OSCAR ad hoc workshop on the RRR Gap Analysis Requirements for OSCAR (Offenbach, 6-8 July 2015)

Background information and status of OSCAR

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OSCAR Background

- An evolution of the former WMO-CEOS Database and "GOS Dossier" on the space-based GOS
- Was initiated through the WMO Space Programme in cooperation with former CBS ET-ODRRGOS in support of WMO Rolling Review of Requirements (RRR)
  - Technology free observational users requirements
  - Observing systems capabilities
  - Gap analysis originally done with Excel sheet
- "GOS Dossier" included satellite programme descriptions (satellites & their instruments, gap analysis, estimated performance of satellite products, compliance analysis potential product performances)
OSCAR Background

- Strategy for establishing a database in support of the Rolling Requirements Review (RRR) process was drafted by *ad hoc* group established by ICT-IOS-6 (2010) & approved by CBS Ext 2010

- Requirements Database (avail. since 2011), now included as OSCAR/Requirements

- Content of “Dossier on the space-based GOS” was migrated to OSCAR/Space in 2012

- Missing piece was OSCAR/Surface
  - Partnership with MeteoSwiss initiated in 2014 with blessing of ICG-WIGOS and CBS (through ICT-IOS, and IPET-WIFI)
  - Opportunity to migrate Vol. A to OSCAR

- Available on-line at [oscar.wmo.int](http://oscar.wmo.int)
Rolling Review of Requirements (RRR) and Evolution of Global Observing Systems

Application Areas

Critical review

User requirements

Observing Systems Capabilities (Space & Surface) (OSCAR)

Statements of Guidance (gap analysis)

Impact Studies (e.g. NWP5)

Priorities, cost effectiveness

Long term vision of global observing systems

Implementation Plan (EGOS-IP)

Members’ and Space Agencies Observation Programmes
WMO Application Areas

1. Global Numerical Weather Prediction
2. High Resolution Numerical Weather Prediction
3. Nowcasting and Very Short Range Forecasting
4. Sub-seasonal to longer predictions
5. Aeronautical Meteorology
6. Forecasting Atmospheric Composition
7. Monitoring Atmospheric Composition
8. Providing Atmospheric Composition information to support services in urban and populated areas
9. Ocean Applications
10. Agricultural Meteorology
11. Hydrology
12. Climate Monitoring (GCOS)
13. Climate Applications (Other aspects, addressed by the Commission for Climatology)
14. Space Weather

Cross cutting:
- Global Cryosphere Watch (GCW)
- Global Framework for Climate Services (GFCS)
OSCAR/Requirements

- Repository of Technology Free Observations User Requirements for
  - 14 Application Areas
  - 28 Layers in Atmosphere, Ocean, Terrestrial and Outer Space domains
  - 8 Regional dimensions (global, global ocean, global land, coastal areas, regional, sub-regional, local, point)
  - 260 variables
  - 2 Cross cutting themes (cryosphere, volcanoes)
  - 585 user requirements recorded in the database

- For each Application Area, designated focal points have limited editing rights on the database

- After review and endorsement, these changes become visible to the public

- Process overseen by CBS IPET-OSDE
User requirements for observation (OSCAR/Requirements)

This database is the official repository of requirements for observation of physical variables in support of WMO Programmes and Co-sponsored Programmes. These requirements are maintained by the focal points designated for each application area.

It is the foundation of the Rolling Requirements Review (RRR) process overviewed by the Inter-Programme Expert Team on Observing System Design and Evolution (IPED-OSDE) of CBS. (More information)

The requirements are regularly reviewed by groups of experts nominated by those organizations and programmes. For WMO, this process is conducted by the Inter-Programme Expert Team on Observing System Design and Evolution (IPED-OSDE) and its designated focal points for each of the Application areas.

In addition, Themes offer an additional, cross-cutting view on variables and requirements.

Using the database

To explore the database, you can use the “Quick Search” in the top right corner, when looking for a specific variable or Application area. You can also consult the full tables accessible through the top menu, and use the filter options provided.

The database is open for consultation. Editing is only possible by designated focal points, after login.

For any questions or clarifications regarding the content of the database, please directly contact the respective focal point. A list of all focal points can be found on the Application areas page.

Definitions

Requirements are expressed for geophysical variables in terms of 6 criteria: uncertainty, horizontal resolution, vertical resolution, observing cycle, timeliness, and stability (where appropriate). For each of these criteria the table indicates 3 values determined by experts:

- The “threshold” is the minimum requirement to be met to ensure that data are useful
- The “goal” is an ideal requirement above which further improvements are not necessary
- The “breakthrough” is an intermediate level between “threshold” and “goal” which, if achieved, would result in a significant improvement for the targeted application. The breakthrough level may be considered as an optimum, from a cost-benefit point of view, when planning or designing observing systems.

The “uncertainty” characterizes the estimated range of observation errors on the given variable, with a 68% confidence interval (1σ).
### Requirements defined for *Air pressure (at surface)* (10)

This table shows all related requirements. For more operations/filtering, please consult the full list of Requirements.

**Note:** In reading the values, goal is marked **blue**, breakthrough **green**, and threshold **orange**.

<table>
<thead>
<tr>
<th>Id</th>
<th>Variable</th>
<th>Layer</th>
<th>App Area</th>
<th>Uncertainty</th>
<th>Stability / decade</th>
<th>Hor Res</th>
<th>Ver Res</th>
<th>Obs Cyc</th>
<th>Timeliness</th>
<th>Coverage</th>
<th>Conf Level</th>
<th>Val Date</th>
<th>Source</th>
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</thead>
<tbody>
<tr>
<td>250</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Global NWP</td>
<td>0.5 hPa</td>
<td>1 hPa</td>
<td>15 km</td>
<td>100 km</td>
<td>60 min</td>
<td>6 min</td>
<td>Global</td>
<td>firm</td>
<td>2009-02-10</td>
<td>John Eyre</td>
</tr>
<tr>
<td>251</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Global NWP</td>
<td>0.5 hPa</td>
<td>1 hPa</td>
<td>15 km</td>
<td>100 km</td>
<td>60 min</td>
<td>6 min</td>
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<td>firm</td>
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<td>John Eyre</td>
</tr>
<tr>
<td>335</td>
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<td>Near Surface</td>
<td>High Res. NWP</td>
<td>0.5 hPa</td>
<td>0.8 hPa</td>
<td>1 km</td>
<td>5 km</td>
<td>30 min</td>
<td>15 min</td>
<td>Global</td>
<td>firm</td>
<td>2010-02-01</td>
<td>T Montmonc</td>
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<tr>
<td>335</td>
<td>Air Pressure (at surface)</td>
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<td>0.5 hPa</td>
<td>0.8 hPa</td>
<td>1 km</td>
<td>5 km</td>
<td>30 min</td>
<td>15 min</td>
<td>Global</td>
<td>firm</td>
<td>2010-02-01</td>
<td>T Montmonc</td>
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<tr>
<td>417</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Marine Biology</td>
<td>10 hPa</td>
<td>3 hPa</td>
<td>50 km</td>
<td>75 km</td>
<td>24 h</td>
<td>3 h</td>
<td>Global</td>
<td>firm</td>
<td>2003-10-20</td>
<td>GOOS JPO</td>
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<tr>
<td>487</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Ocean Applications</td>
<td>0.5 hPa</td>
<td>1 hPa</td>
<td>10 km</td>
<td>25 km</td>
<td>30 min</td>
<td>15 min</td>
<td>Global</td>
<td>firm</td>
<td>2011-03-07</td>
<td>All Mafimbo (JC0MM)</td>
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<td>488</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Ocean Applications</td>
<td>1 hPa</td>
<td>5 hPa</td>
<td>1 km</td>
<td>10 km</td>
<td>60 min</td>
<td>3 h</td>
<td>Global</td>
<td>firm</td>
<td>2011-03-07</td>
<td>All Mafimbo (JC0MM)</td>
</tr>
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<td>67</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Climate-AOPC</td>
<td>0.5 hPa</td>
<td>0.8 hPa</td>
<td>200 km</td>
<td>300 km</td>
<td>3 h</td>
<td>3 h</td>
<td>Global</td>
<td>reasonable</td>
<td>2007-07-19</td>
<td>AOPC</td>
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<tr>
<td>68</td>
<td>Air Pressure (at surface)</td>
<td>Near Surface</td>
<td>Climate-AOPC</td>
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<td>0.8 hPa</td>
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<td>3 h</td>
<td>3 h</td>
<td>Global</td>
<td>reasonable</td>
<td>2007-07-19</td>
<td>AOPC</td>
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<tr>
<td>721</td>
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<td>Near Surface</td>
<td>Aeronautical Meteorology</td>
<td>0.5 hPa</td>
<td>1 hPa</td>
<td>200 km</td>
<td>300 km</td>
<td>3 h</td>
<td>3 h</td>
<td>Global</td>
<td>firm</td>
<td>2013-12-05</td>
<td>J van der Meulen</td>
</tr>
</tbody>
</table>
OSCAR/Space – oscar.wmo.int/space

Presentation by Jerome Lafeuille (WMO/SBOSD)
OSCAR/Space – [_link](oscar.wmo.int/space)

- 800-1000 visits per day, from various countries worldwide
- Space agencies, researchers, students, application centres, consultants
- Feeds the CGMS website
- Used as reference for reports, application planning, gap analysis, socio-economic benefit studies, frequency management, etc.
Two kinds of information in OSCAR/Space

- **Factual information:**
  - > 600 satellites
  - > 800 instruments (including ~ 260 for space weather)
  - Regularly updated based on input from space agencies including the reports to CGMS and ET-SAT

- **Expert assessments:**
  - Mapping of instruments to variables with degree of relevance (rated 1 to 5)
  - Mapping with WMO-defined target capabilities (rated 1 to 5)
(1) Factual information content

- Name, purpose
- Mass, power
- Orbit (type, alt, ECT, lon)
- Launch date, end date, status
- Data access, telecom
  - Detailed status, dates
  - Link to details

Satellite payload

- Name, purpose
- Mass, power
- Type, description, scan mode
- Resolution FOV, coverage
- Status
- Spectral characteristics

Satellite

Instrument

Programme

Agency
### Instrument: ABI

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full name</th>
<th>Type of Instrument</th>
<th>Purpose</th>
<th>Short description</th>
<th>Background</th>
<th>Scanning Technique</th>
<th>Resolution</th>
<th>Coverage / Cycle</th>
<th>Mass</th>
<th>Power</th>
<th>Data Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABI</td>
<td>Advanced Baseline Imager</td>
<td>01. Moderate-resolution optical imager</td>
<td>Multi-purpose VIS/IR imagery and wind derivation by tracking clouds and water vapour features</td>
<td>16 channels, balanced VIS, NIR, SWIR, MWR and TIR [see detailed characteristics below]</td>
<td>Replacing IMAGER flown on GOES 8 to 15</td>
<td>Mechanical, 3-axis stabilised satellite, E-W continuous, S-N stepping</td>
<td>Changing with channel (see table)</td>
<td>Full disk every 15 min, 3000 x 5000 km² (&quot;CONUS&quot;, Continental U.S.) in 5 min, 1000 x 1000 km² in 30 s</td>
<td>338 kg</td>
<td>450 W</td>
<td>86 Mbps</td>
</tr>
</tbody>
</table>

**Satellites this instrument is flying on**

- Geostationary Operational Environmental Satellite - 3rd generation (NOAA)
- GOES-R (2015 - 2026)
- GOES-S (2017 - 2028)
- GOES-T (2019 - 2030)
- GOES-U (2024 - 2035)

**Contribution to Space Capabilities**

The instrument contributes to the following Capabilities, as identified in the "Vision for the GO Implementation Plan for the Evolution of Global Observing Systems:

- Multi-purpose VIS/IR imagery from GEO

**Tentative Evaluation of Measurements**

The following list indicates which measurements can typically be retrieved from this category. For full Gap Analysis by Variable, click on the respective variable.

Note: table can be sorted by clicking on the column headers.
(2) Expert assessments: mapping instruments to variables

- Which variables can be derived from a given instrument?
- Which instruments can be used to measure a given variable?

- OSCAR provides first-level response based on expert assessment of instrument design features
- This is the basis of the gap analysis
Tentative Evaluation of Measurements

The following list indicates which measurements can typically be retrieved from this category of instrument. To see a full Gap Analysis by Variable, click on the respective variable.

Note: table can be sorted by clicking on the column headers.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relevance for measuring this Variable</th>
<th>Operational Limitations</th>
<th>Processing maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar EUV flux</td>
<td>2-very high</td>
<td>Referring to the Photosphere</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Solar X-ray flux</td>
<td>2-very high</td>
<td>Referring to the Photosphere</td>
<td>Consolidated methodology</td>
</tr>
</tbody>
</table>
# Measurement Timeline for Solar EUV flux

**Definition:**
Integrated EUV flux over the solar disk.

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<td>EXIS</td>
<td>Very High</td>
<td>GOES-R</td>
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<td>GOES-16</td>
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</table>

## All instruments for measuring Solar EUV flux

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Relevance of Measurement</th>
<th>Processing Maturity</th>
<th>Operational Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>LYRA</td>
<td>Very High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHOCA</td>
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</table>
Mapping instruments to variables: a complex issue requiring expert assessment

- Instrument-variable is not a one-to-one relationship
- Most instruments are measuring «radiances»: product derivation results of complex multispectral processing
- Evolving with the progress of science
- Various degrees of relevance
- Different users have different criteria (depending on application requirements)
- Users and providers may have different views
### Tentative Evaluation of Measurements

The following list indicates which measurements can **typically** be retrieved from this category of instrument. To see a full Gap Analysis by Variable, click on the respective variable.

*Note: table can be sorted by clicking on the column headers.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relevance for measuring this Variable</th>
<th>Operational Limitations</th>
<th>Processing maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind vector over the surface (horizontal)</td>
<td>2-very high</td>
<td>Only over sea</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Soil moisture at surface</td>
<td>2-very high</td>
<td>Vegetation dependent</td>
<td>Methodology being tuned</td>
</tr>
<tr>
<td>Snow water equivalent</td>
<td>2-very high</td>
<td>Snow-depth dependent</td>
<td>Heavily dependent on external info</td>
</tr>
<tr>
<td>Wind speed over the surface (horizontal)</td>
<td>2-very high</td>
<td>Only over sea</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Snow status (wet/dry)</td>
<td>3-high</td>
<td>Snow-depth dependent</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Sea-ice cover</td>
<td>3-high</td>
<td>Coarse resolution</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Leaf Area Index (LAI)</td>
<td>4-fair</td>
<td>No specific limitation</td>
<td>Consolidated methodology</td>
</tr>
<tr>
<td>Soil moisture (in the roots region)</td>
<td>4-fair</td>
<td>Highly indirect</td>
<td>Heavily dependent on external info</td>
</tr>
<tr>
<td>Snow cover</td>
<td>4-fair</td>
<td>Snow-depth dependent</td>
<td>Consolidated methodology</td>
</tr>
</tbody>
</table>
Current Instrument-variable mapping principle

Classes of instruments with similar design features e.g:
- Spectral bands
- Bandwidth
- No of channels
- Polarization
- Etc..

Variable 1
Variable 2
Variable 3
Variable 4
Variable 5
Variable x
Variable y
Instruments are clustered in classes assuming similar design and performances
- Performance of each class based on *implicit* scientific rationale
- Black-box
- Heavy to manage with high number of classes
- Excellent results for Earth Observation instruments (~600 instruments, ~200 classes) but unpractical for Space Weather (too diverse).

Current Class-based approach

New expert system approach

- No assumption made about similarity of instruments
- Performance assessment based on *explicit* expert rules
- Transparent: the rules can be submitted to external reviews
- Each instrument characterized by fully objective features
- Facilitates scientific maintenance: rules are independent of the software itself
- No limitation in number or diversity of instruments
New instrument-variable mapping principle

Instrument design requirements e.g.:  
- Spectral bands  
- Bandwidth  
- No of channels  
- Polarization  
- Scanning mode  
- Etc..

Variable 1
Variable 2
Variable 3
Variable 4
Variable x
Variable y

Objective assessment
Science-based rules

IPET-WIFI SG-OD & OSCAR-RRR workshop, Offenbach, 6-8 July 2015
### Examples of rules

<table>
<thead>
<tr>
<th>For this Variable</th>
<th>With this type of instrument</th>
<th>If the following conditions are true</th>
<th>Then the relevance is</th>
</tr>
</thead>
</table>
| Sea Surface Temperature     | Microwave Radiometer         | • >=2 two-polarisations channels in 4-8 GHz  
• >=1 multi-polarisation channel in 8-12 GHz                                                                                   | Very good             |
| Solar wind velocity         | Particle detector            | • Detects protons, in 0-10 keV,                                                                                   | Excellent             |
|                             |                              | • Over 2π solid angle, sun pointing                                                                            |                       |
|                             |                              | • Energy spectral resolution <10%                                                                               |                       |
|                             |                              | • Angular resolution <0.2π sr                                                                                   |                       |
|                             |                              | • Time resolution <10 s                                                                                         |                       |
Proof of concept

- A tool has been developed in EXCEL in order to:
  - Demonstrate the method
  - Support the creation of a knowledge basis
  - Refine the specification of the development to be made in OSCAR
- Early results
  - No show-stopper
  - The assessment of all EO instruments can be translated into ~2000 expert rules referring to instrument objective properties
  - A heavy task is to assess all instruments against these properties
  - Preliminary results better than OSCAR with potential for improvement
  - The implementation in OSCAR is being designed
Expected benefits

- Increase the value and reliability of OSCAR/Space as reference tool for RRR, studies and applications
  - Improved relevance assessment, especially for «unique» sensors (incl. Space weather)
  - Will enable engaging expert groups to review the rules related to their fields of competence: collaborative resource, shared ownership
- Enables «interactive capability exploration»
  - Using the instrument properties for search/filter functions
  - Customized gap analysis (e.g. GSICS)
- Potential for training applications
  - working on the rules for a variable, virtual instruments…
OSCAR/Surface and OSCAR in the WIGOS and CBS frameworks

Presentation by Etienne Charpentier (WMO/OSD)
OSCAR/Surface – oscar.wmo.int/surface

- An evolution/modernization of WMO No. 9, Volume A, Observing Stations and WMO Catalogue of Radiosondes
- Meant to become the official repository of WIGOS Metadata required for international exchange
  - One-stop-shop for surface- and space-based observing instruments & platforms metadata
  - Allows user to understanding observational data
  - Allows to identify potential synergies
  - A tool for developing countries willing to use OSCAR as their primary WIGOS metadata database
- A database for recording surface-based observing systems capabilities for the purpose of the RRR (WIGOS KAA#3)
  - Objective gap analysis / critical review
  - A tool for planning evolution of the observing system
  - Monitoring evolution of capabilities, compare with plans, look at progress
Welcome to OSCAR

Latest news

2015-05-26

OSCAR/Surface launched at WMO Congress Cg-17

Today, we are happy to present to the Members of WMO the beta version of OSCAR/Surface. OSCAR/Surface complements the already existing OSCARSpace.
OSCAR in the WIGOS Framework

- Contributing to Key Activity Areas (KAA)
  - **KAA#3**: Design, planning and optimized evolution of WIGOS and its regional, sub-regional and national component observing systems
  - **KAA#7**: The WIGOS Information Resource (WIR)

- A component of the WIR – [www.wmo.int/wigos/wir](http://www.wmo.int/wigos/wir)
  - **Goal**: Provide single access point for WIGOS stakeholders (*Network decision makers, Implementation Coordinators, Data users etc.*)
  - Shall contain all relevant information on the status and evolution of WIGOS and its components
  - Formally launched at EC-65 (May 2013)
The WIR Components

- The Portal - [www.wmo.int/wigos/wir](http://www.wmo.int/wigos/wir)

- The « Standardization of Observations » Reference Tool (SORT)
  Referencing WIGOS related standards and best practices into a database for easy search and access to specific documents and/or sections of documents

- The Observing System Capability Analysis and Review Tool (OSCAR)
  A tool for the WMO Rolling Review of Requirements providing information on (i) observational user requirements, (ii) space-based observing system capabilities, and (iii) surface-based observing system capabilities. Includes a critical review module to compare requirements with capabilities.
The WIR web portal - www.wmo.int/wigos/wir

WIGOS Operational Information Resource

The WIGOS Operational Information Resource (WIR)

Note: The WIR is currently under construction, and tools and some of the information meant to be delivered here may not be available at this point. These are added gradually, and the plan is to have WIR completed by Cg-17 (2015).

The WMO Integrated Global Observing System (Wigos) is an integrated, comprehensive, and coordinated system which comprises the present WMO global observing systems, in particular of the in situ and space-based components of the Global Observing System (GOS), the Global Atmosphere Watch (GAW), the Global Cryosphere Watch (GCW), and the WMO Hydrological Observing System (and WHYCOS). WIGOS also provides a framework for the contributions of WMO to the co-sponsored observing systems.

The WIGOS Operational Information Resource (WIR) is a network platform and tool designed to provide Wigos stakeholders with all relevant information on the operational status and evolution of WIGOS and its component observing systems, the operational requirements of WIGOS, including standard and recommended practices and procedures used in the WIGOS framework, and their capabilities to meet observational user requirements of all WMO Application Areas.

The WIR provides information on the following WIGOS topics:

1. WIGOS concept, rationale and benefits
2. Management and coordination mechanism
3. Design, planning and optimized evolution of WIGOS component observing systems
4. Observing System Operation and Maintenance, and Quality Management
5. Standardization, System Interoperability and Data Compatibility
6. Data Discovery, Delivery and Archival
7. Capacity Development, Communication and Outreach
8. WIGOS component observing systems

WIGOS Tools:
- SORT: "Standardization of Observations" Reference Tool
- OSCAR: Observing System Capability Analysis and Review tool
  - OSCAR/Requirements: Observational User Requirements
  - OSCAR/Space: Space-based capabilities
  - OSCAR/surface: Surface-based capabilities

The functional requirements of the WIR are available here.

The diagram below summarises the key WIGOS Framework Activity Areas (click on each activity below for more information):

WIGOS Framework: Key activity areas

- Management of WIGOS Implementation
- Collaboration with co-sponsors and partners
- Data discovery, delivery & archival
- Observing system operation & maintenance
- To oversee, guide and coordinate WIGOS
- Design, planning and optimised evolution
- Capacity Development
- To plan, implement and evolve WIGOS component systems
- To facilitate and support the operation of WIGOS
## OSCAR in the CBS framework

<table>
<thead>
<tr>
<th>CBS Team</th>
<th>Role</th>
<th>Reporting to</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT-IOS</td>
<td>Lead</td>
<td>ICG-WIGOS</td>
</tr>
<tr>
<td>IPET-WIFI</td>
<td>1) Overall coordination and leadership at the technical level</td>
<td>ICT-IOS</td>
</tr>
<tr>
<td></td>
<td>2) Regulatory Materials and metadata required in liaison with ICG-WIGOS and its dedicated Task Teams</td>
<td></td>
</tr>
<tr>
<td>IPET-OSDE</td>
<td>1) Functional requirements with regard to the tools required for the RRR process</td>
<td>IPET-WIFI</td>
</tr>
<tr>
<td></td>
<td>2) Review content required for the RRR process including the observational requirements from application areas</td>
<td></td>
</tr>
<tr>
<td>ET-SAT</td>
<td>Space-based observing systems capabilities (programmatic and technical updates)</td>
<td>IPET-WIFI</td>
</tr>
<tr>
<td>ET-SUP</td>
<td>Space-based observing systems capabilities (user assessments)</td>
<td>IPET-WIFI</td>
</tr>
<tr>
<td>ET-ABO</td>
<td>Aircraft-based observing systems capabilities</td>
<td>IPET-WIFI</td>
</tr>
<tr>
<td>ET-SBO</td>
<td>Surface-based observing systems capabilities</td>
<td>IPET-WIFI</td>
</tr>
<tr>
<td>ICTSW</td>
<td>Space Weather capabilities (surface- and space-based)</td>
<td>IPET-WIFI</td>
</tr>
</tbody>
</table>
Partnership with MeteoSwiss and status of project

- Partnership with MeteoSwiss (MoU) for OSCAR platform migration and further development
  - Phase 1 (2014/2015):
    - Adapting OSCAR/Requirements to MeteoSwiss IT infrastructure
    - Develop OSCAR/Surface with basic observing network types (Annex 1 of doc.) and include it in the MeteoSwiss IT infrastructure
    - Develop critical review module
  - Phase 2 (2016/2017):
    - Interfacing OSCAR/Space to MeteoSwiss IT infrastructure (user requirements are common to both systems)
    - Complement OSCAR/Surface with missing observing network types
    - Integrate Space and Surface into the critical review module?
Collaborate with MeteoSwiss in further specifying the project goals and functional requirements of OSCAR

Provide human resources, including project lead and requirements engineer, in support of the project

Establish the necessary conditions and WMO-internal support for the migration of the “Requirements”, “Space” and “Vol A” components of OSCAR to MeteoSwiss

Establish agreements with the data owners and/or operators of external data sources regarding operational delivery of metadata needed for OSCAR

Inform MeteoSwiss on milestones achieved and major deviations from the project plan
OSCAR Platform Project
(Role of WMO for long term maintenance and operations)

- Seek contributions from WMO Members to the WIGOS Trust Fund for OSCAR
- Establish a line item into the WIGOS Trust fund dedicated to the operations, maintenance, and future evolutions of OSCAR
- Establish contract with MeteoSwiss for contributing to the cost of operating, maintaining, and evolving OSCAR
- Maintain the content of the OSCAR system [overall data owner] and provide human resources for quality monitoring of the system, coordination with Members contributing information to the system, reporting, and liaison with MeteoSwiss regarding maintenance, and future evolutions of the system
- Ensure the cooperation of the external (machine-to-machine) data providers
- Propose future evolutions of the system
- Inform MeteoSwiss on any issues concerning this collaboration
Ad hoc Workshop on OSCAR Project requirements (Geneva, 3-4 Sept. 2014)

- Received guidance from ICT-IOS & IPET-OSDE Chairs
- Reviewed obs. Requirements, and WIGOS Metadata Standard
- Agreed on priority for specific platform types
  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)
Agreed on some principles

- For being representing 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.
Ad hoc Workshop on OSCAR Project requirements (Geneva, 3-4 Sept. 2014)

- **Action items**
  - ET-ABO to finalize and specify the AMDAR metadata required for OSCAR, and the methodology for representing the capabilities
    - Done
  - ET-SBO 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
    - Done (Michelsen et al. model)
  - To discuss with TSMS how to implement the required evolutions of the WRD (i.e. additional metadata), including user interface
    - Underway
  - To implement the required evolutions of the JCOMMOPS Information System (i.e. additional metadata), including the user interface
    - Underway
Agreed on some principles

- Quantitative Precipitation Estimation (QPE) products (e.g. Combi-Precip of Switzerland), when available, based on the combination of precipitation observation from various sources (e.g. weather radars, precip. 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 RRR gap analysis, 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.

- Simple mathematical model could be proposed for deriving the cloud of virtual points on the basis of the surface weather radar capabilities.
Status of OSCAR/Surface

Presentation by Jörg Klausen (MeteoSwiss)
Current status of OSCAR/Surface

- Successful demonstration of phase 1 prototype at Cg-17 (June 2017)
  - OSCAR Booth
  - OSCAR side Event
  - OSCAR Brochure
  - Members obligations with regard to OSCAR included in Technical Regulations and WIGOS Manual to come into force in July 2016
- Operational as of September 2015
Data integration

- **GAWSIS**
  - Metadata for the Global Atmosphere Watch
- **WMO Pub 9 Vol A**
  - Catalogue of synoptic and upper-air stations of GOS
- **JCOMMOPS**
  - Marine element of GOS / GOOS
- **WMO Radar DB**
  - World-wide radars
- **Amdar**
  - Coming soon …

<table>
<thead>
<tr>
<th>Dataset</th>
<th># stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAWSIS</td>
<td>1’053</td>
</tr>
<tr>
<td>WMO Pub 9 Vol A</td>
<td>13’026</td>
</tr>
<tr>
<td>JCOMMOPS</td>
<td>11’387</td>
</tr>
<tr>
<td>WMO Radar DB</td>
<td>762</td>
</tr>
</tbody>
</table>

IPET-WIFI SG-OD & OSCAR-RRR workshop, Offenbach, 6-8 July 2015
OSCAR quick access & reports

Quick access & Map filter

Generate station report by:
- Station name
- WMO ID

Generate station lists by:
- Country
- Program

Find people by:
- Contact name

Filter map

By program / network:
- GAW
- GOOS
- GCW
- GOOS
- GOS
- GTS
- HWRP

Detailed station report

IPET-WIFI SG-OD & OSCAR-RRR workshop, Offenbach, 6-8 July 2015
OSCAR search

Various search targets

Finely tuned search

IPET-WIFI SG-OD & OSCAR-RRR workshop, Offenbach, 6-8 July 2015
OSCAR search results

Integration with GoogleEarth

Download for further analysis

<xml version="1.0" encoding="UTF-8"?>
  <list>
    <Station>
      <wmoRa>Asia</wmoRa>
      <country>China</country>
      <station>SHANTOU</station>
      <latitude>23.35</latitude>
      <longitude>116.6666666667</longitude>
      <elevation>4</elevation>
      <wmoIndex>0-20001-0-59316</wmoIndex>
    </Station>
  </list>
OSCAR management console

- Stations
  - Basic characteristics
  - Photos
  - History
- Observations
  - Location
  - Variable
  - Methods
  - Instruments
  - Quality and uncertainty
  - History
- Contacts
- Bibliographic references
Security and user management

- **Authentification** by identity provider (Swiss Government)
- **Authorization** within application based on «trust-relationships» and various «user roles»
Outlook Phase I (OSCAR/Surface)

- Operational processing of machine-based sources (GAW and related archives, JCOMMOPs, WMO Radar DB)
- Development and implementation of WMDS exchange format for machine-to-machine import/export
  - OGC/ISO-compliant
  - XML, JSON, CSV?
- “Vol A”-legacy export format

- Phase-out of Vol A (by end of 2016)
Outlook Phase II (subject to available resources)

- ABOS/AMDAR interface
- Migration of OSCAR/Requirements
- Interface OSCAR/Space with OSCAR/Surface
- Other data sources for OSCAR/Surface, e.g.

<table>
<thead>
<tr>
<th>Upper air soundings from ships (ASAP)</th>
<th>Road weather stations</th>
<th>Tide gauges (all)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote sensing profiling stations</td>
<td>Urban stations</td>
<td>Aerosol Optical Depth</td>
</tr>
<tr>
<td>Lightning detection systems</td>
<td>Research Vessels</td>
<td>Ground-based space weather observing stations</td>
</tr>
<tr>
<td>All hydrological Stations (WHOS)</td>
<td>Rigs &amp; Platforms, Automatic Sea Stations</td>
<td>Partner AWS</td>
</tr>
<tr>
<td>Ground water stations</td>
<td>Profiling gliders</td>
<td>Webcams</td>
</tr>
</tbody>
</table>

- OSCAR/Analysis ("critical review") component
Thank you for your attention