	JCOMM Observations Programme Area
OPACE	Open Panel of CCl Experts
OPAG	Open Programme Area Group
OPAG-DPFS	CBS OPAG on Data-Processing and Forecasting System
OPAG-IOS	CBS OPAG on Integrated Observing Systems
OPERA	EIG EUMETNET Operational Programme for the Exchange of Weather Radar Information
OQIS	WIGOS Observations Quality Information System
OSCAR	Observing System Capability Analysis and Review tool
OSE	Observing System Experiment
OSDW	Observing System Design Workshop
OSND	Observing system network design
OSSE	Observing System Simulation Experiment
PoC	Point of Contact
PROMICE	Programme for Monitoring of the Greenland Ice sheet
QM	Quality Management
R&D	Research and Development
RA	Regional Association
RBCN	Regional Basic Climatological Network
RBSN	Regional Basic Synoptic Network
R-MAR	OPAG-IOS Rapporteur on Marine Observing Systems
RRR	Rolling Review of Requirements
R-SEIS	OPAG-IOS Co-Rapporteur on Scientific Evaluation of Impact Studies undertaken by NWP centres
RTH	Regional Telecommunication Hub
R-WIP	Regional WIGOS Implementation Plan
SAG	Scientific Advisory Groups
SARP	Standard And Recommended Practices
SG-RFC	OPAG-IOS Steering Group on Radio-Frequency Coordination
SIAF	Seasonal to Inter-Annual Forecasting
SoG	Statement of Guidance
TBD	To be defined
TC	Technical Commission
TDCF	Table Driven Code Form
THORPEX	WMO Observing System Research and Predictability Experiment
TOPC	GCOS Terrestrial Observation Panel for Climate
TT-WMD	ICG-WIGOS Task Team on WIGOS Metadata
TT-WQM	ICG-WIGOS Task Team on WIGOS Quality Management
TT-WRM	ICG-WIGOS Task Team on WIGOS Regulatory Materials
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UR	User Requirement
USA	United States of America
VCP	Voluntary Cooperation Programme
VOSs	Volatile Organic Compounds
WACA-DARE	West Africa as part of the West Africa Climate Assessment and Data Rescue
WAM	West African monsoon
WCRP	WMO-IOC-ICSU World Climate Research Programme
WHOS	WMO Hydrological Observing System
WIGOS	WMO Integrated Global Observing System
WIP	WIGOS Framework Implementation Plan
WIR	WIGOS Information Resource
WIS	WMO Information System
WRF	Weather Research and Forecasting
WWW	World Weather Watch

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