

WIGOS Technical Systems; OSCAR/Surface and the WIGOS Data Quality Monitoring System



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

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The WIGOS Pre-Operational Phase (2016-2019)

- Approved by Cg-17 in 2016
- Increased emphasis on regional and national activities
- Five main priority areas:
 - I. WIGOS Regulatory Material, supplemented with necessary guidance material
 - II. WIGOS Information Resource, including the Observing Systems Capabilities analysis and Review tool (OSCAR), especially OSCAR/Surface**
 - III. WIGOS Data Quality Monitoring System (WDQMS)
 - IV. Regional Structure; Regional WIGOS Centers
 - V. National WIGOS Implementation, coordination and governance mechanisms



OSCAR/Surface

(“What is WIGOS?”)

- Implementation layer of the *WIGOS Metadata Standard*:
Modern, electronic, searchable inventory of metadata for all observing stations/platforms under WIGOS
 - OSCAR/Surface will replace *WMO Pub. 9, Volume A*, but will also include information from similar inventories for other (non-GOS) components of WIGOS
 - Developed jointly by WMO and MeteoSwiss, with the Swiss government providing the major part of the funding
 - Operational since May 2016
 - Education and training Members in populating, editing and using OSCAR/Surface is a major priority for 2016-2019 financial period



WIGOS Metadata Standard (WMDS)

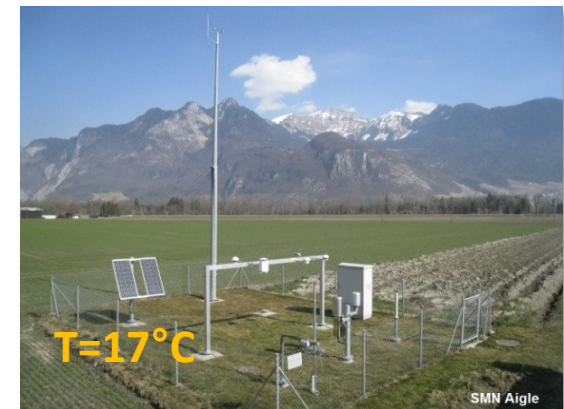
- Developed by Task Team on WIGOS Metadata under ICG-WIGOS
- Initial version approved by Cg-17 as part of Manual on WIGOS:
http://library.wmo.int/pmb_ged/wmo_1160_en.pdf#page=48
 - **Entered into force for WMO Members on 1 July 2016**
- In order to comply with WMO-No. 49, Vol. I, Part I – WIGOS, and WMO no. 1160, Manual on WIGOS, Members will have to:
 - **Collect and keep records of WIGOS metadata**
 - **Provide WIGOS metadata for observations exchanged internationally**
 - **Review current entries in OSCAR/Surface and keep them up-to-date**
- Guidance on WMDS is included in the 1st ed. of Guide to WIGOS, available online since June 2016



What are metadata? Why are they essential?

Metadata = documentation describing data, context of observations

- Observed variable
- Location
- Environment
- Intended use
- ...



Essential data are exchanged globally, but metadata are not. Metadata are needed to make *adequate* use of observations globally, but they are not always easily obtained by users.



WIGOS Metadata Standard (WMDS)

Metadata reporting obligations:

Mandatory - Required for all WIGOS stations/platforms

Conditional - Required if applicable

(e.g. instrument calibration is not applicable to a human observer)

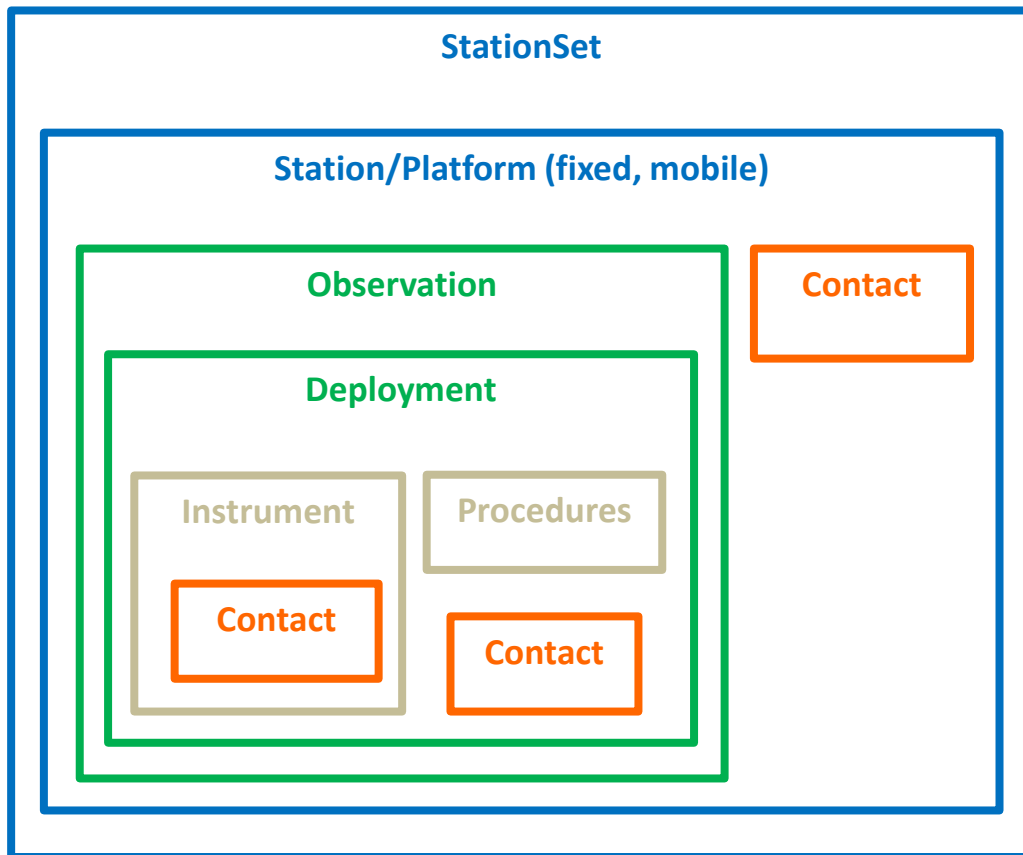
Optional – Desirable/useful, but non-compulsory

WMDS Implementation Phases:

WIGOS Metadata Implementation phases		
2016	2017-18	2019-2020
Metadata elements that are less challenging to implement	Elements that will require additional data and/or changes to procedures	Remaining elements



WIGOS Metadata Standard



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



WIGOS Metadata Standard (WMDS)

Implementation Phases

Extract of the WMDS elements per Implementation Phases

Category	Phase I	Phase II	Phase III
	2016	2017–2018	2019–2020
1. Observed variable	1-01 Observed variable – measurand (M)	1-05 Representativeness (O)	
	1-02 Measurement unit (C)		
	1-03 Temporal extent (M)		
	1-04 Spatial extent (M)		
2. Purpose of observation	2-01 Application area(s) (M)		
	2-02 Programmes/Network affiliation (M)		
3. Station/Platform	3-01 Region of origin of data (C)	3-04 Station/platform type (M)	3-05 Station/platform model (M)
	3-02 Territory of origin of data (C)	3-08 Data communication method (O)	
	3-03 Station/platform name (M)		
	3-06 Station/platform unique identifier (M)		
	3-07 Geospatial location (M)		
	3-09 Station status (M)		
4. Environment		4-04 Events at Station/platform (O)	4-01 Surface cover (C)
		4-05 Site information (O)	4-02 Surface Cover classification scheme (C)
			4-03 Topography or Bathymetry (C)
5. Instruments and Methods of Observation	5-01 Source of observation (M)	5-11 Maintenance party (O)	5-04 Instrument operating status (O)
	5-02 Measurement/observing method (M)	5-12 Geospatial location (C)	5-06 Configuration of instrumentation (C)
	5-03 Instrument specifications (M)	5-15 Exposure of instrument (C)	5-07 Instrument control schedule (C)
	5-05 Vertical distance of sensor (C)		5-08 Instrument control result (C)



OSCAR/Surface web application

- Industry-standard technology stack
 - Oracle DB, ArcGIS
 - JEE, AngularJS
- Safe and secure, traceable
- Publicly available for anonymous use
- Management console for registered users



Last updated: 2016-04-28

MINSK (Belarus)

in WMO Region VI - Europe

Station characteristics

Station name: MINSK
Station alias:
Date established: 1891-01-01
Station type: Land (fixed)
Station class(es):
WMO index No: 0-20000-0-26850
WMO region: VI - Europe
Country / Territory: > Belarus
Coordinates: > 53.9286111111°N, 27.6352777778°E



Time zone:
Climate zone:
Station URL:
Other link (URL):
Predominant surface cover:
Surface roughness:
Topography or bathymetry:
Population in 10km / 50km (in thousands):
Supervising organization: > Hydromet



WMO

Initial data integration into OSCAR/Surface



WMO Publication No. 9, Vol
and WMO Catalog

Important Note: OSCAR/Surface *
2016, thereby replacing WMO No. 9, Vol
Catalogue of Radiosondes. A "legacy"
continue to be published after that d
years. However, the "legacy" format
traditional format described below (see
this transition can be found in the WWW
- OSCAR/Surface legacy files after 2 Ma
- Latest version of OSCAR/Surface lega
- Differences between OSCAR/Surface I
Guidance on WMO

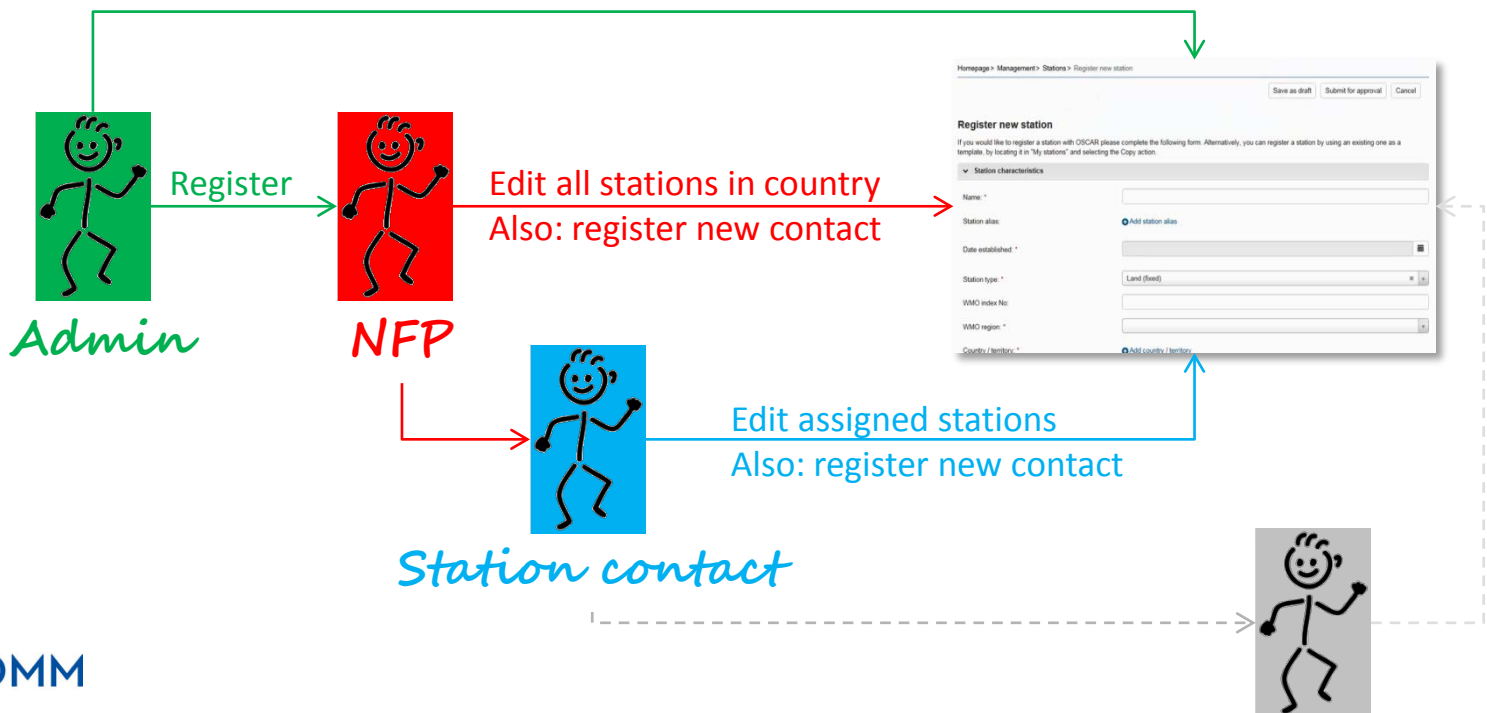
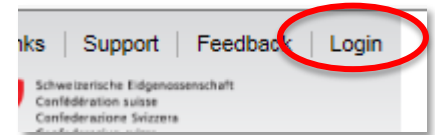


stations

- GAWSIS
 - Global Atmosphere Watch stations = 1.053
- WMO Pub 9 Vol A
 - Catalogue of GOS stations >13.026
- JCOMMOPS
 - Marine element of GOS / GOOS >11.387
- WMO Radar DB
 - World-wide weather radars >762
- Amdar
 - Coming soon ...

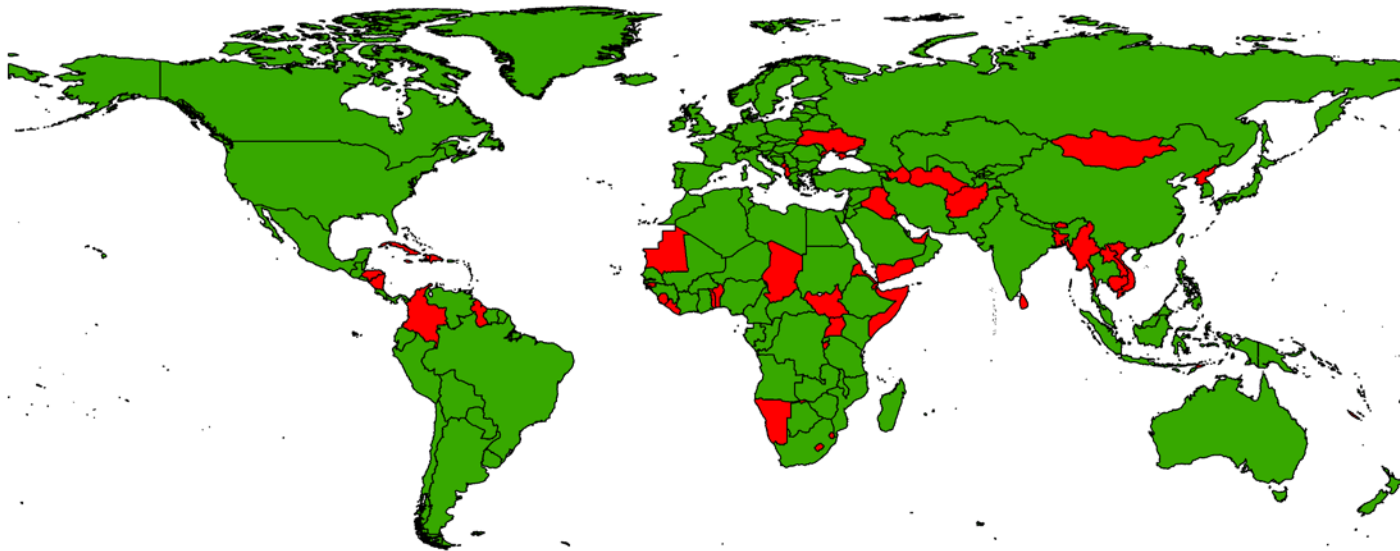
Security and user management

- **Authentication** by identity provider (Swiss Government)
- **Authorization** within application based on «trust-relationships» and various «user roles»



Focal Points for OSCAR/Surface as at 11/05/2017

Focal Points for OSCAR/Surface



Legend

focal_points

WMO_basemap

OSCAR focal point

only Volume A focal point

no focal point

Training efforts

- Several workshops/training events have been held since 2015
- Need hands-on training for **OSCAR/Surface Nat.Focal Points**

Type of training	Content	Audience	Region	Language	Date
Classroom	Web interface	NFPs O/S	RA I	French	4 th Q 2016
Classroom	Web interface	NFPs O/S	RA I	English	1 st Q 2017
Classroom	Web interface	NFPs O/S	RA III/IV	Spanish	1 st Q 2017
Classroom	Web interface	NFPs O/S	RA VI	English	2 nd Q 2017
Classroom	Web interface	NFPs O/S	RA II	English	2 nd Q 2017
Classroom	Web interface	NFPs O/S	RA V	English	3 rd Q 2017
Webinar	M-2-M interface	Members IT staff	RA IV/VI	English	3 rd Q 2017
Webinar	M-2-M interface	Members IT staff	RA III/VI	Spanish	3 rd Q 2017
Webinar	M-2-M interface	Members IT staff	RA II/V	English	4 th Q 2017
Webinar	M-2-M interface	Members IT staff	RA I	English	4 th Q 2017
Webinar	M-2-M interface	Members IT staff	RA I	French	4 th Q 2017



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WIGOS Data Quality Monitoring System (WDQMS)

- Real-time monitoring of performance (data availability and data quality) of all WIGOS components, searchable by region, country, station type, period, etc.

Delayed mode monitoring of data quality as measured against reference sources of information will be included for non-real time observations

Incident management component for mitigation of performance issues

- **The WDQMS will provide a complete description of how well WIGOS is functioning**

Current activities

- **Pilot project on NWP-based monitoring; ECMWF, NCEP, DWD, JMA**
- **RA-I Demonstration Project of monitoring and incident management involving Kenya and Tanzania running through 2017**





WDQMS Pilot Project

Four NWP centers, ECMWF, NCEP, JMA, DWD, providing monitoring output in real time (every six hours) to WMO Secretariat; started with surface pressure, now including also surface humidity, wind, temperature and upper air soundings

Simple ASCII files in commonly agreed format containing the following information for each individual observing station:

- Observation received within operational data cut-off (yes/no)

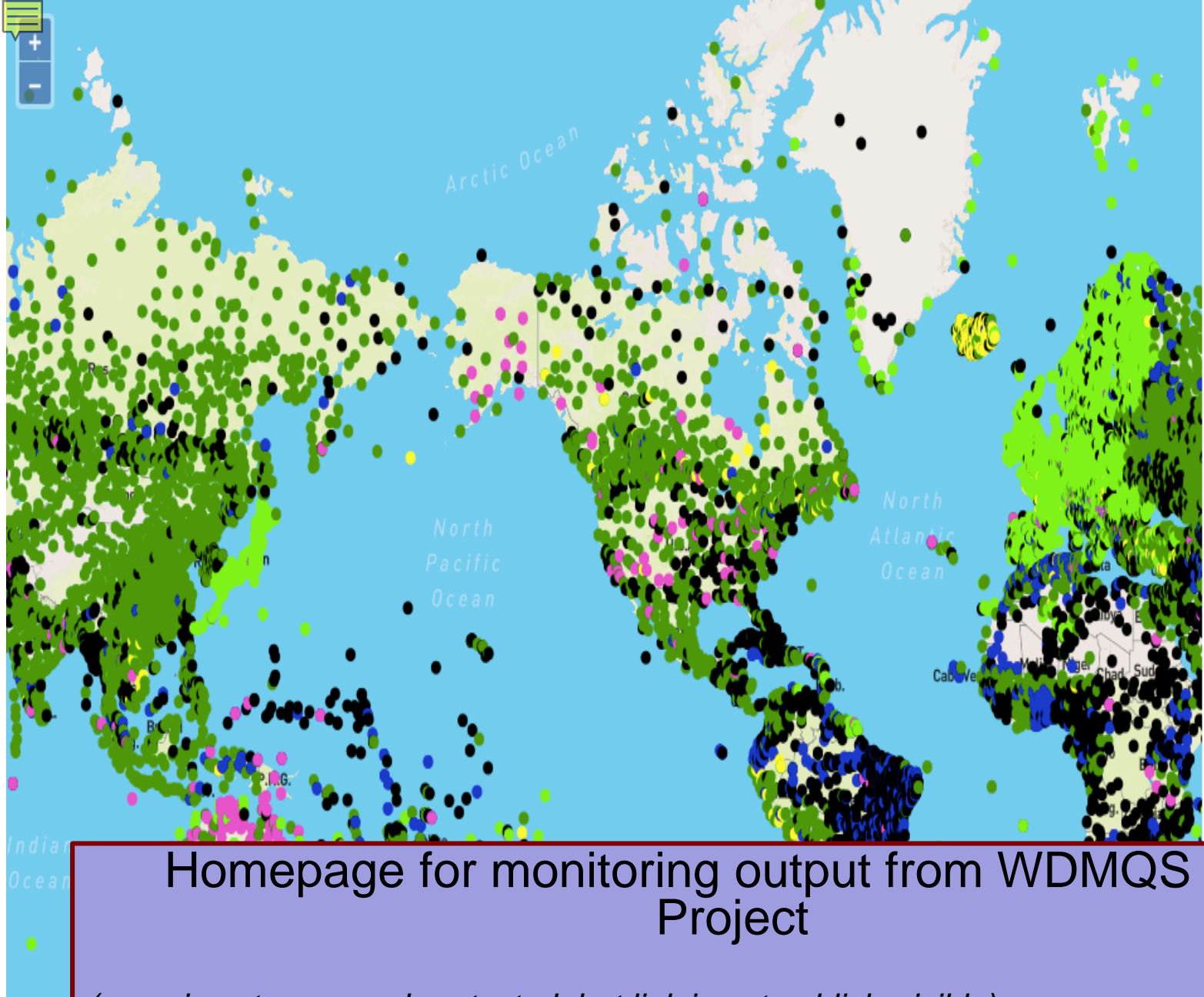
- Observation used in assimilation (yes/no)

- If not used, why not (flag)

- Observation minus background residual (value)

- ...





NWP monitoring pilot project

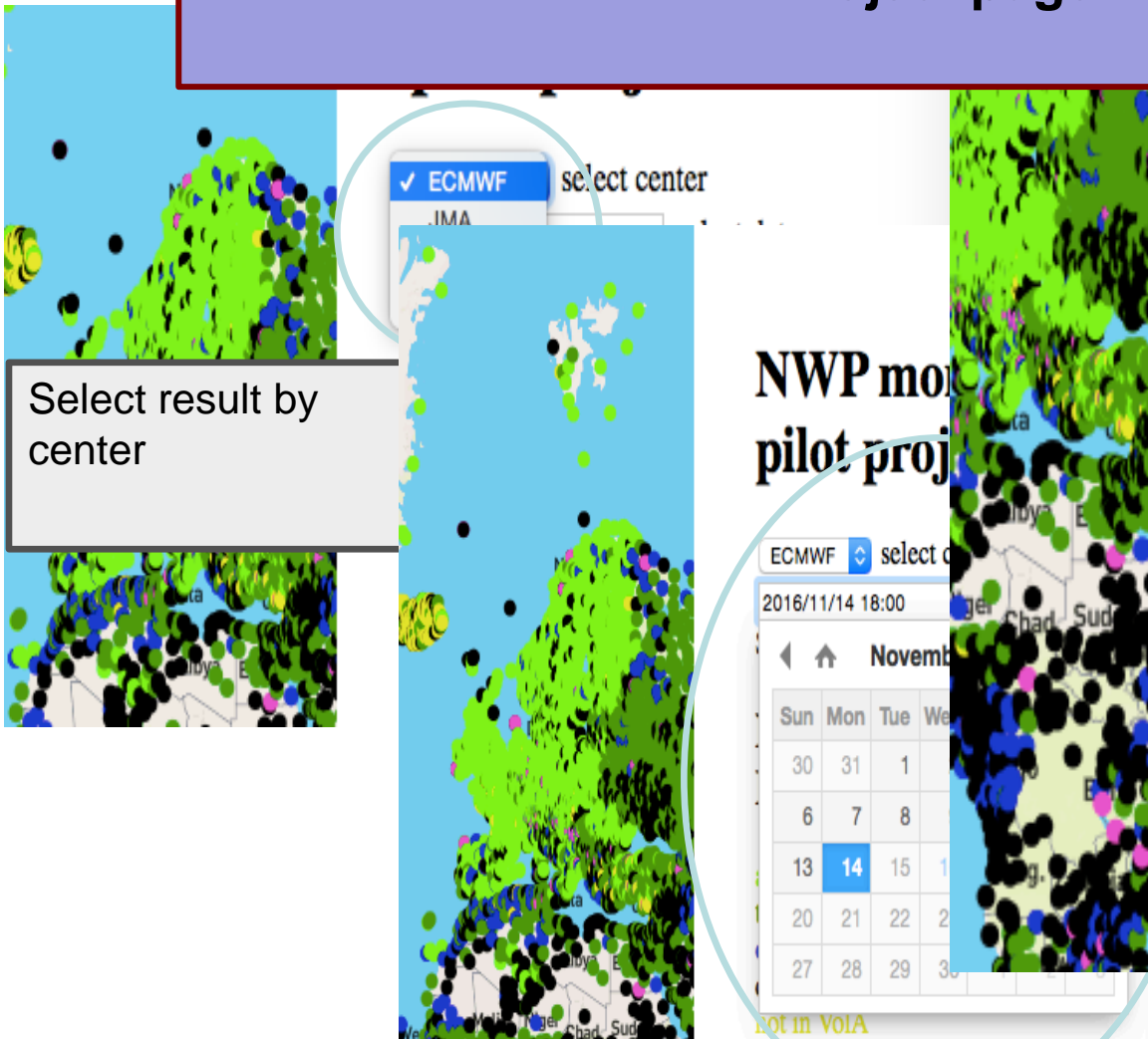
ECMWF select center
2017/05/09 18:00
select date
Surface Pressure (110)

Nr. expected vs. Nr. Received

all observations in period

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

Information currently available on the WDAQMS Pilot Project page



Select result by center

Select result by date

Nr. expected vs. Nr. Received

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

Legend; colors show no. of observations received (example; still tinkering with display options)



Data receipt example; Europe Nov 18 2016 (6-hour window)

ECI
star
DV
IN

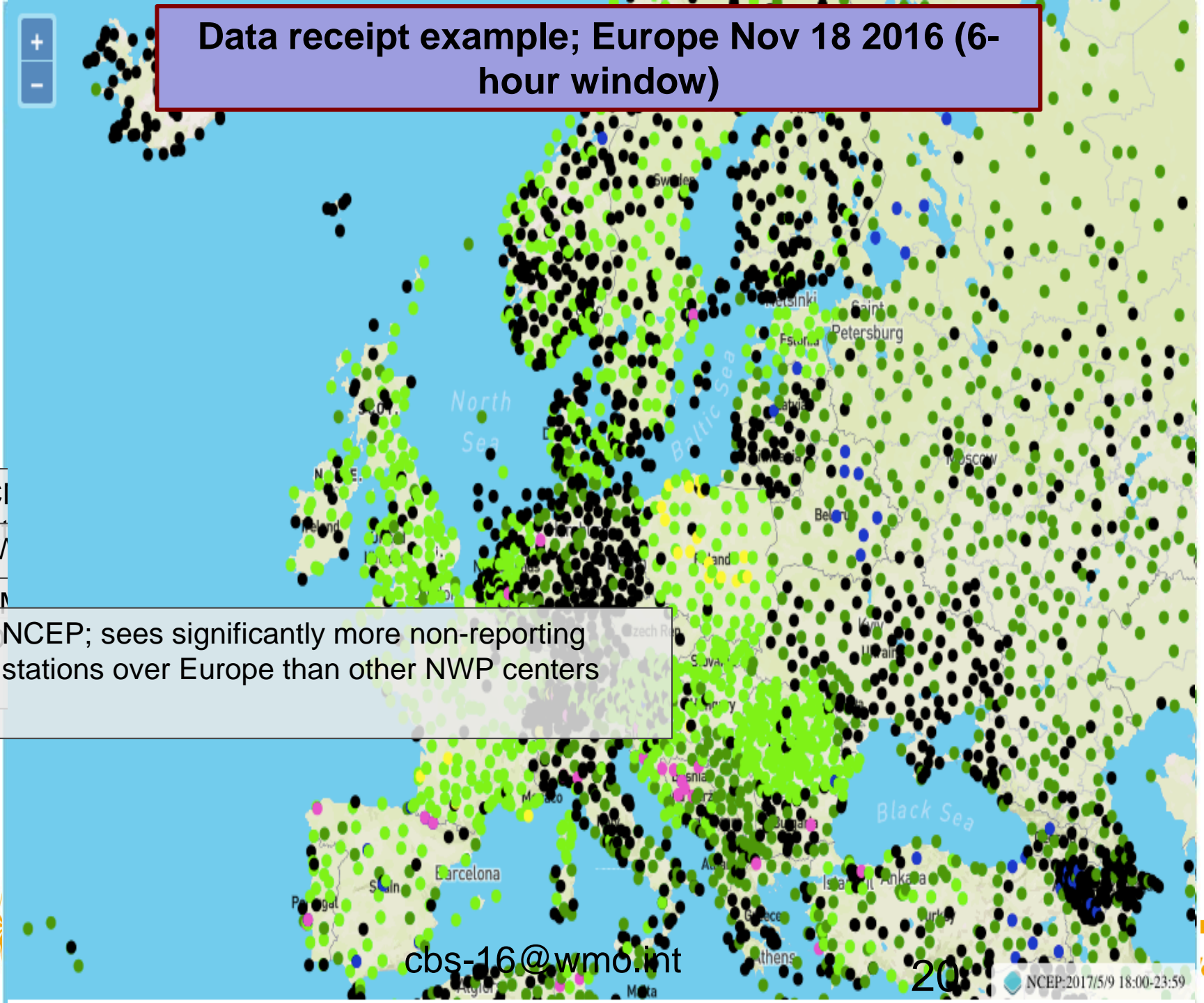
NCEP; sees significantly more non-reporting stations over Europe than other NWP centers

cbs-16@wmo.int

20

NCEP:2017/5/9 18:00-23:59

ater



Future development directions of WDAQMS Pilot Project

Include additional observation types; RAOBs next on the list (still working on criteria)

Additional analysis tools; display time averages, trends, ...

Stratification of results by country, region, datatype, etc.

Improve consistency of cut-off criteria across different NWP centers

Integration with OSCAR/Surface

Key monitoring results should be mandatory metadata, displayed in OSCAR; WIGOS Metadata Standard evolving to allow this

Opportunities for Members to contribute

Financial contributions to the WIGOS Trust Fund

Secondments to the WIGOS Project Office

In-kind (off-site) development of data processing and display tools

Eventually, operational hosting of NWP-based monitoring system



WDQMS RA-I Demonstration Project

Goal is to field-test the concept of WDQMS and its major functions, including Incident Management

Operations running at Kenya Meteorological Department Jul-Nov 2016;

Training sessions have been delivered to KMD and TMA staff remotely

Project participants and contributors:

- Kenya Met.Dep.: operations pilot centre providing temporary human & technical resources

- Tanzania Met.Agency: assessing issues identified with their stations;

- NWP Centres (ECMWF,NCEP,JMA,DWD) providing near-real time monitoring results;

- Additional expertise and support provided by EUMETNET/EUCOS

Governance:

- ICG-WIGOS TT-WDQMS providing technical advice and support;

- WMO Secretariat providing support and training on OSCAR/Surface;

Monitoring tools made available by TT-WDQMS and WMO Secretariat:

- Online web-tool, complemented by the EUCOS/Quality Portal and ECMWF-Wiki-page;

- Online incident management tracking (“ticket-based”) tool;



WDQMS page for United Republic of Tanzania

JMA 2016/11/21

Daily results of NV

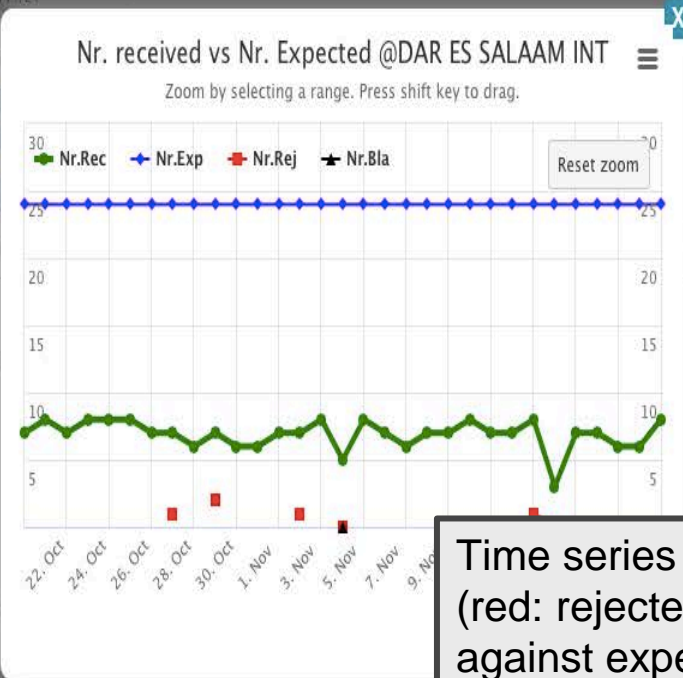
- Silent
- Show 10
- Name

- BUKOBA
- DAR ES SALAAM INT
- DODOMA
- IRINGA
- KIGOMA
- KILIMANJARO
- MBEYA
- MOROGORO
- MTWARA
- MUSOMA

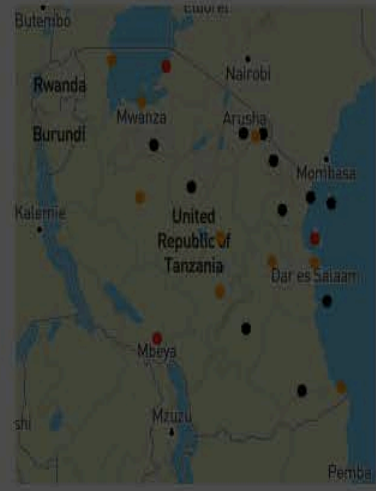
Name	IndexNbr	Expected	Received	Rejected	Blacklisted	Details
------	----------	----------	----------	----------	-------------	---------

Showing 1 to 10 of 15 entries

Previous 1 2 Next



Time series of availability (green) and quality (red: rejected; black: black-listed) plotted against expectations (blue) for individual stations



WDQMS RA-I Demonstration Project (current status)

Four phases of operations covering silent stations, availability and accuracy of surface pressure data, availability and accuracy of radiosonde data

A total of 38 incident tickets have been raised by KMD:

25 tickets for KMD stations (2 closed,7 no follow-up); 13 for TMA (none closed,6 no follow-up)

30 incidents refer to silent stations/data availability, 8 to data quality

Initial technical problems in accessing/editing the website or the incident tickets

Functional problems:

Lack of understanding/training on the use of monitoring tools

Slow response from the "actions" side/Role of national contact

What to do with Incident tickets that stay open for a long time?

The Monitoring Web-tool not mature yet;

Training on OSCAR/Surface is needed!

Overall project evaluation at TT-WDQMS-1 in Geneva in December 2016



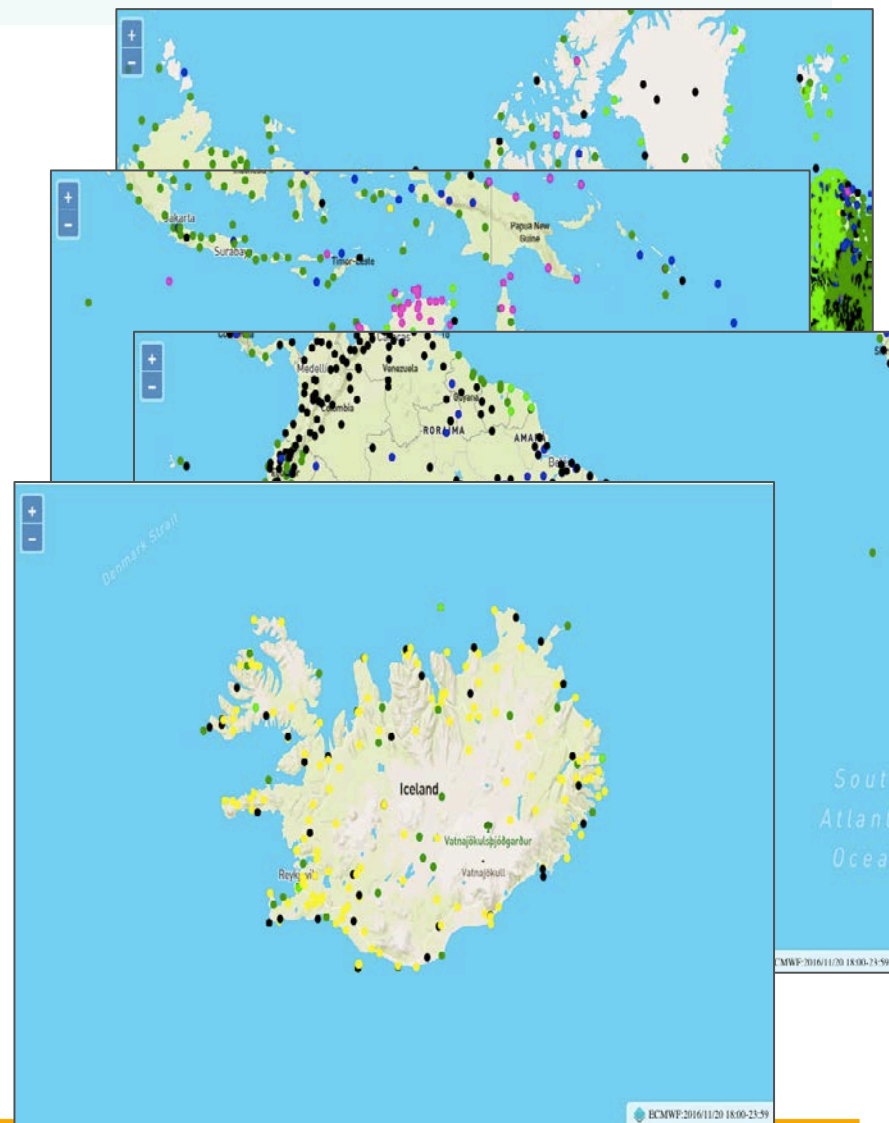
Next steps for WDQMS

- **NWP-based monitoring Pilot Project**; *further development and plan for operational follow-on*
- **Region I Demonstration Project**; *extended through 2017*
- Integration of WDQMS output in OSCAR – *ICG-WIGOS TT-OSCAR*
- Integration of other WIGOS components into overall system concept – *Workshop in Geneva in June 2017*
 - GAW
 - Climate observations
 - Hydrological observing systems
 - GCW components



Summary and Conclusions

- WDAQMS is a fundamental WIGOS technical tool to help WMO Members with network evaluation and design, trouble-shooting, etc.
- WDAQMS evolving very rapidly, already providing a wealth of information about availability and quality of observations
- Potentially a transformational activity for WIGOS and for WMO as a whole
- WIGOS Project Office welcome any and all offers of assistance from Members!
- WDAQMS monitoring result to be rolled out gradually over the coming year (until EC-70)
 - Monitoring data are sensitive; need caution and careful quality control



Thanks to all the participants (both WMO Members and other organizations) for their contributions to OSCAR/Surface and WDQMS activities, especially Switzerland, Germany, Kenya, Japan, Tanzania, United Kingdom, United States, ECMWF, EUMETNET



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