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| **WORLD METEOROLOGICAL ORGANIZATION****\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****COMMISSION FOR BASIC SYSTEMS****CONJOINT MEETING OF** **THE INTER-PROGRAMME EXPERT TEAM ON WIGOS FRAMEWORK IMPLEMENTATION, SUB-GROUP ON OSCAR DEVELOPMENT (IPET-WIFI-SG-OD-1)****AND****AD HOC WORKSHOP ON THE ROLLING REVIEW OF REQUIREMENTS GAP ANALYSIS REQUIREMENTS FOR OSCAR (RRR-OSCAR)** Offenbach, Germany, 6-8 July 2015 | CBS/IPET-WIFI-SG-OD-1/Doc. 9(21.V.2015) \_\_\_\_\_\_\_\_\_ITEM: N/AOriginal: ENGLISH ONLY |

**OSCAR RRR gap analysis Workshop with WMO & MeteoSwiss**

*(Zurich, 11-12 May 2015)*

**PARTICIPANTS**

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**BACKGROUND**

A technical workshop is planned 6-8 July 2015 hosted by DWD, Offenbach, Germany. The workshop in Offenbach will have to make and discuss a proposal on the functional specifications, and algorithms behind, for the RRR gap analysis. In parallel, and in part jointly, the 1st session of the OPAG-IOS IPET-WIFI Sub-Group on OSCAR Development (SG-OD) will also take place (WMO liaison: Roger Atkinson).

**OBJECTIVES**

The objective of the workshop at MeteoSwiss (11-12 May 2015) is to prepare for the Offenbach workshop: We now have the paper from Daniel Michelson *et al.* on how to represent qualitatively the radar capabilities. We know how the space capabilities are (qualitatively) managed in the current OSCAR, and we know how we are representing them for other surface-based observing systems. So we'll have to review all of these, and then brainstorm to find a way to reconcile everything. Then we'll have to discuss the agenda for the Offenbach workshop, discuss who will be providing written input and present. Moreover, the workshop should address the transition of Vol A to OSCAR and the OSCAR support organization, i.e., sharing of responsibilities between WMO and MeteoSwiss.

**DISCUSSION**

1. **Transition of Vol-A to OSCAR**

The workshop noted the following:

* OSCAR will in principle be operationally available as of September 2015.
* New WIGOS Technical Regulations will in principle come into force as of July 2016

The workshop agreed on the following:

* The transition from Vol-A to OSCAR will last between September 2015 and October 2017.
* As of September 2015, National Focal Points will be given the opportunity to decide whether (i) they want to provide their WIGOS metadata directly via OSCAR or (ii) continue to provide their metadata through existing WMO procedures (NB: this will only report a small fraction of the metadata eventually required by WMDS, an aspect we haven’t really discussed at the workshop). Uploads will be possible through the web interface (human interaction through web forms) and machine to machine interfaces/web services. “Staged files” can also be used optionally by the NFPs to ingest metadata into OSCAR. If choosing OSCAR, the NFPs cannot go backwards to using the current Vol-A procedures.
* From that point, OSCAR will become the official repository of WIGOS metadata, and source for Vol-A. OSCAR will therefore produce a report that is similar to Vol-A and could then be used by Vol-A users in place of the existing flat file on the WMO website. The new Vol-A report will include all column headings but will not contain information in all columns.
* Information updated in Vol-A through normal existing procedures will be used to amend and build up the history of WIGOS metadata in OSCAR.
* Protocol and format for feeding information into OSCAR to be discussed by IPET-MDRD, and work completed by mid-2016 (before RA-II Session).
* The late 2016 Regional Association II Session will be an opportunity to ask the Session to check the information in OSCAR (preparatory document with list of RBSB, RBCN shall be made available in advance)
* After September 2017, Vol A will cease to exist and only OSCAR will be used (both input and output). At that time, OSCAR will be fully operational, and Vol-A obsolete.

Action/E. Charpentier: WMO to check approval process for new observing stations to be registered as part of specific networks and identify responsible people (=role “approver” in OSCAR) (RBSN, RBCN, GRUAN, GSN, etc.)

Action/E. Charpentier: WMO to get feedback from key NWP centres on what core information they need from VolA, and to what extent they rely on the current file format.

Action/E. Charpentier: WMO to formulate the requirement for VolA export

Action/J. Klausen: to investigate how bulk (updates on several stations) information can be accepted.

Action/J. Klausen: Make tool available to WMO for ingesting VolA files into OSCAR (note from J. Klausen: we will have to allow some flexibility on the “how” and what the tool looks like, it could also be a work-flow).

1. **General principles regarding the gap analysis within OSCAR**

The workshop reviewed the structure of the Observational User Requirements database within OSCAR, and guidance from the IPET-OSDE Chair, John Eyre regarding the gap analysis. It was agreed that in order to be able to compare the observing systems capabilities with the user requirements, the database criteria (HR[[1]](#footnote-1), VR[[2]](#footnote-2), OC[[3]](#footnote-3), U[[4]](#footnote-4), Timeliness, and stability) could be treated as follows:

Principle 1: The observing systems capabilities should be expressed in terms of the criteria (HR, VR, OC, U, Timeliness, Stability) in which the observational user requirements are expressed.

Principle 2: An OSCAR user willing to make a gap analysis will specify the following elements:

* Measured variable
* Application Area
* Geographical area of interest (and grid resolution if desired)
* Whether the gap analysis should be made on the basis of (i) “Stated Capabilities” based on the WIGOS metadata in OSCAR, or (ii) “Monitored Capabilities” based on actual observations (data) received by the application area users and provided by the monitoring centres.
* Whether the gap analysis should be made for only one criterion (HR, VR, OC, U, Timeliness) or whether all criteria shall be considered at once.
* Inclusion or exclusion of specific sources of observations (manual, automatic, model, code table in WMDS)

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|  | **Stated capabilities** | **Monitored capabilities** |
| **Based on** | * WIGOS metadata
 | * Actual data from the monitoring centres
 |
| **Nature** | * Quantitative (possibly based on qualitative assessment)
 | * Quantitative
 |
| **Usefulness** | * Brings information on the potential of the observing system
 | * Brings information on real capabilities (and gaps)
 |
| **Advantage** | * Complete (all WIGOS metadata)
 | * Easy to estimate quantitatively
 |
| **Drawback** | * Not always reflect actual capabilities
* Difficult to estimate quantitatively for consistency between different types of observing systems
 | * Need monitoring information, which is not always available
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Table 1: Stated capabilities vs. monitored capabilities

Principle 3: Capabilities of remote-sensing instruments and profiling instruments (mobile in situ or remote sensing) shall be estimated or assessed in 3D boxes on the basis of expressing the capabilities for observations of a variable as a cloud of points representing virtual fixed in situ observations. These clouds of points will be derived from the WIGOS metadata or from monitored data existing in such 3D boxes. Estimate/assessment is achieved as indicated in table 1 below.

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| ***Criteria*** | ***HR*** | ***VR*** | ***OC*** | ***U*** | ***Timelines*** | ***Stability*** |
| Computation | Estimate on the basis of network of points | Estimate on the basis of network of points | Attribute | Attribute | Attribute | Not considered for gap analysis |
| Need for gap analysis based on WIGOS metadata | Yes | Yes (profile data only noting that VR can be computed on the basis of a collection of stations at different heights) | Yes | Yes[[5]](#footnote-5) | No (application dependant) | No |
| Need for gap analysis based on Monitored data | Yes | Yes (profile data only) | Yes (reporting may be less frequent that the actual OC of the instrument) | Need to be confirmed (Application dependant) | Yes (Application dependant) | No |

Table 2: Capability estimates in 3D box

Principle 4: When using monitored data for the gap analysis, the monitoring centres (e.g. NWP) shall provide a gridded product (3D) with the required information, i.e. each grid cell containing information on observed variables from specific observing platforms in terms of OC, U, and Timeliness, but not HR and VR.

Principle 5: One shall be able to compute capabilities for active stations on one hand, and for planned or currently silent stations on the other hand. The reporting status of a station shall be deduced from the monitoring data.

Principle 6: If/when assumptions, approximations are made or limitations exist for the gap analysis, these shall be clearly communicated through OSCAR and along with the analysis results.

Principle 7: Profilers are all treated equally, namely as vertical profilers. This applies to AMDAR, radio sondes and other mobile in situ equipment.

Principle 8: Integrated products (e.g. MeteoSwiss CombiPrecip, or the EUMETNET OPERA product) can be regarded as specific observing systems (a virtual instrument), and one should be able to do a gap analysis including such observing systems.

The workshop invited the Offenbach workshop to address the following questions:

Question 1: Observations are sometimes required only during specific environmental conditions or weather events (e.g. Nowcasting) or during specific periods (e.g seasons). It is assumed that the requirements are stated only for when the observations are needed (e.g. required observing cycle during storm condition). This should be confirmed by the Offenbach workshop.

Question 2: Requirements assume regularity/homogeneity (spatial, temporal, OC, U, L): how important are deviations from this assumption of linear distribution?

Question 3: Considering that the requirements as expressed implicitly assume a regular spatial distribution, and considering that points within a 3D box are not necessarily evenly distributed, what statistical method (average, median, other) to use for estimating HR and VR on the basis of points within a 3D box ?

Question 4: The need of Uncertainty for gap analysis purposes using OSCAR needs to be clarified (needed, not needed, needed using WIGOS metadata only, …).

Question 5: There may be value in splitting some predefined layers (e.g. troposphere) into finer ones for the gap analysis. What sort of vertical resolution for the analysis is desirable ?

Question 6: How can the different representativeness of different observations be considered in the expression of capabilities?

Question 7: What is the vertical resolution of the gridded product to be asked from NWP centres to describe capabilities of profilers? For what profilers can we get this information? (all that are received by NWP centres?).

Question 8: If gap analysis is performed on several criteria at once, how can this be aggregated? And how do we take into account that one observation may meet one criterion and another one may meet another one? Requirements are only fulfilled if a capability meets all requirements against which we test. What are the use cases? What do the OSCAR users need? Need flexible reporting, highlight various aspects, …

Question 9: How frequently are gap analysis expected to be repeated? Question 10: Requirements stated do not include all important aspects, e.g., there is no way to specify a requirement on the lead time until “on demand” systems become available. Similarly, there is no way of describing such aspects in the capabilities. This may be very relevant for emergency response and more complex observing systems (e.g., lidar) that would only be ramped up in the event.

1. **Gap analysis for Weather Radar capabilities**

The workshop agreed on the following:

Principle 9: The Michelson et al. model is a good basis to express weather radar capabilities as a cloud of points.

Principle 10: Only precipitation amount at the surface will be used for the gap analysis (wind is too complicated, and depends on precipitation conditions anyway). So the vertical structure of profile data is not considered for this exercise. All that is needed are the capabilities in the foot print on the ground.

Question 11: Need further feedback from radar experts to what extent the quality classification provided by Michelson/Baltrad can be expressed as uncertainty.

1. **Gap analysis for profilers**

The workshop agreed that there is a need to find out what the stated capabilities are for each type of instrument (e.g. for wind profilers, the VR could be expressed as a linear function of the distance from the instrument; for mobile in situ platforms, the VR can be regarded as constant in a layer).

The workshop invited the Offenbach workshop to address the following questions:

Question 12: To propose simple models for each type of profiler for estimating the stated capabilities

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1. HR: Horizontal Resolution [↑](#footnote-ref-1)
2. VR: Vertical Resolution [↑](#footnote-ref-2)
3. OC: Observing Cycle [↑](#footnote-ref-3)
4. U: Uncertainty [↑](#footnote-ref-4)
5. It was noted that Appendix III.I of the GOS Guide (WMO No. 488) provides information of AWS functional specifications with maximum effective range and minimum reported resolution. [↑](#footnote-ref-5)