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WIGOS & OSCAR

... Where Observational Requirements
Meet Observational Capabilities

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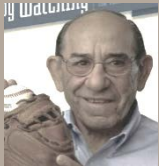
Outline

- WIGOS
- WIGOS metadata standard and exchange format(s)
- OSCAR/Surface
- Outlook

WIGOS

“If you don't know where you are going,
you'll end up someplace else.”

— Yogi Berra





WIGOS (WMO Integrated Global Observing System)

- A governance framework for WMO and co-sponsored observing systems, surface-based and space-based
- A strategy to do more with less
- An information resource





How to do more with less?

- Specify requirements
- Document existing capabilities
- Identify gaps
- Collaborate and integrate
 - Identify partners
 - Eliminate unnecessary redundancies
 - Automate
 - Streamline data operations



Example: Mbour, Senegal





WIGOS Targeted observing systems

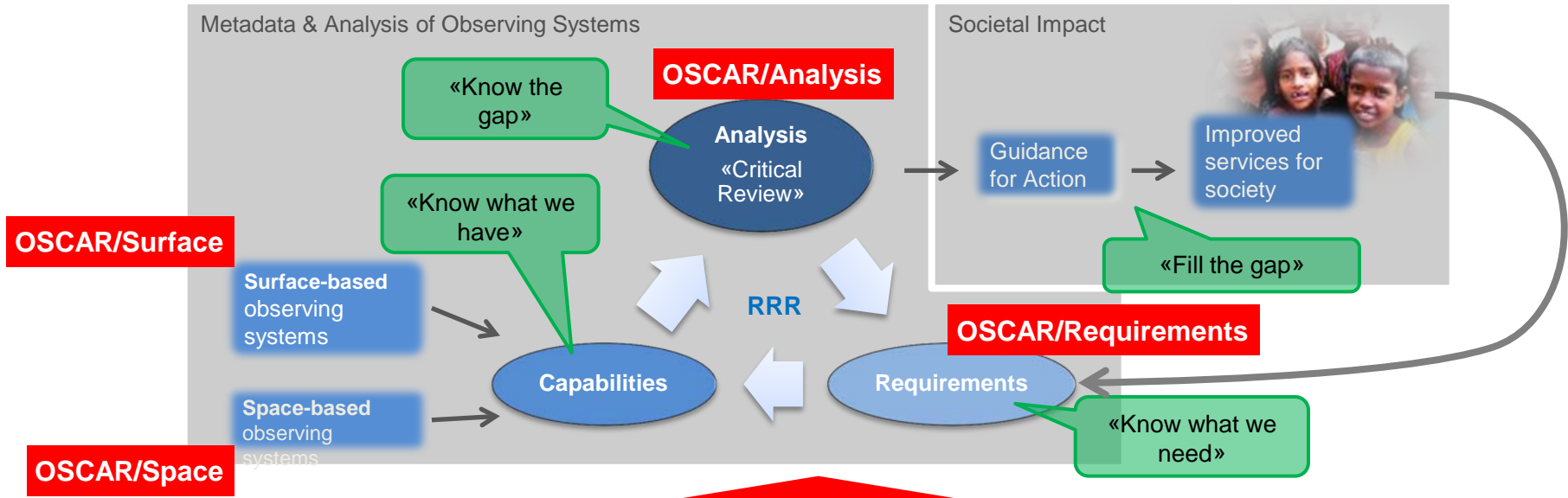
- WMO Observing Systems
 - Global Observing System (WWW/**GOS**)
 - Observing component of Global Atmospheric Watch (**GAW**)
 - WMO Hydrological Observing System (**WHOS**)
 - Observing component of Global Cryosphere Watch (**GCW**)
- Co-Sponsored Observing Systems
 - Global Climate Observing System (**GCOS**) (WMO-IOC-UNEP-ISC)
 - Global Ocean Observing System (**GOOS**) (IOC-WMO-UNEP-ISC)





RRR and OSCAR

Evolve observing systems rationally → WIGOS “Rolling Review of Requirements” Process

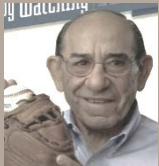


Enable adequate use of observational data → Operational Meteorology, Climatology, Public Health, ...

WIGOS metadata standard and exchange format(s)

“If the world were perfect, it wouldn't be.”

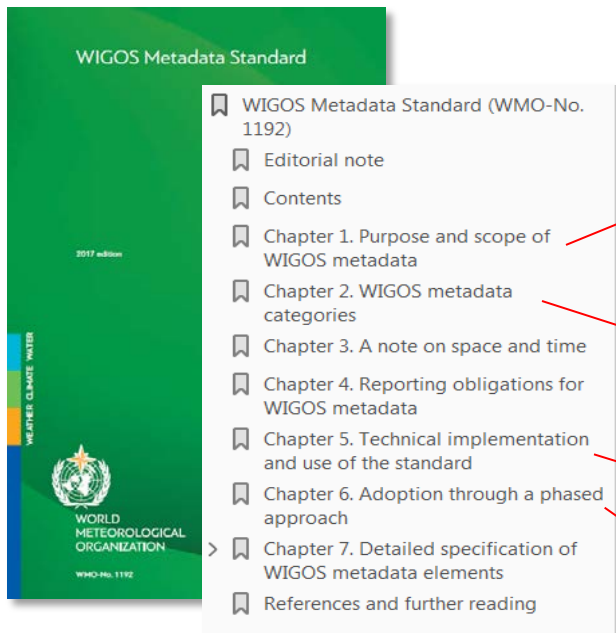
— Yogi Berra





WIGOS Metadata Standard

Approved by WMO Cg-17 (2015)



- Land, ocean, space
- Fixed, mobile observing facilities
- In-situ, remote-sensing instruments
- Physical, chemical, biological, hydrological observations
- Weather, climate, warnings, ...

1. Observed variable
2. Purpose of observation
3. Station/ platform
4. Environment
5. Instruments & methods of observation
6. Sampling
7. Data processing and reporting
8. Data Quality
9. Ownership and Data Policy
10. Contact

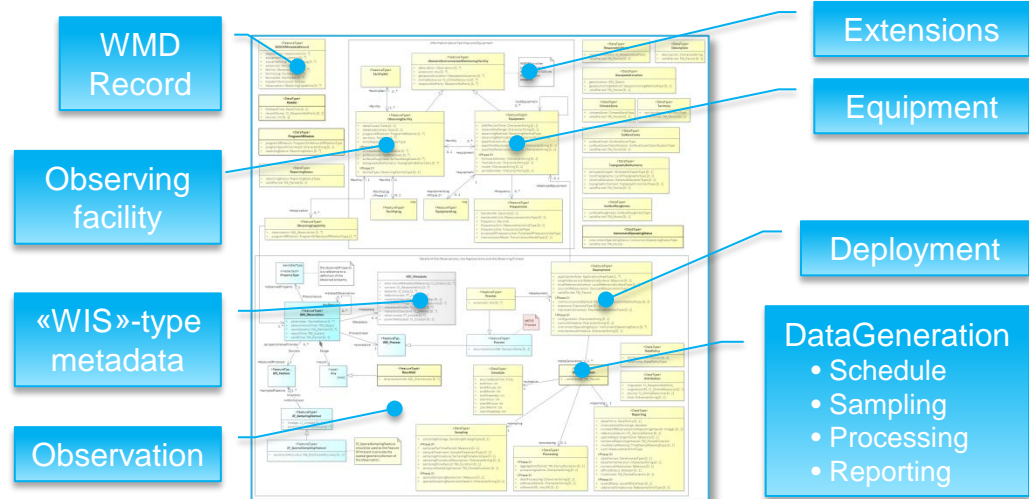
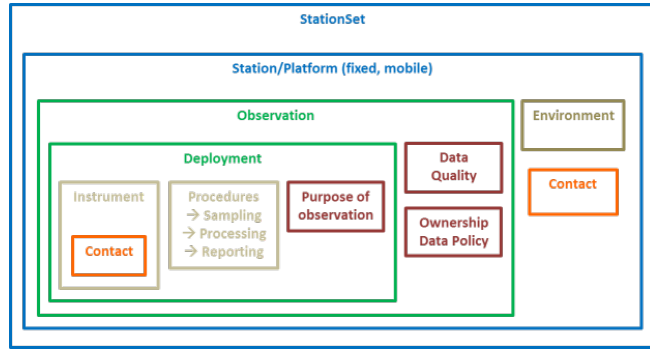
XML schema & API

2016 - 2019

<https://wis.wmo.int/WIGOS-MD>



WIGOS metadata exchange format(s)



1. Observed variable
2. Purpose of observation
3. Station/ platform
4. Environment
5. Instruments & methods of observation
6. Sampling
7. Data processing and reporting
8. Data Quality
9. Ownership and Data Policy
10. Contact

```

<?xml version="1.0" encoding="UTF-8"?>
<wmdr:WIGOSMetadataRecord xsi:schemaLocation="http://def.wmo.int/wmdr/2017 file:///C:/svn/wmdr/branches/develop/
xmins:sams="http://www.opengis.net/samplingSpatial/2.0" xmins:sam="http://www.opengis.net/sampling/2.0" xmins:
xmins:gmd="http://www.iso/211.org/2005/gmd" xmins:xlink="http://www.w3.org/1999/xlink" xmins:wmdr="http://def.
-wmdr:headerInformation owns="false">
  <wmdr:Header/>
  <wmdr:headerInformation/>
  <wmdr:facility/>
  <wmdr:ObservingFacility gml:id="0-20008-0-JFJ">
    <gml:description>The high alpine research station Jungfraujoch is situated on a mountain saddle between the
    surrounded by highly industrialized regions at much lower altitudes. This special geographical situation of
    layer to the free troposphere.</gml:description>
    <gml:identifier codeSpace="http://wigos.wmo.int">http://wigos.wmo.int/0/20008/0/JFJ</gml:identifier>
    <gml:name>Jungfraujoch</gml:name>
  </wmdr:ObservingFacility>
  </wmdr:facility>
</wmdr:WIGOSMetadataRecord>

```

WMDR
XSD
XML

OSCAR/Surface

Reference implementation of WMDS



Public web interface

Various search targets and results export possibilities

Management console for registered users

oscar.wmo.int/surface
gawsis.meteoswiss.ch

Search for stations

Search for stations

Station name

Search term

Search using advanced criteria

Criteria setting: All Any

Station type

- Air (float)
- Air (moored)
- Land (float)
- Land (moored)
- Upperwater (float)
- Satellite (spaceborne)
- Underwater (moored)
- Sea (float)
- Sea (moored)
- Underwater (moored)

Program / network affiliation

WMO ID / Country

Organization

Variable

More search options

Home Search Critical review Management

OSCAR

Observing Systems Capability Analysis and Review Tool

Welcome to OSCAR/Surface

OSCAR/Surface is the World Meteorological Organization's official repository of metadata on surface-based meteorological and climatological observations that are intended for international exchange. For more details on OSCAR/Surface, please visit the About section.

Quick access

Generate station report by:

Station name

WMO ID

Generate station lists by:

Country

Type

Find people by:

Contact name

Filter map

By program / network:

- WIGOS components
- GOS
- GAW
- WHOS
- GCW

air • land or ocean surface • sub-surface • lake or river •

Latest news

Industry-standard technology stack

- Oracle DB, ArcGIS
- JEE, AngularJS

Safe and secure, traceable

Finely tuned search

Detailed station report



Restricted management console

- Stations
 - Basic characteristics
 - Photos
 - History
- Observations
 - Location
 - Variable
 - Methods
 - Instruments
 - Quality and uncertainty
 - History
- Contacts
- Bibliographic references & documents

The screenshot shows the OSCAR (Observing Systems Capability Analysis and Review Tool) web interface. The top navigation bar includes links for Home, Search, Critical review, and Management. The main content area is titled 'Register new station' and contains a form with the following sections:

- Station characteristics:** Includes radio buttons for 'Basic view' (selected) and 'Advanced view'.
- Name:** A text input field.
- Date established:** A date picker.
- Station type:** A dropdown menu with 'Land (fixed) (Observing facility on solid terrain, at fixed position)' selected.
- WMO Station Identifier:** A text input field with a '+ Add WMO Station Identifier' link.
- WMO region:** A dropdown menu.
- Country / territory:** A dropdown menu with '+ Add country / territory' link.
- Coordinates:** A text input field with '+ Add latitude / longitude / elevation / geospatial method' link.
- Time zone:** A dropdown menu with '+ Add time zone' link.
- Supervising organization:** A text input field with '+ Add supervising organization' link.

Buttons for 'Save as draft', 'Submit', and 'Cancel' are located at the top right of the form.



GUI interface to API endpoint for testing ...

- Upload full records or increments
- Register or update stations, observations, deployments, contacts, ...
- Flexible + powerful = tricky!

```
<?xml version='1.0' encoding='UTF-8'?>
<wmo:WMOObserveDataUpload xmlns:wmo="http://ddp.wmo.int/wmo/2012/7/files"
xmlns:cm="http://www.opengis.net/wml/2006/1"
xmlns:os="http://www.wmo.int/wmo/2006/1"
xmlns:osm="http://www.wmo.int/wmo/2006/1"
xmlns:oscd="http://www.wmo.int/wmo/2006/1"
xmlns:osid="http://www.wmo.int/wmo/2006/1"
xmlns:osca="http://www.wmo.int/wmo/2006/1"
xmlns:oscb="http://www.wmo.int/wmo/2006/1"
xmlns:oscc="http://www.wmo.int/wmo/2006/1"
xmlns:oscd="http://www.wmo.int/wmo/2006/1"
xmlns:osce="http://www.wmo.int/wmo/2006/1"
xmlns:oscf="http://www.wmo.int/wmo/2006/1"
xmlns:oscg="http://www.wmo.int/wmo/2006/1"
xmlns:osch="http://www.wmo.int/wmo/2006/1"
xmlns:osci="http://www.wmo.int/wmo/2006/1"
xmlns:oscj="http://www.wmo.int/wmo/2006/1"
xmlns:osck="http://www.wmo.int/wmo/2006/1"
xmlns:oscl="http://www.wmo.int/wmo/2006/1"
xmlns:oscm="http://www.wmo.int/wmo/2006/1"
xmlns:oscn="http://www.wmo.int/wmo/2006/1"
xmlns:osco="http://www.wmo.int/wmo/2006/1"
xmlns:oscp="http://www.wmo.int/wmo/2006/1"
xmlns:oscq="http://www.wmo.int/wmo/2006/1"
xmlns:oscr="http://www.wmo.int/wmo/2006/1"
xmlns:oscs="http://www.wmo.int/wmo/2006/1"
xmlns:osct="http://www.wmo.int/wmo/2006/1"
xmlns:oscu="http://www.wmo.int/wmo/2006/1"
xmlns:oscv="http://www.wmo.int/wmo/2006/1"
xmlns:oscw="http://www.wmo.int/wmo/2006/1"
xmlns:oscx="http://www.wmo.int/wmo/2006/1"
xmlns:oscy="http://www.wmo.int/wmo/2006/1"
xmlns:oscz="http://www.wmo.int/wmo/2006/1"
xmlns:osca="http://www.wmo.int/wmo/2006/1"
xmlns:oscb="http://www.wmo.int/wmo/2006/1"
xmlns:oscc="http://www.wmo.int/wmo/2006/1"
xmlns:oscd="http://www.wmo.int/wmo/2006/1"
xmlns:osce="http://www.wmo.int/wmo/2006/1"
xmlns:oscf="http://www.wmo.int/wmo/2006/1"
xmlns:oscg="http://www.wmo.int/wmo/2006/1"
xmlns:osch="http://www.wmo.int/wmo/2006/1"
xmlns:osci="http://www.wmo.int/wmo/2006/1"
xmlns:oscj="http://www.wmo.int/wmo/2006/1"
xmlns:osck="http://www.wmo.int/wmo/2006/1"
xmlns:oscl="http://www.wmo.int/wmo/2006/1"
xmlns:oscm="http://www.wmo.int/wmo/2006/1"
xmlns:oscn="http://www.wmo.int/wmo/2006/1"
xmlns:osco="http://www.wmo.int/wmo/2006/1"
xmlns:oscp="http://www.wmo.int/wmo/2006/1"
xmlns:oscq="http://www.wmo.int/wmo/2006/1"
xmlns:oscr="http://www.wmo.int/wmo/2006/1"
xmlns:oscs="http://www.wmo.int/wmo/2006/1"
xmlns:osct="http://www.wmo.int/wmo/2006/1"
xmlns:oscu="http://www.wmo.int/wmo/2006/1"
xmlns:oscv="http://www.wmo.int/wmo/2006/1"
xmlns:oscw="http://www.wmo.int/wmo/2006/1"
xmlns:oscx="http://www.wmo.int/wmo/2006/1"
xmlns:oscy="http://www.wmo.int/wmo/2006/1"
xmlns:oscz="http://www.wmo.int/wmo/2006/1"/>

```

Generate XML

copy/paste

The screenshot shows the OSCAR web application interface. At the top, there's a navigation bar with 'Home', 'Search', 'Critical view', and 'Management'. A central message reads: "Note: This is the test environment, use OSCAR for the operational environment." Below this, a sidebar contains various management tools: 'Stations', 'Register new station', 'New station editors', 'Contacts', 'Register new contact', 'My contacts', 'Reference data', 'Instruments', 'Methods', 'Variables', 'Organisations', 'Programs', 'Administration', 'User management', and 'Audit logs'. The main content area displays a 'Copy to clipboard your XML below:' section with a large text area containing XML code. Below the XML area is a 'Submit XML' button.

log

The screenshot shows a log window with the title 'Status: SUCCESS_WITH_WARNINGS' and 'XML parsing logs:'. The log content indicates that the XML was parsed with several exceptions/issues:
- REF_6: No value found for the element "facility/responsibleParty/validPeriod". Information for this item is discarded.
- REF_3: The element "ObservingFacility/_programAffiliation" with WMO306_CD = "GOS" is not linked with any observation under "observation/programAffiliation", thus it is discarded.

new/updated report

The screenshot shows a station report for 'Jungfraujoch (Switzerland)'. It includes details such as 'Part of Jungfraujoch (JUNGFRAUJOCH) in WMO Region VI - Europe', 'Station characteristics', 'Name: Jungfraujoch', 'Station alias: Jungfraujoch', 'Date established: 1957-09-28', 'Station type: Land (fixed)', 'Station classes: WIGOS Station Identifiers', and 'WIGOS Station Identifier: 0-20008-0-JFJ'. A map of Switzerland highlights the station location. At the bottom, it provides the 'WMO region: VI - Europe', 'Country / Territory: Switzerland', 'Coordinates: > 46.5474891663°N, 7.9850897789°E, 7.56m, QPS', 'Time zone: > UTC+1', and a 'Site description: > The high alpine research station Jungfraujoch is situated on a mountain saddle between the two mountains Jungfrau (4158m a.s.l.) and Aletsch (4099m a.s.l.). The station is located in the center of Europe at an altitude of 3500m a.s.l. and is surrounded by highly industrialized regions at much lower altitudes. This



REST API for search and upload

- https://oscar.wmo.int/surface/rest/api?_wadl
- Public (GET) endpoints, e.g., station search
- Private (POST) endpoint requiring security token for upload of XML and different scope
 - NMHSs → their territory
 - World data centres → global
 - Instrument experts → instrument catalogue

```
- <resource path="/upload">
- <method name="POST">
- <request>
- <representation mediaType="application/xml">
  <param type="xs:string" style="plain" name="request"/>
</representation>
</request>
- <response>
  <representation mediaType="application/json">
</response>
</method>
</resource>
```

Stations

Register new station

Pending approvals

My stations

View linked stations

Contacts

Register new contact

My contacts

Manage machine access

Reference data

Instruments

Homepage > Management > Contacts > Manage machine access

Generate security token for NMHS Surname NMHS Name

I accept the conditions for use of security tokens as specified in the [General conditions for use of this application]

Generate

Security token: 35a4b6c5-04a9-4c51-8a22-8e6a9078e1b10

This token is only displayed once, immediately after generation. Please copy the token and embed it in your scripts. The token needs to be sent in the HTTP header 'X-WMO-WMDR-Token' with each request.

Expiration date: 2019-10-03

```
>>> url = 'https://oscar.wmo.int/surface/rest/wmd/upload/'
>>> headers = {'X-WMO-WMDR-Token': '35a4b6c5-b4a9-4c51-ba22-8e6a9078e1b1'}
>>> files = {'file': open('observations_0-2008-0-JFJ_atmosSurfaceOzone.xml', 'rb'), 'application/xml'}
>>> r = requests.post(url, headers=headers, files=files)
>>> r.text
{
  ...
  "files": {
    "file": "<?xml version='1.0' encoding='UTF-8'?><wmdr:WIGOSMetadataRecord xmlns:wmdr=..."
  },
  ...
}
```

Outlook

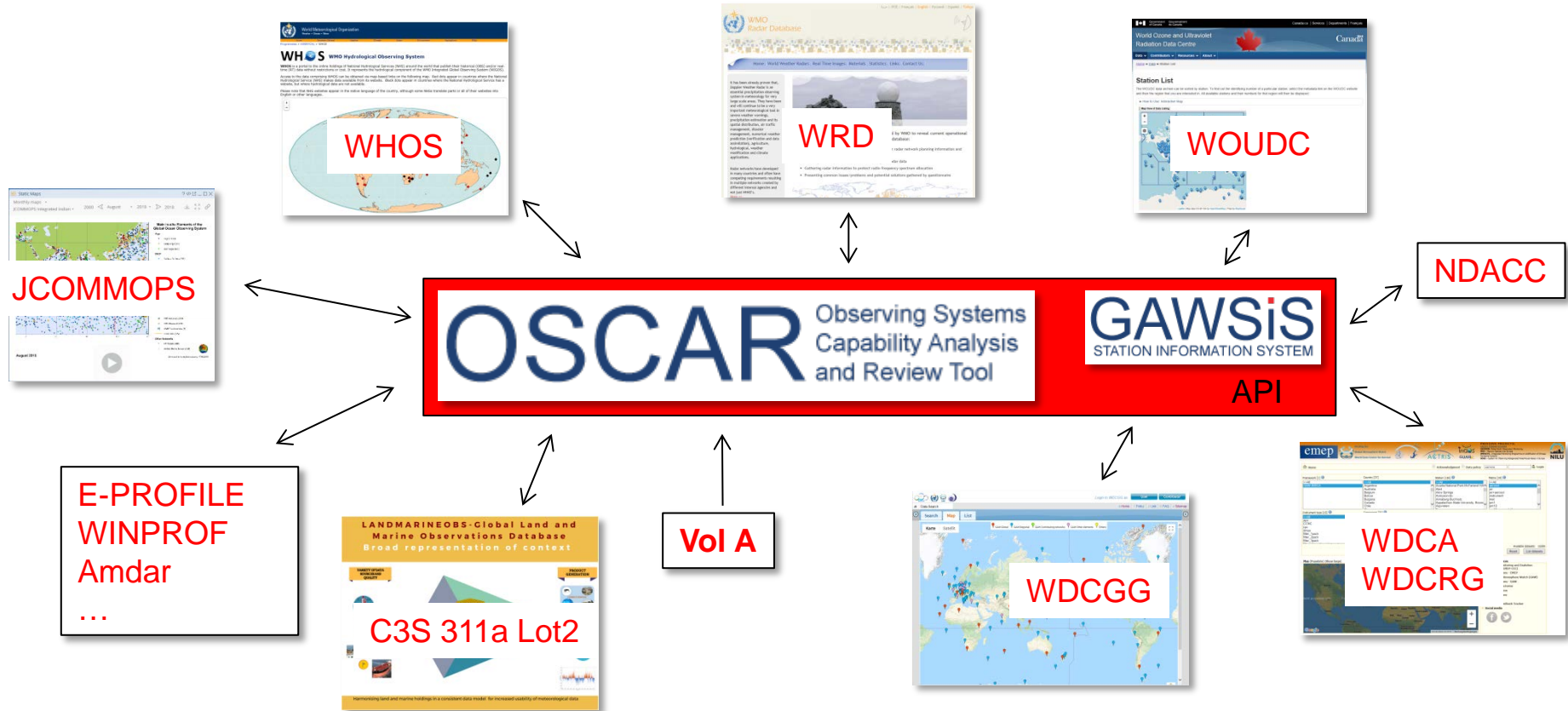
“Cut my pie into four pieces, I don’t think I could eat eight.”

— Yogi Berra





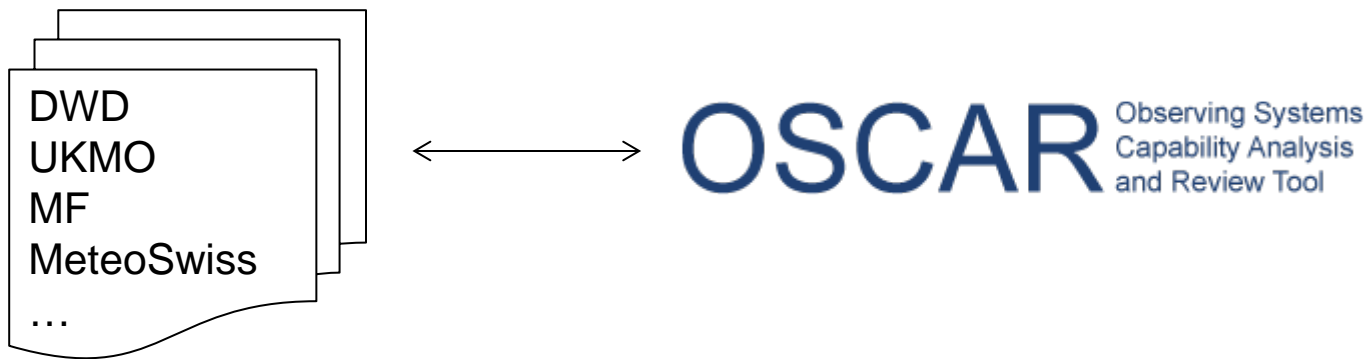
(Re-)link data centres to OSCAR/Surface





Link NMHSs to OSCAR/Surface

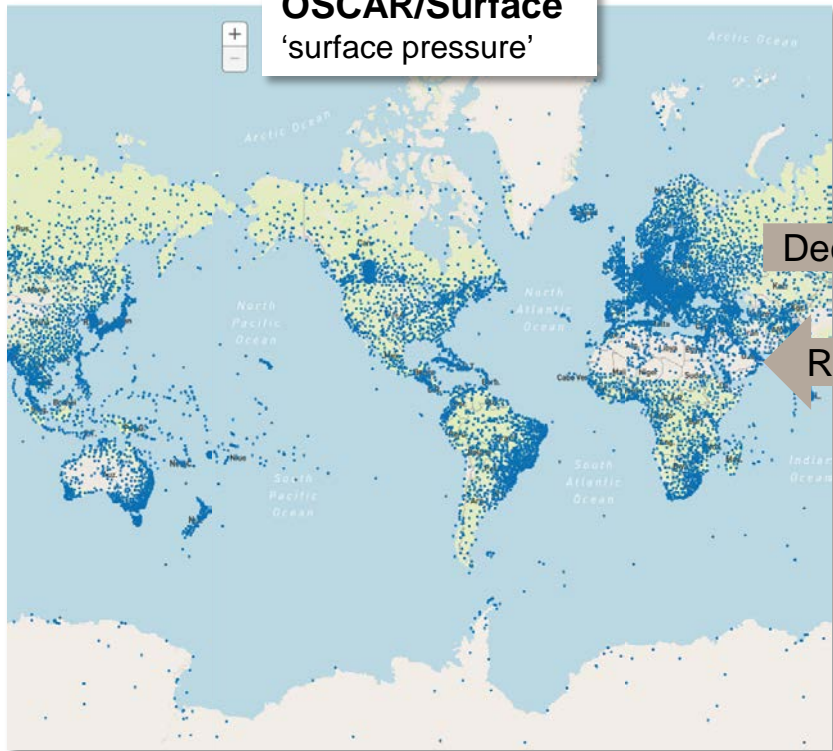
- Primary candidates are the larger services with own metadata repositories
 - Export WMDR records in XML
 - Upload to OSCAR/Surface using API





OSCAR/Surface & WIGOS Data Quality Monitoring System (WDQMS)

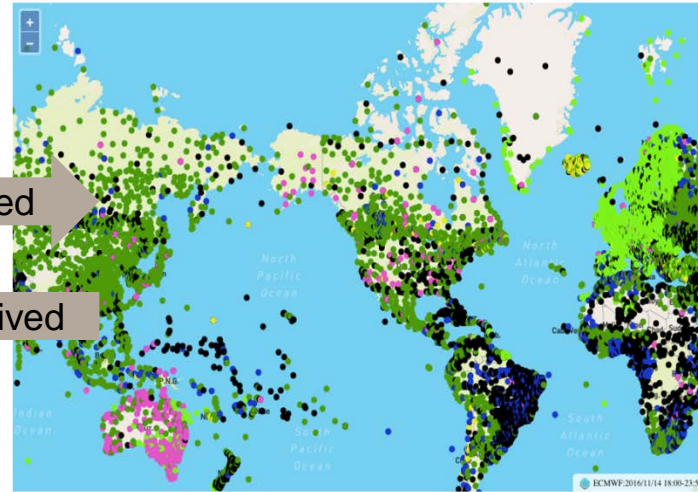
OSCAR/Surface
'surface pressure'



Declared

Received

WDQMS Pilot Project with NWP Centres



NWP monitoring pilot project

ECMWF select center
2016/11/14 18:00 select date
Surface Pressure (110)

Nr. expected vs. Nr. Received

all observations in period
two observations in period
one observation in period
did not report in period
data in WIGOS
more than 100%

Homepage for monitoring output from WDMQS Pilot Project
(page is not password-protected, but link is not publicly visible)





Improve OSCAR/Surface API

- Extend API to allow retrieval of
 - Full and partial station records as
 - WMDR records (XML, JSON)
 - WIS records (XML, JSON)
 - Lists based on parameterized searches
- ...



Furthermore ...

- Integration of OSCAR toolset
- Integrate ABOS
- Multilingual support
- Evolve web application's functionalities, workflows ...



Training



Please let us know about your training needs!



RA III Lima 2017

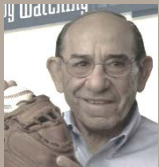
RA IV Habana 2018



Questions?

“If you ask me anything I don't know, I'm not going to answer.”

— Yogi Berra





Thank you for your attention

- For more information:
- oscar@meteoswiss.ch
- oscar@wmo.int



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