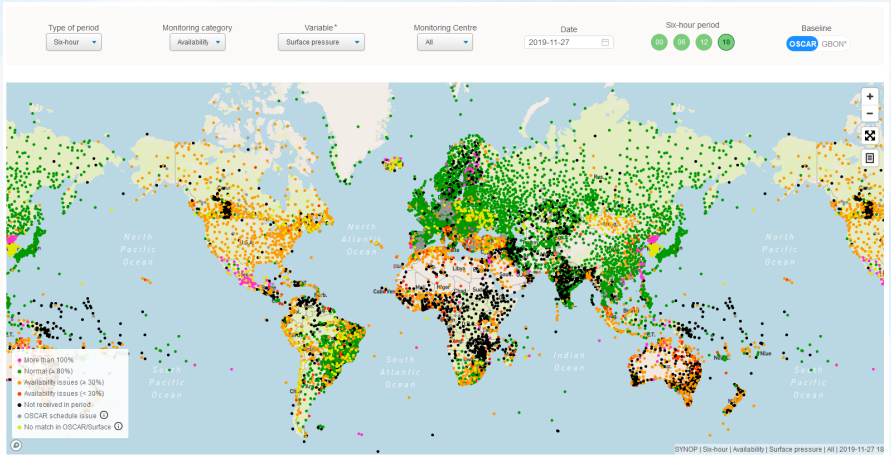
WIGOS Data Quality Monitoring System (WDQMS)

How to evaluate the data availability performance of surface land stations



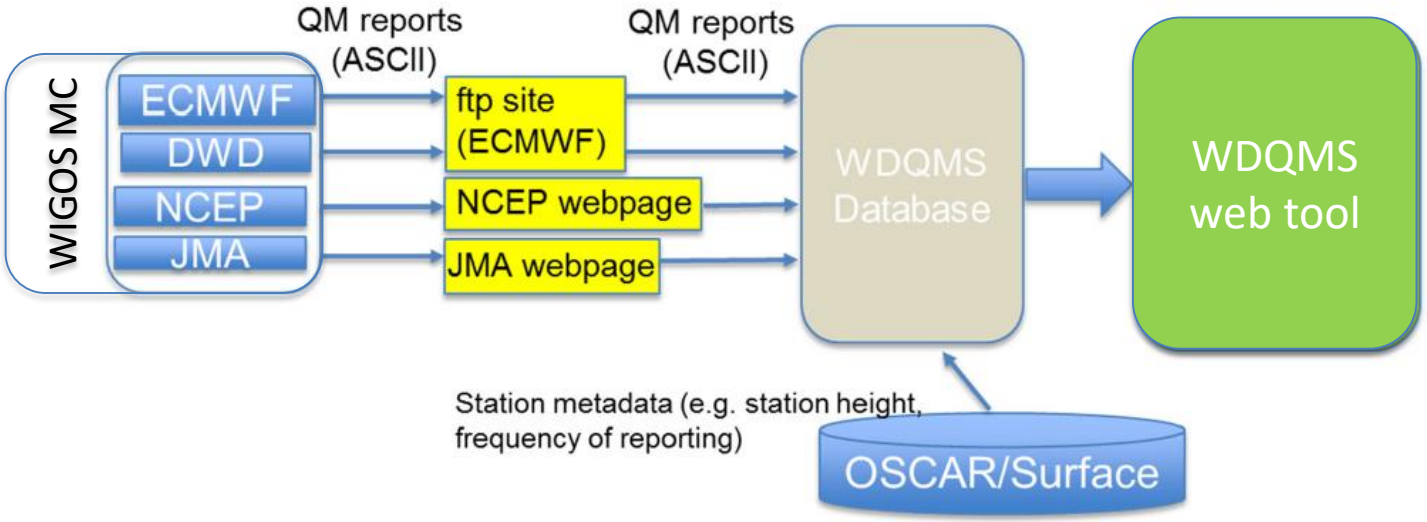
WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

Category 'Availability' in comparison to OSCAR/Surface metadata

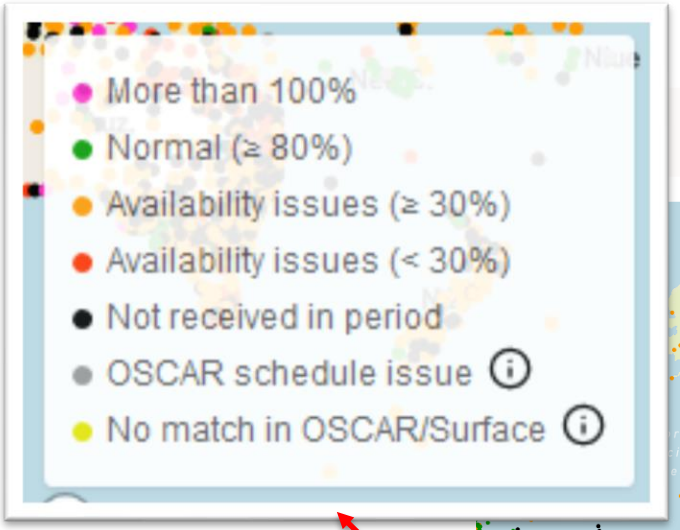
The monitoring of data availability of the surface-based network is based on performance figures of WIGOS Monitoring Centres (MC) obtained from comparing the observations received from the network to those required and expected to be ingested to the WMO Information System (WIS) according to the **schedule of international exchange** determined from OSCAR/Surface metadata.

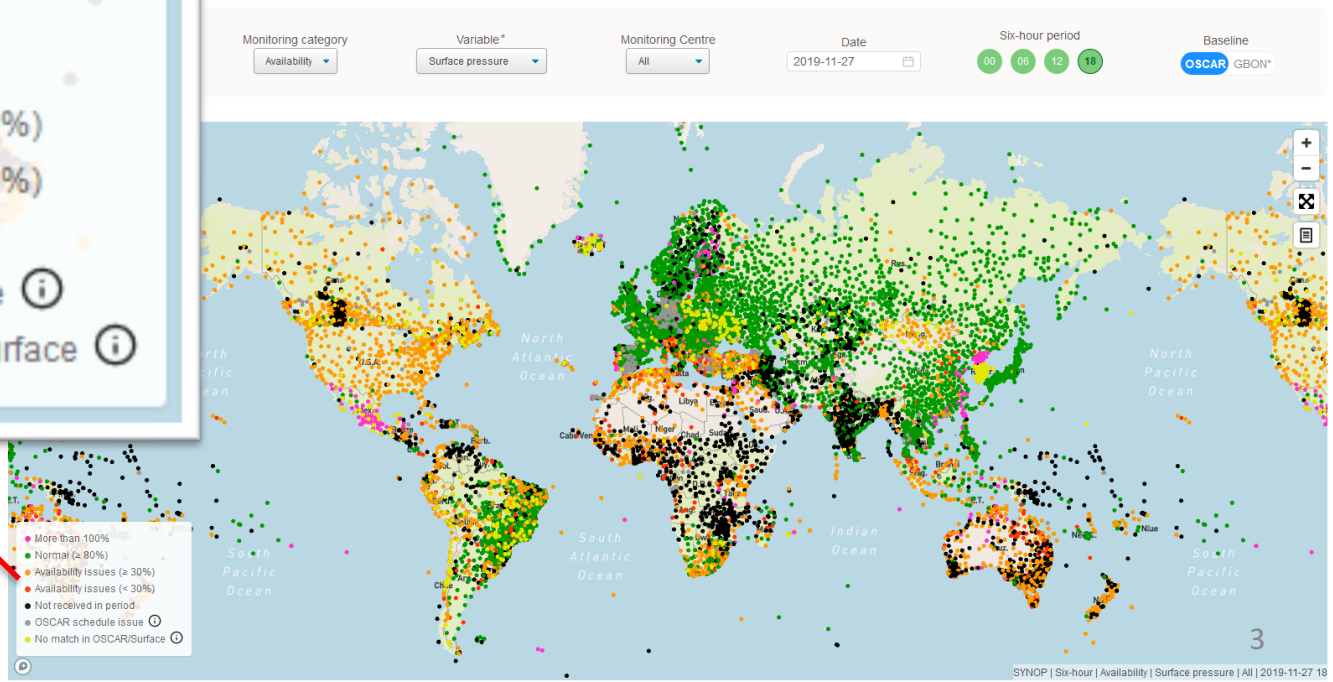


Category ‘Availability’ – highlighting observational issues

- The WDQMS web tool gives near-real time information about the status of the observational network in terms of availability, highlighting the stations with observational issues, e.g. from not reporting at all to reporting less frequently than expected, and even showing stations that are not registered in OSCAR/Surface.

➔ *Select ‘Availability’ in the web tool*





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Different WIGOS MCs → different results

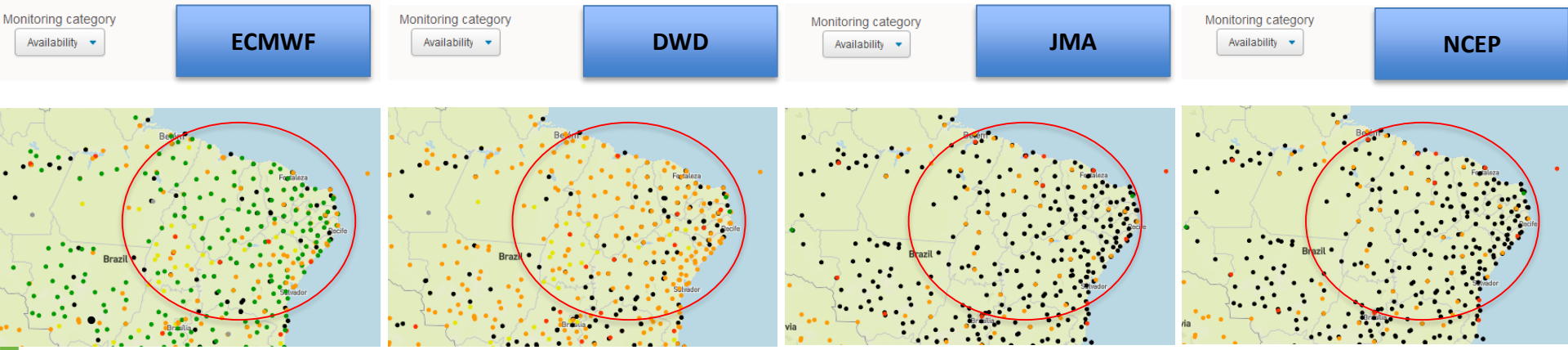
- **If at least one WIGOS Monitoring Centre shows 'Normal' (green) and others show different results, e.g. 'Availability issues' (orange or red) no action is required by the RWC.**
- The differences in the WIGOS Monitoring Centre results occur mainly due to the fact that the data assimilation characteristics of each of the different WIGOS Monitoring Centres (NWP systems) differ:
  For example, NCEP shows only the data that pass a accuracy control step prior to DA, therefore part of the data available that is deemed to be of poor accuracy or duplicate is filtered out and is not available to the DA, whereas ECMWF shows even the data that is deemed to be of poor accuracy and is rejected and/or blacklisted.

Different WIGOS MCs → different results

However, other aspects might also lead to different results:

- The routing of the data among the GISCs and to the WIGOS MCs is uneven *(see example of Brazil data)*

  ➔ **action:** RWC to inform WIGOS MCs to follow up routing issues with their GISC FP, raise issue in incident management system tool but no IMS ticket → **out of RWC´s responsibility**

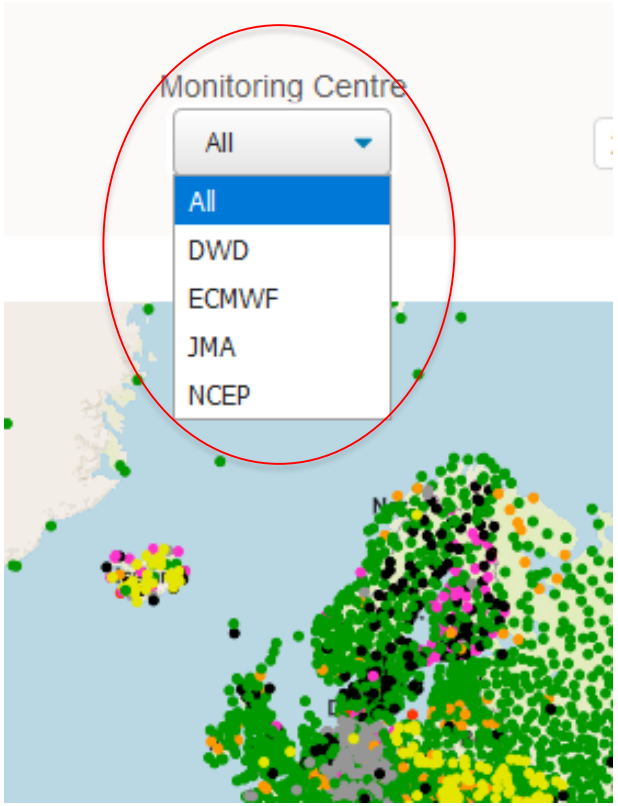


- Availability issues might also be related to the assimilation of TAC or BUFR messages causing different results in WIGOS MC reports

See issue No. 5

Display of ‘All’ centers

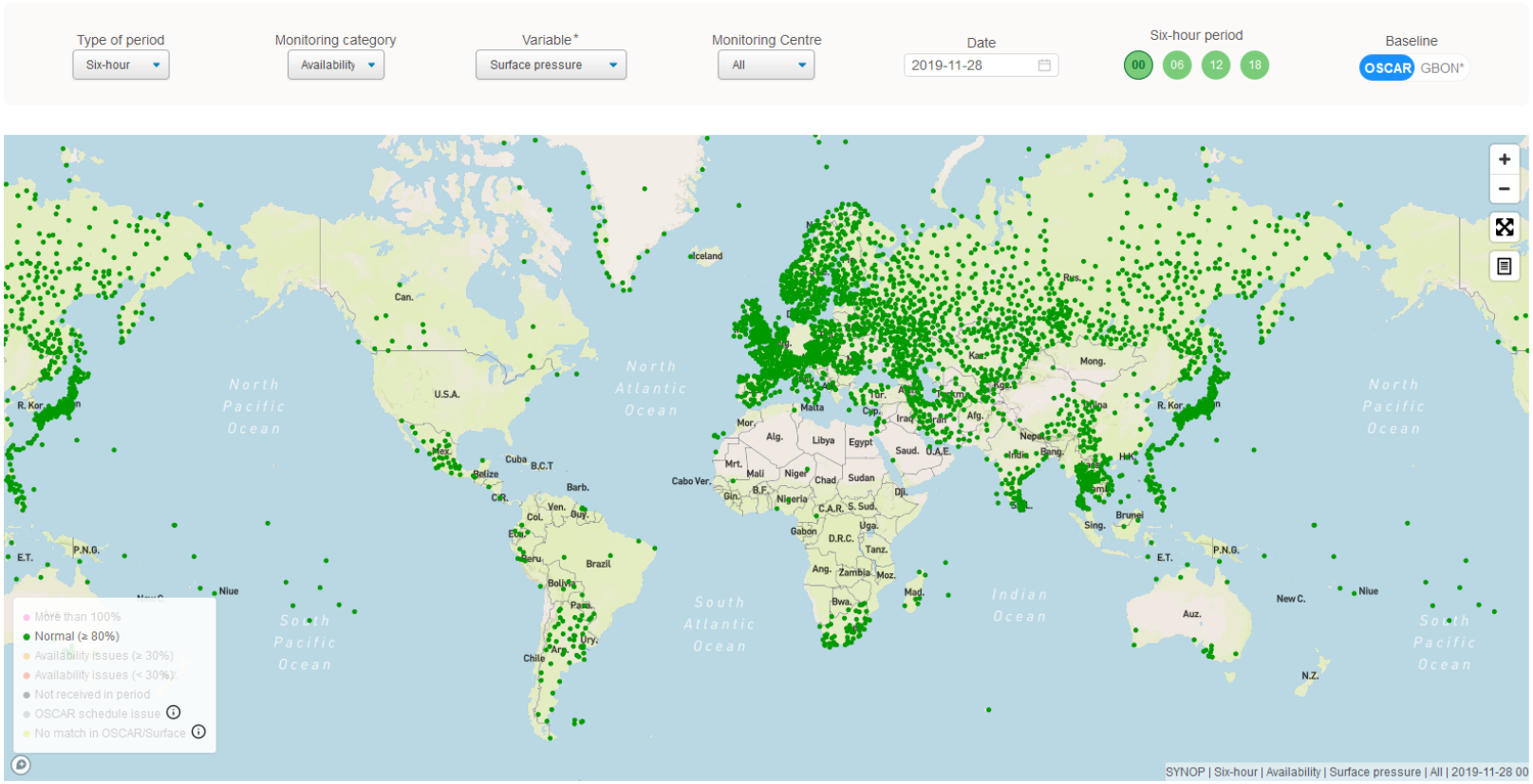
- The WDQMS web tool allows selecting results of a **particular WIGOS Monitoring Centre** or the aggregation of all centres.
- If ‘All’ is selected the results of all WIGOS MCs are combined into one figure concerning ‘Availability’.
- The WIGOS MC results might differ due to various reasons *(see Potential differences in results of WIGOS Monitoring Centres for more details)*
- Hence, the daily summary combining all **availability** reports will be generated by **selecting the best of all WIGOS MCs**, i.e. the **maximum availability result** will be retained in the combined availability performance maps.



Normal (≥ 80%)

- Stations shown as green dots
- Normal (≥ 80%) – station is performing well

➔ no action required ☺



No match in OSCAR/Surface

- No match in OSCAR/Surface – although data available on WIS!
- Stations shown as yellow dots, are reporting but has not been registered in OSCAR/Surface so far, or at least there is not a match of the station ID (potential reason: NMHS might not have sufficient number of WMO IDs but did not migrate to WSI yet).

➔ **action:** RWC to initiate an incident management process (IMP) asking WDQMS NFP to contact OSCAR/Surface NFP

OSCAR schedule issue

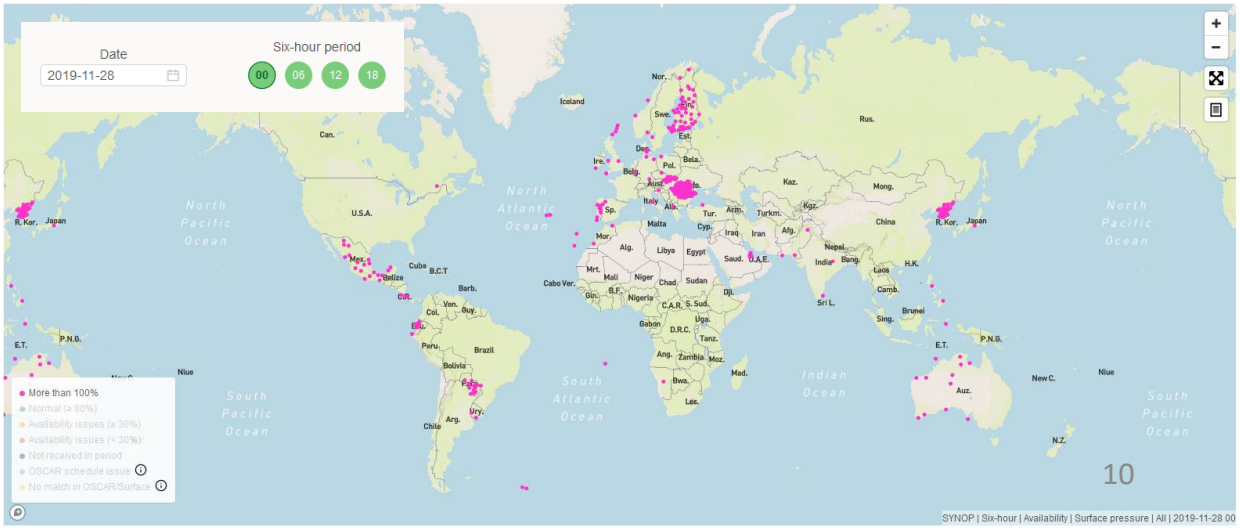
- Stations shown as grey dots, are reporting but there seem to be issues in the OSCAR schedule (potential reason: NMHS might report higher temporal resolution but didn´t set the field ‘international exchange’ correctly).

  ➔ **action:** RWC to initiate an incident management process (IMP) asking WDQMS NFP to contact OSCAR/Surface NFP

More than 100%

- Stations shown as pink dots
- More than 100% - actually a ‘happy problem’ because more data are shared internationally than indicated in OSCAR/Surface
- Most likely there is an issue with the expected number of measurements in the metadata field **‘Reporting interval’** in OSCAR/Surface for this particular variable

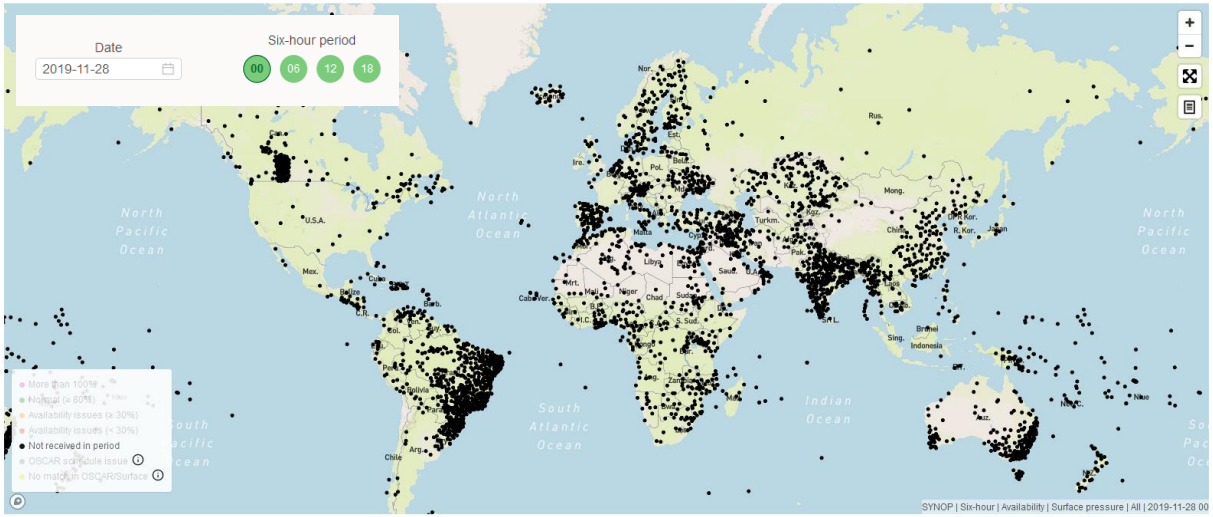
➔ **action:** RWC to initiate an IMP asking WDQMS NFP to contact OSCAR/Surface NFP to make corresponding changes in OSCAR/ Surface metadata



Not received in period

- Data from stations shown as black dots were **'Not received in period '** – this is shown especially when selecting **'All' Centers** and the **'Daily'** or **'Alert'** display
- If data of this station were not received since a longer period of time (more than 5 days) it is a 'silent station'

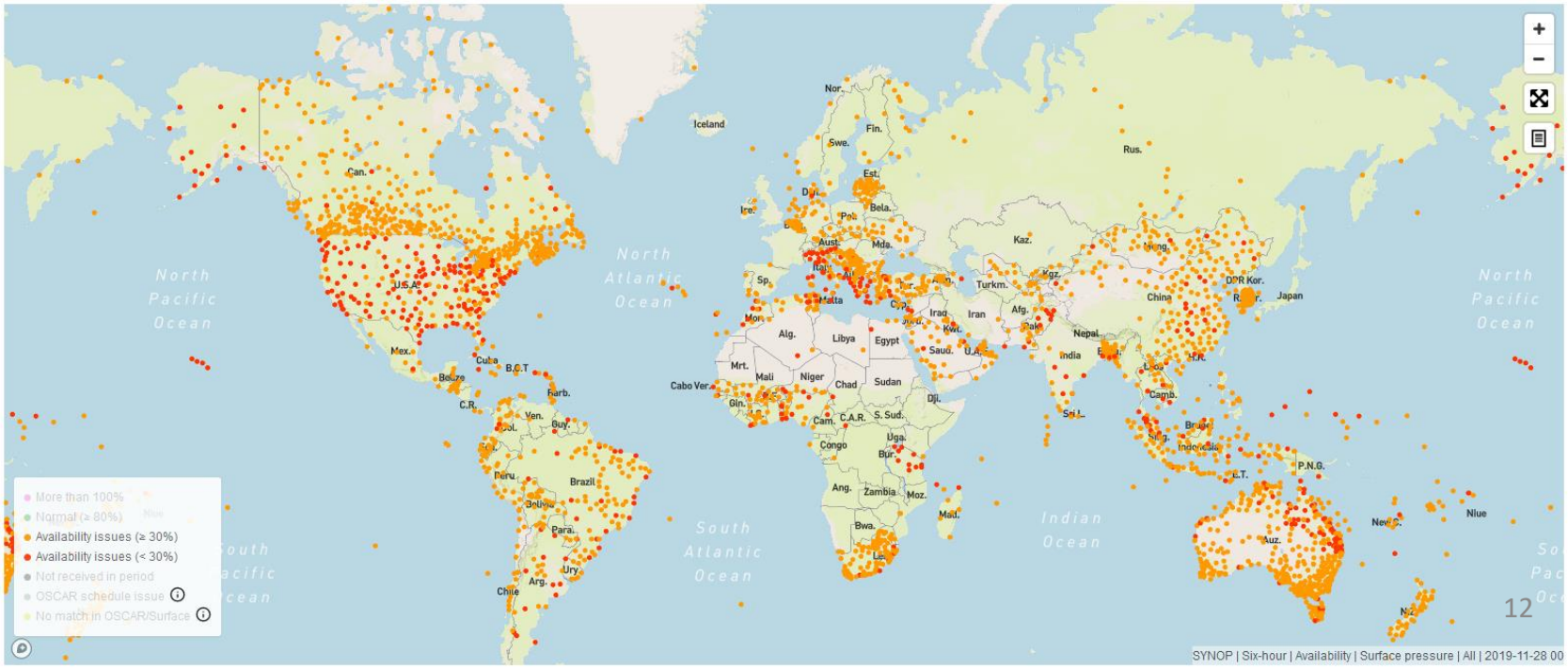
  ➔ **action:** RWC to initiate an IMP asking WDQMS NFP to take actions to investigate the cause of the incident (technical/ routing issues, no GOS affiliation,…) and to find a solution



Availability issues ● (≥30%) and ● (<30%)

- Stations showing orange or red dots have availability issues
- If they continue to appear having **'Availability issues'** especially when selecting **'All' Centers** and the **'Daily'** or **'Alert'** display

  ➔ **action:** RWC to initiate an IMP asking WDQMS NFP to take actions to investigate the cause of the incident and to find a solution



Reasons for data availability issues

There are several reasons for no or less data being received by the WIGOS Monitoring Centres. The causes for these issues have to be clarified by the country concerned; these could be for example:

1. Station is not intended to report to WIS (only national use of the data intended) – most likely shown as *'Not received in period'* ● in the WDQMS web tool

   action ➔ WDQMS NFP together with OSCAR/Surface NFP to check GOS affiliation in OSCAR/Surface

   See issue No. 1

2. Station is reporting less frequently to WIS as compared to what is declared in OSCAR/Surface – most likely shown as *'Availability issues (≥ 30% or < 30%)'* ● *or* ●

   action ➔ WDQMS NFP together with OSCAR/Surface NFP to check reporting schedule for international exchange in OSCAR/Surface

   See issue No. 2

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Reasons for data availability issues (cont.)

The following reasons for no/less data being received by the WIGOS Monitoring Centres are most likely shown as ***'Not received in period'*** ● or ***'Availability issues'*** ● or ● in the WDQMS web tool:

3. Station data is expected in the WIS but no data available
   action ➔ WDQMS NFP to work with WIS NFP to check WIS dissemination, data transfer from site to RTH hub
   See issue No. 3
4. No data received at RTH hub due to technical issue at site (data transmission or sensor malfunctioning or others)
   action ➔ WDQMS NFP to work with WIS NFP and/or maintenance technician to check data transfer from site or sensors at site
5. Lack of BUFR data on WIS or in WIGOS MC/users database
   action ➔ WDQMS NFP together with WIS NFP to check BUFR encoding at site or headquarters
   See issue No. 4

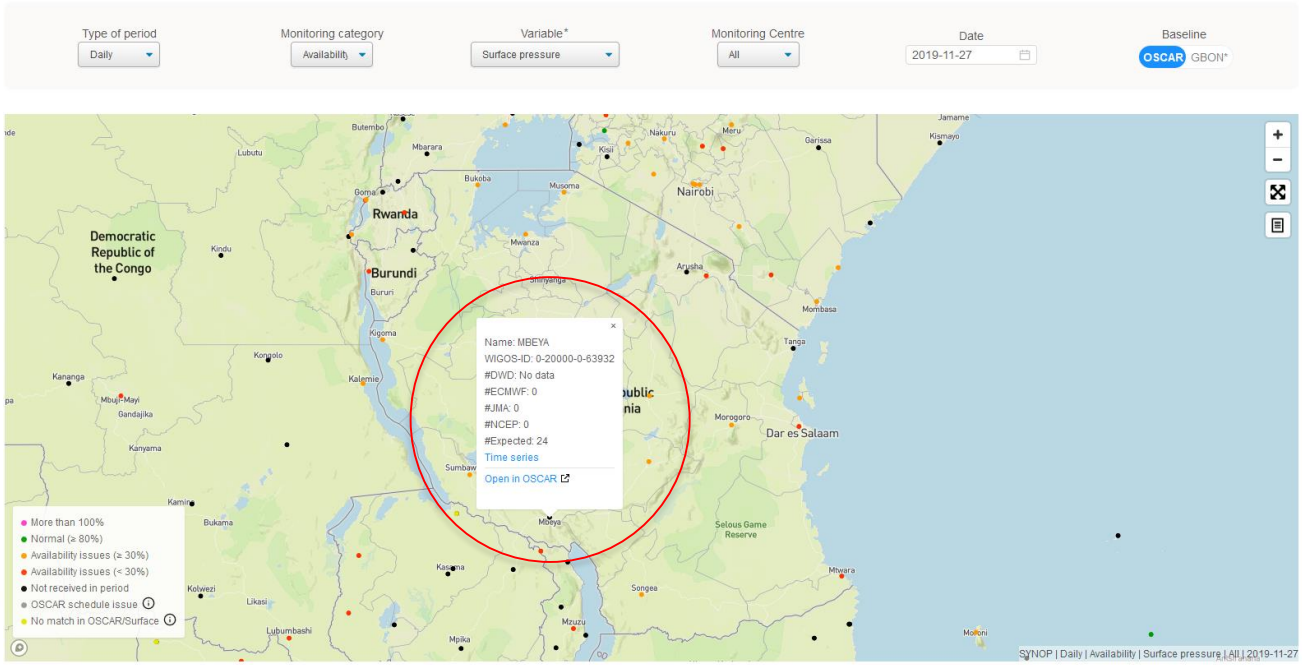
Example of issues in data availability – No. 1

63932 MBEYA (Tanzania)

Issue No. 1 (silent station):

- In RA I, Tanzanian station 63932 MABEYA was confirmed as being affiliated to GOS
- The station is shown as **'Not received in period'** ●

➢ RWC to initiate an IMP asking WDQMS NFP to take appropriate actions to investigate and to solve the incident

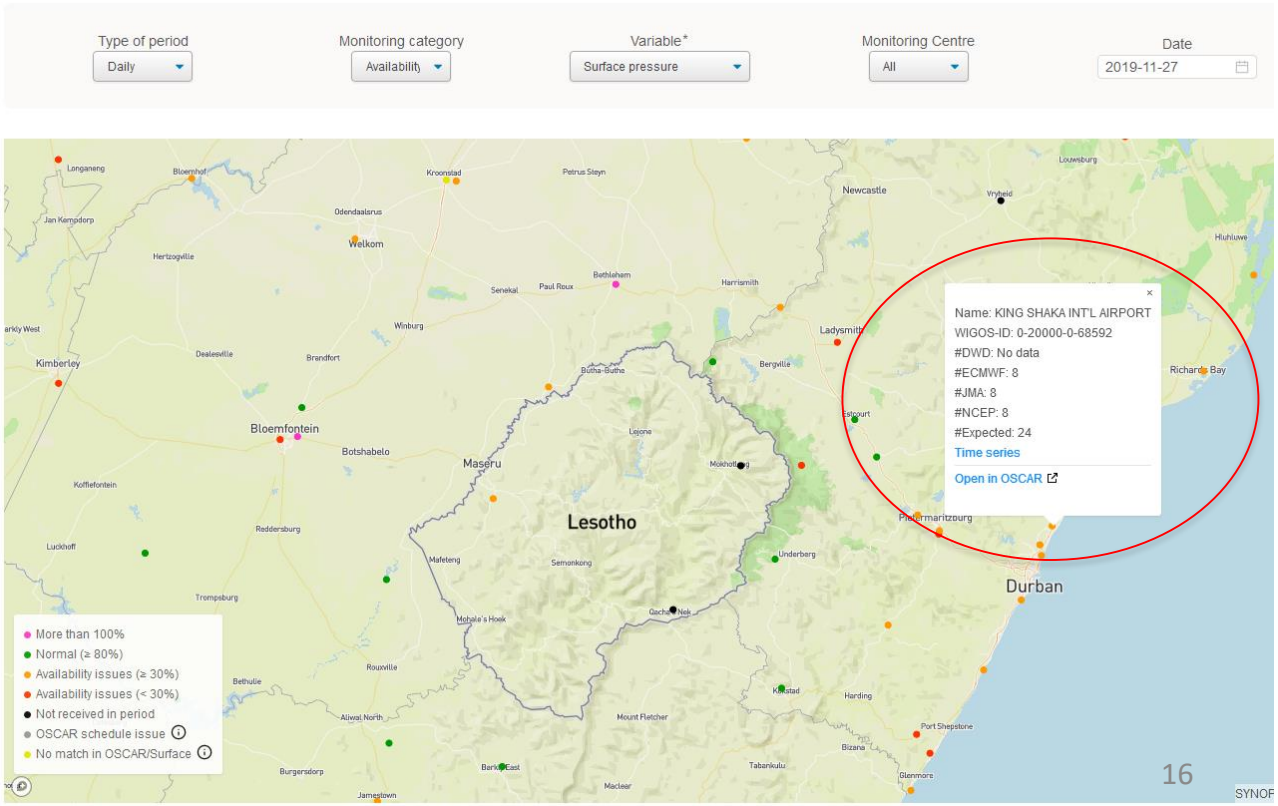


Example of issues in data availability – No. 2

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 2 (less frequent reporting):

- Station shows less frequent reporting of surface pressure than indicated in OSCAR/Surface (marked ●)
- No. expected surface pressure values per day = **24**
- No. surface pressure values received by WIGOS MCs per day = **8**

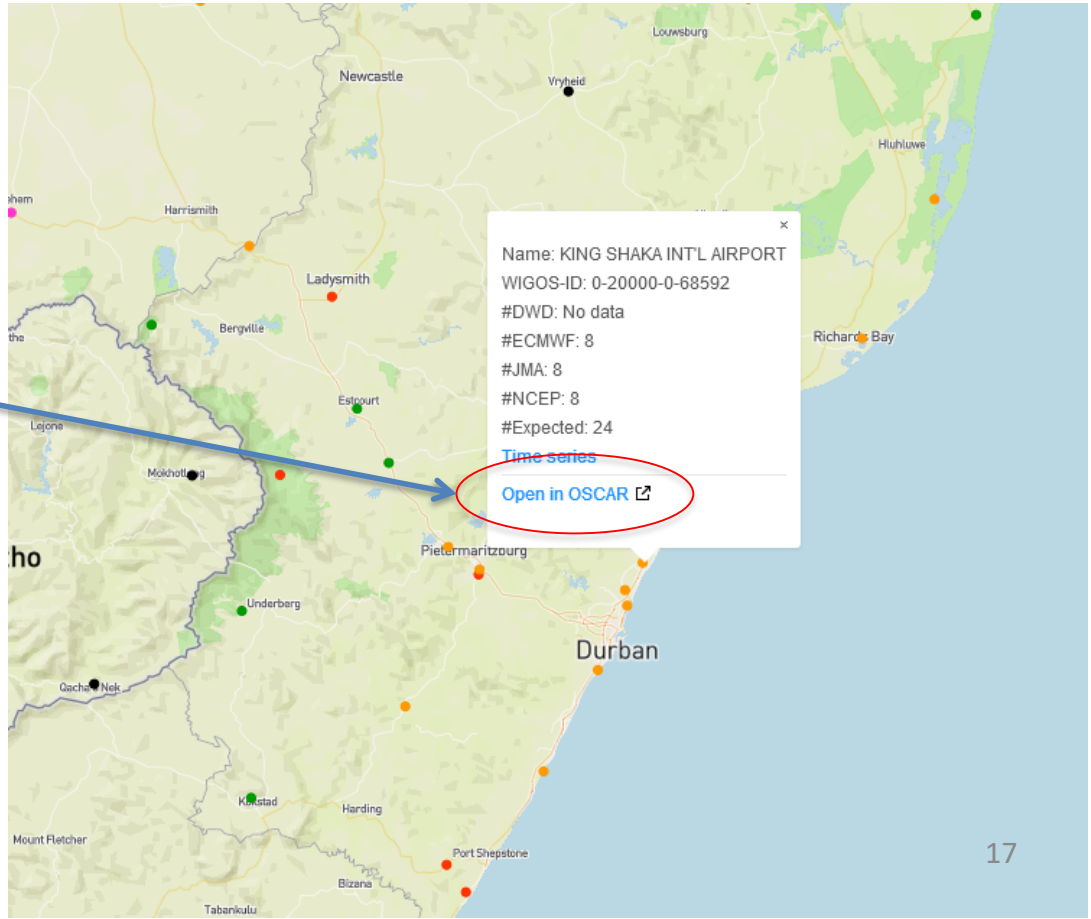


Example of issues in data availability – No. 2

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 2 (cont.):

- RWC would first check the reporting interval for international exchange for surface pressure in OSCAR/Surface
  ➔ click onto the link 'Open OSCAR' which will lead directly to the corresponding station metadata in OSCAR/Surface

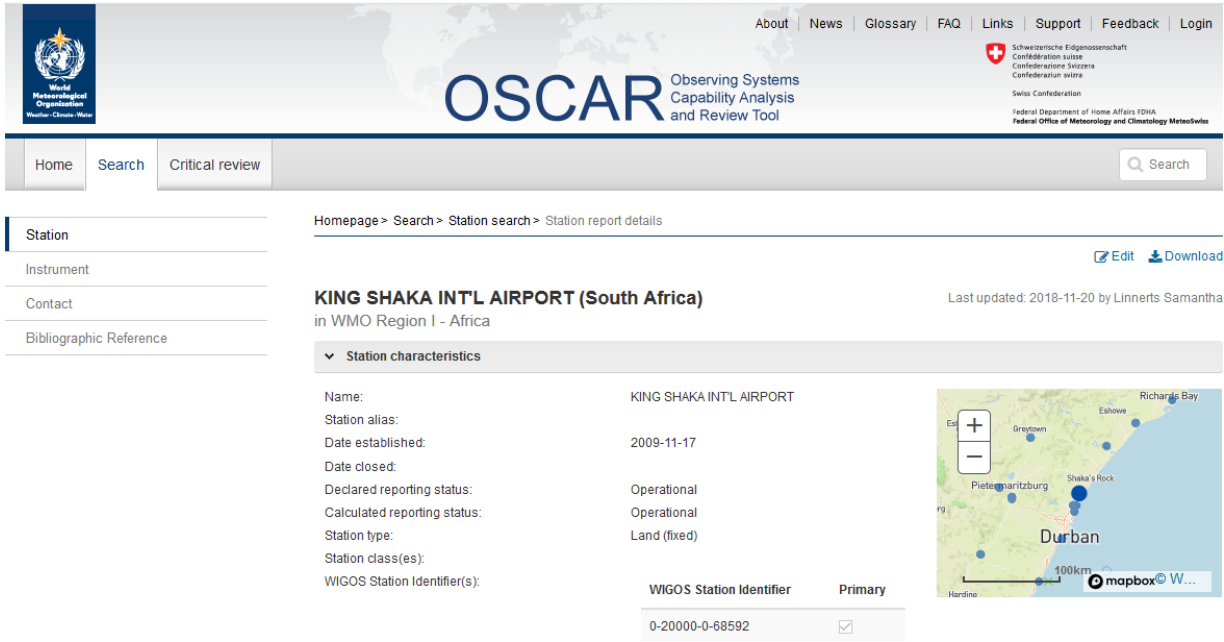


Example of issues in data availability – No. 2

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 2 (cont.):

- Check the metadata for pressure by clicking onto
  - Observations / measurements
  - Atmosphere > Pressure
  - Atmospheric pressure - [Geometry: Point]
  - Deployments
  - From 2016-04-29
  - Data Generation



See also https://oscar.wmo.int/surface/#/search/station/stationReportDetails/0-20000-0-68592

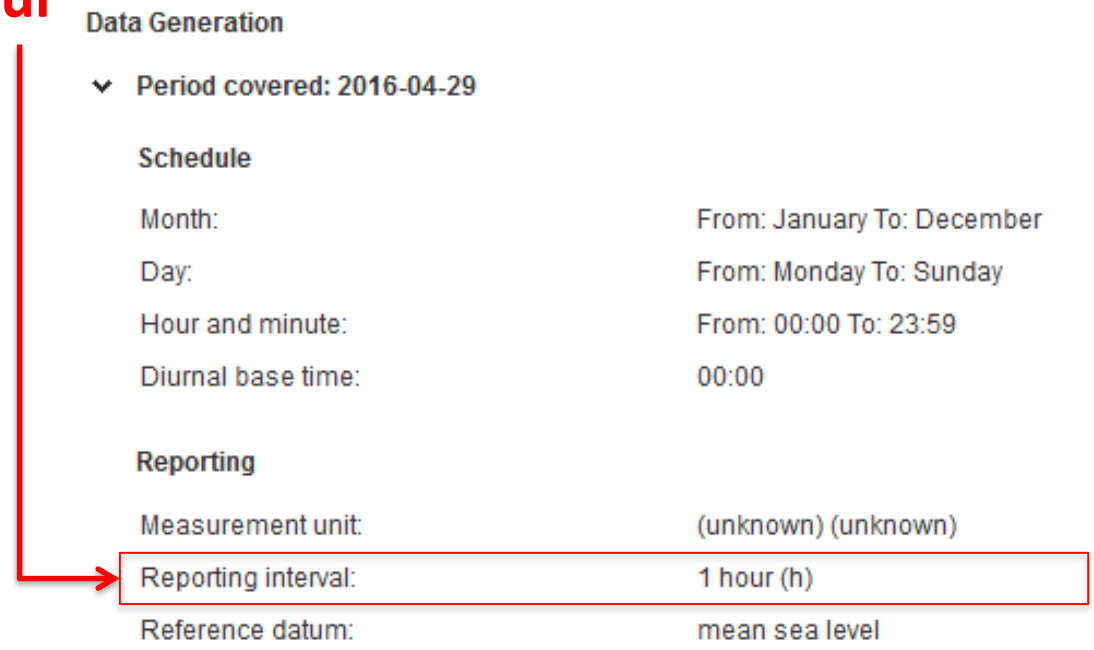
Example of issues in data availability – No. 2

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 2 (cont.):

- According to OSCAR/Surface the station reports surface pressure with an **interval of 1 hour**

➢ **But availability on WIS: only 3-hourly** (7 pressure obs. per day)



➢ RWC to initiate an IMP asking WDQMS NFP to either correct OSCAR/Surface or to ingest hourly surface pressure obs. to WIS

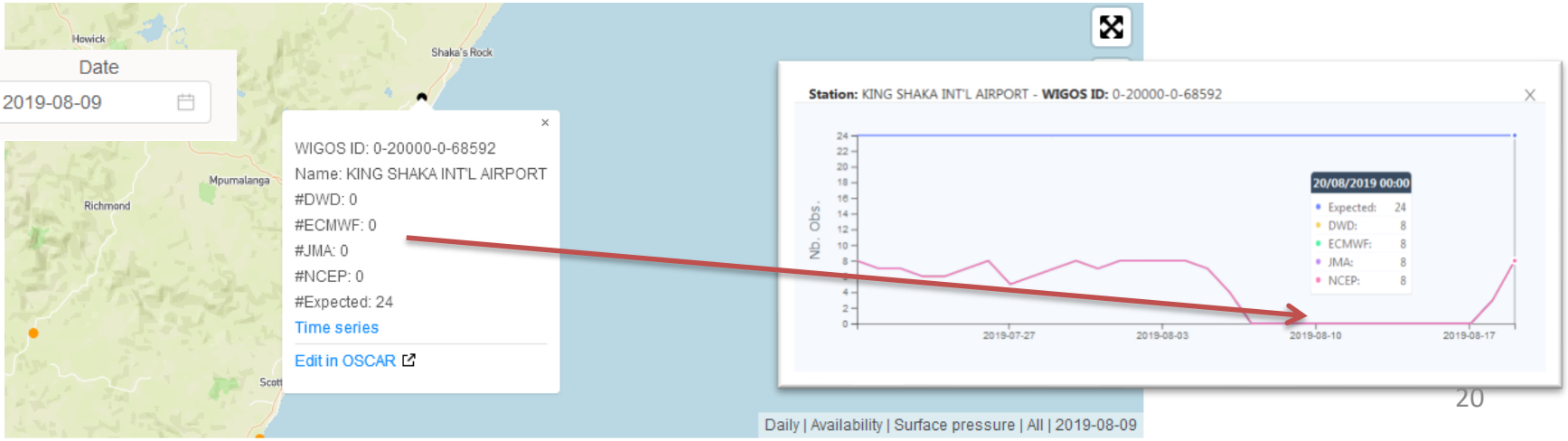
Example of issues in data availability – No. 3

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 3 (complete data outage):

- Station usually reports to WIS (as shown in previous slides)
- However, since 08th August 2019 no data were available on WIS (No. of obs. received by each of the WIGOS MC = 0), see black dot in availability map and time series
- The data outage continued until 18th August 2019 (10 days)

➢ RWC would have to initiate an IMP concerning this data outage at the 5th day, i.e. on 12th August



Example of issues in data availability – No. 3

68592 KING SHAKA INT'L AIRPORT (South Africa)

Issue No. 3 (cont.):

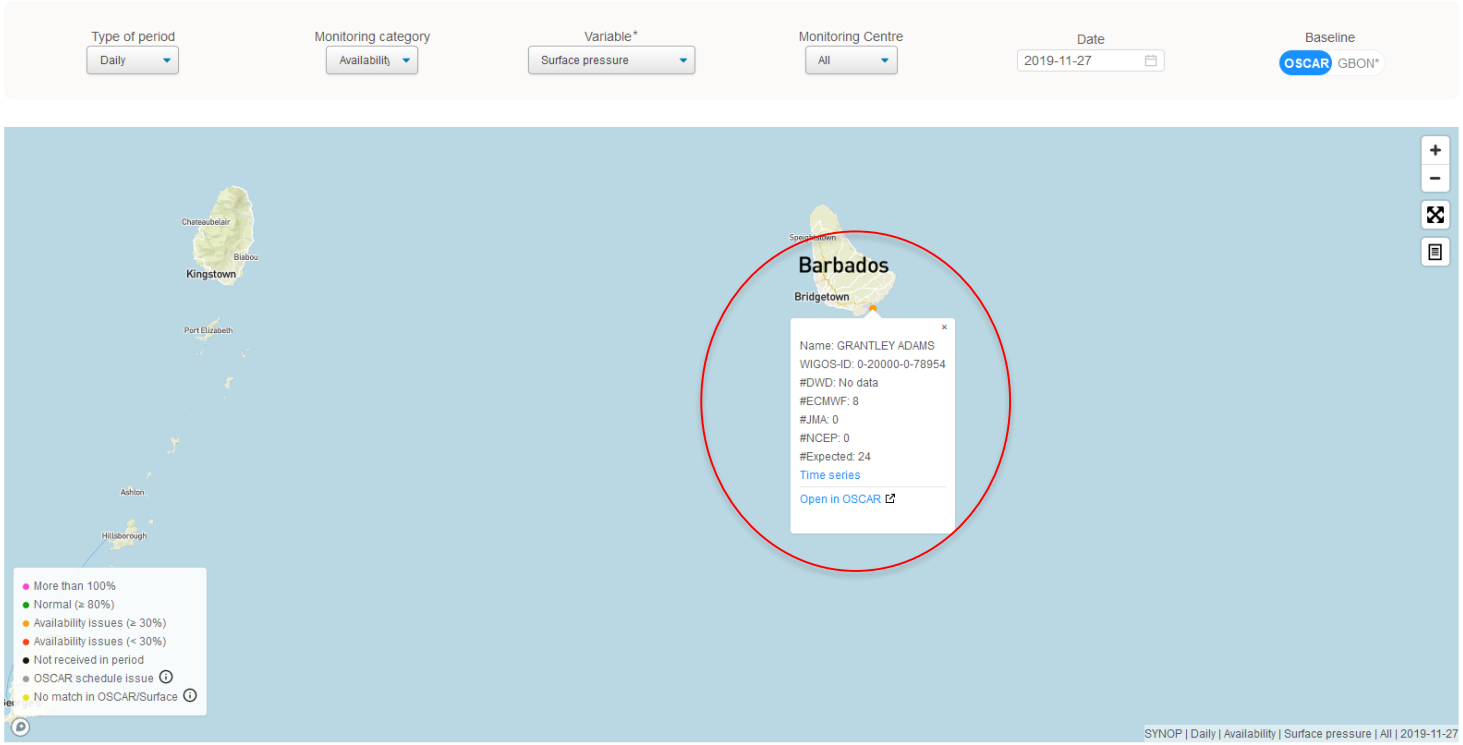
Data outage

Example of availability issues due to BUFR encoding issues – No. 4

78954 GRANTLEY ADAMS (Barbados)

Issue No. 4 (BUFR encoding issues):

- Most of the WIGOS MCs don´t receive any data from this station
- According to data provider and GISC the station reports BUFR messages to WIS



Example of availability issues due to BUFR encoding issues – No. 4

78954 GRANTLEY ADAMS (Barbados)

Issue No. 4 (cont.):

In this case, the reasons for the availability issues were identified through ad hoc liaison between Barbados HQ, GISCs, QM experts and BUFR encoding experts as follows

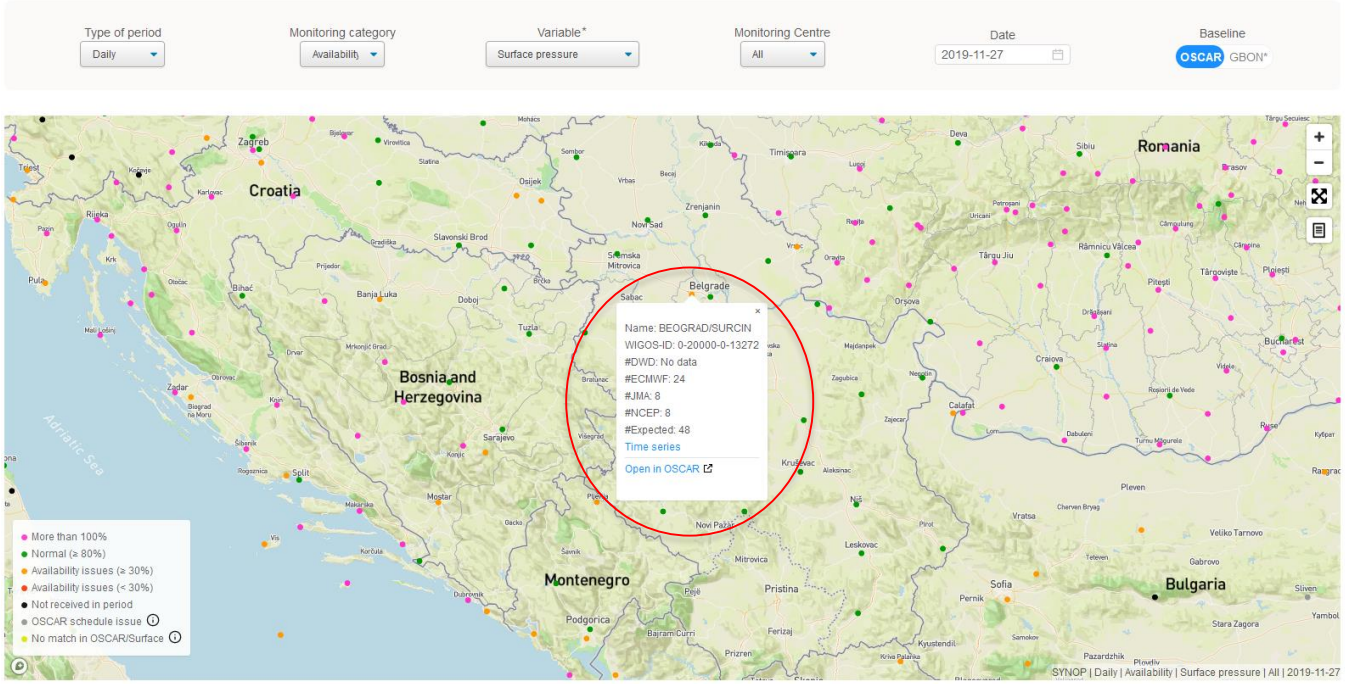
- The messages are disseminated in BUFR format, but the data is encoded in **BUFR Edition 3**
- BUFR Edition 3 is obsolete (removed from the Manual on Codes in 2012) and BUFR Edition 4 is the valid edition
- The BUFR messages contain descriptors which BUFR Edition 3 didn´t contain yet
  Action proposed for rectification → NMHS to switch to BUFR Edition 4 to allow all WIGOS MCs to be able to use the data

Example of differing availability results depending on the use of TAC or BUFR – No. 5

13272 BEOGRAD/SURCIN (Serbia)

Issue No. 5 (differing availability results depending on format type):

- According to NCEP and JMA quality monitoring reports the station seems to be reporting pressure on a **3-hourly basis** only
- According to ECMWF quality monitoring reports the station seems to be reporting surface pressure on an **hourly basis**



Example of differing availability results depending on the use of TAC or BUFR – No. 5

13272 BEOGRAD/SURCIN (Serbia)

Issue No. 5 (cont.):

- **All results are correct:**
  - ECMWF considers **BUFR messages** which are ingested to WIS on an **hourly basis**,
  - Whilst NCEP and JMA consider **TAC messages** which are reported at **main and intermediate hours** (3-hourly) only
- **No RWC action required**

RWC starting to operationalize…

- When a RWC is starting its WDQMS operations they should initiate incident management processes for long-term ongoing issues of the following types of issues before getting into detail with special incidents of particular stations:
  - No match in OSCAR/Surface
  - Stations which didn´t report for a longer period of time (i.e. so-called ‘silent stations’)
  - Stations reporting more than 100%

RWC evaluation background and priorities

- The RWC should base their evaluation of the data availability performances on the performance targets as outlined in the *'Technical Guidelines for Regional WIGOS Centres on the WIGOS Data Quality Monitoring System'* (WMO-No. 1224) or on particular performance targets, e.g. concerning Global Basic Observing Network (GBON) requirements or other network or regional requirements.
- Frequent issues are described in WMO-No. 1224 as well
- The incident management process shall be prioritized according to the priority levels as described in WMO-No. 1224 , e.g. giving very high priority if several / all stations of a country are affected.

➢ **All information available on the Moodle platform https://etrp.wmo.int/course/view.php?id=173**

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Thank you

Tanja.Kleinert@dwd.de
https://community.wmo.int/activity-areas/wigos

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