

WIGOS Data Quality Monitoring System (WDQMS)

Performance targets of surface land stations



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

Performance targets of surface land stations

- The Observing Systems Capability Analysis and Review (**OSCAR**) tool (<https://www.wmo-sat.info/oscar/>) and the **Manual on the Global Observing System, Volume II – Regional Aspects** (WMO, 2011b) define requirements for observation cycles.
- According to the Manual, a **minimum** of three observations at main hours in Universal Time Coordinated (UTC) and five observations at main and intermediate hours (3 h) are required. The target is four observations at main hours in UTC and eight obs. at main and intermediate hours (3 h) required.

➤ **Provisional GBON:
hourly observations**

A screenshot of the OSCAR web application interface. The header includes the WMO logo, the title "OSCAR Observing Systems Capability Analysis and Review Tool", and a "Login" button. A navigation menu contains "Home", "Observation Requirements", "Space-based Capabilities", "Surface-based Capabilities", and "Analysis". The main content area is titled "Welcome to OSCAR" and contains introductory text about the tool's purpose and a list of available documents for download, including a 10-minute screen-cast, a user manual (413 kbyte), a focal point manual (200 kbyte), and a flyer (1.4 Mbyte). A sidebar on the right provides instructions for getting started with OSCAR/Space and OSCAR/Surface. At the bottom, there is a diagram showing the tool's architecture with "Web-based interface" and "Data sources" components.

OSCAR
Observing Systems Capability Analysis and Review Tool

Home Observation Requirements Space-based Capabilities Surface-based Capabilities Analysis

Welcome to OSCAR

OSCAR is a resource developed by WMO in support of Earth Observation applications, studies and global coordination.

It contains quantitative user-defined requirements for observation of physical variables in application areas of WMO (i.e. related to weather, water and climate). OSCAR also provides detailed information on all earth observation satellites and instruments, and expert analyses of space-based capabilities.

The tool constitutes a building block of WIGOS and more specifically, the so-called **Rolling Requirements Review process**. OSCAR targets all users interested in the status and the planning of global observing systems as well as data users looking for instrument specifications at platform level. To continue, please select one of the following modules:

- Observation Requirements
- Satellite Capabilities
- Surface based Capabilities

Each of the modules can be consulted individually, however, the tool is also designed with the goal to integrate user requirements with actual capabilities. This facilitates the Rolling Requirements Review process, comparing "what is required" with "what is, or will be available", in order to identify gaps and support the planning of integrated global observing systems.

Getting started with OSCAR/Space and OSCAR/Requirements

- Watch the [10 minute OSCAR screen-cast](#) to get an overview of the application and learn how to use its functionalities
- Documents available for download
 - [OSCAR/Space and OSCAR/Requirements User manual](#) (413 kbyte)
 - [OSCAR/Requirements Focal Point manual](#) (200 kbyte) for user requirements editors
 - [OSCAR Flyer](#) (1.4 Mbyte)

Getting started with OSCAR/Surface

- Read the [OSCAR/Surface User manual](#)

Performance targets of RA VI

- Examples for the WMO Integrated Global Observing System (WIGOS) Data Quality Monitoring System (WDQMS) of Regional Association (RA) VI.
- It is up to individual RAs to define their own performance targets.
- Data availability = 95%
- Timeliness HH+50 = 90%, HH+100 = 95%

| <i>Parameter</i> | <i>Target</i> | <i>Comment</i> |
|--|--|--|
| Data availability: percentage of observations received from the network | 95% <i>Manual on the Global Observing System (WMO, 2011b)</i> MRQ: 50% TRQ: 95–100% (depending on the RA) | Percentage of monthly data available from the surface land station network according to the schedule outlined in OSCAR/Surface (number of observations received per month compared to number of observations expected per month) |
| Timeliness: percentage received by HH+100 HH+50 | 95% 90% | Percentage of data received by target times (HH+100 or HH+50) calculated on a monthly basis Targets relate to percentage of data received, not expected Threshold requirement Breakthrough requirement |

Bias, trueness and precision

- The **bias** is used as a measure of trueness and is calculated as the average of O-B results over a certain period.
- The targets regarding **trueness** are stated such that the bias should be close to zero for all measured variables.
- The standard deviation is the quantitative measure of **precision**. The targets for precision are applied to the standard deviation of O-B results over a certain period for each of the observed variables.
- All three measures – bias, trueness and precision - are assessed daily and monthly. Also, the 5-day moving average of daily calculated standard deviation of O-B will be calculated for all variables and compared to the respective prescribed threshold.



Gross errors

- The number of gross errors in a month (number of single observations whose O-B results exceed the prescribed threshold) will be computed for each variable at each station.
- The station will be flagged as an issue when the percentage of gross error per variable is **larger than 15% of the total observations of that variable in the month.**
- For different variables different thresholds are defined. The [thresholds](#) proposed for land surface observations as outlined in *WMO-No. 1224* are:
 - 10hPa for surface pressure or 100 m for geopotential height
 - 10 K for 2-metre temperature
 - 15 m/s for wind vector
 - 30% for relative humidity.



Performance targets of RA VI - pressure

- Target for bias (trueness) = 0.5 hPa
- Target for standard deviation (precision) = 1.5 hPa
- Threshold for gross errors = 10 hPa

| <i>Parameter</i> | <i>Trueness – target for bias</i> | <i>Precision – target for standard deviation</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|------------------|-----------------------------------|--|---|--|
| Pressure (hPa) | 0.5 hPa | 1.5 hPa | 10 hPa <15% of all single observations | <p>Bias as a measure of trueness: on average (several days), the absolute value of the daily calculated bias of pressure observations (P BIAS) should not exceed the given target</p> <p>Standard deviation as a measure of precision: on average (several days), the daily calculated standard deviation of pressure (P STDDEV) should not exceed the given target</p> <p>Gross errors: the number of gross errors during 1 month should not exceed a percentage of all single observations of that particular station</p> <p>Threshold requirement</p> |

Performance targets of RA VI – geopotential h.

- Target for bias (trueness) = 30 m
- Target for standard deviation (precision) = 40 m
- Threshold for gross errors = 100 m

| <i>Parameter</i> | <i>Trueness – target for bias/ mean vector difference (MVD)</i> | <i>Precision – target for standard deviation/ root mean square vector difference (RMSVD)</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|----------------------------|---|--|---|--|
| Geopotential height (m) | 30 m | 40 m | 100 m <15% of all single observations | For surface land stations in mountainous areas only where no pressure observations are provided but geopotential heights (gpm) are Bias as a measure of trueness: on average (5 d), the absolute value of the daily calculated bias of gpm observations (gpm BIAS) should not exceed the given target Standard deviation as a measure of precision: on average (several days), the daily calculated standard deviation of gpm (gpm STDDEV) should not exceed the given target Gross errors: the number of gross errors during 1 month should not exceed a percentage of all single observations of that particular station Threshold requirement |

Performance targets of RA VI - temperature

- Target for bias (trueness) = 0.5 K
- Target for standard deviation (precision) = NA
- Threshold for gross errors = 10 K

| <i>Parameter</i> | <i>Trueness – target for bias/ mean vector difference (MVD)</i> | <i>Precision – target for standard deviation/ root mean square vector difference (RMSVD)</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|------------------|---|---|--|---|
| Temperature (K) | 0.5 K | Not currently specified: numerical weather prediction (NWP) 2 m temperature forecasts are not yet reliable to serve as reference | 10 K <15% of all single observations | Bias as a measure of trueness: on average (5 d), the absolute value of the daily calculated bias of temperature observations (T BIAS) should not exceed the given target Standard deviation as a measure of precision: on average (several days), the daily calculated standard deviation of temperature (T STDDEV) should not exceed the given target Gross errors: the number of gross errors during 1 month should not exceed a percentage of all single observations of that particular station Threshold requirement |

Performance targets of RA VI - wind

- Target for bias (trueness) = 3.0 m/s
- Target for standard deviation (precision) = 5.0 m/s
- Threshold for gross errors = 15 m/s

| <i>Parameter</i> | <i>Trueness – target for bias/ mean vector difference (MVD)</i> | <i>Precision – target for standard deviation/ root mean square vector difference (RMSVD)</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|----------------------------------|---|--|--|--|
| Wind vector (m s ⁻¹) | 3.0 m s ⁻¹ | 5.0 m s ⁻¹ | 15 m s ⁻¹ <15% of all single observations | MVD as a measure of trueness: on average (several days), the absolute value of the daily calculated MVD of wind observations (WIND MVD) should not exceed the given target RMSVD as a measure of precision: on average (several days), the daily calculated RMSVD of wind should not exceed the given target Gross errors: the number of gross errors during 1 month should not exceed a percentage of all single observations of that particular station Threshold requirement |

Performance targets of RA VI – relative humidity

- Target for bias (trueness) = 10%
- Target for standard deviation (precision) = NA
- Threshold for gross errors = 30%

| <i>Parameter</i> | <i>Trueness – target for bias/ mean vector difference (MVD)</i> | <i>Precision – target for standard deviation/ root mean square vector difference (RMSVD)</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|-----------------------|---|--|--|--|
| Relative humidity (%) | 10% | | 30% <15% of all single observations | <p>Bias as a measure of trueness: on average (several days), the absolute value of the daily calculated bias of relative humidity observations (RH BIAS) should not exceed the given target</p> <p>Standard deviation as a measure of precision: on average (several days), the daily calculated standard deviation of relative humidity (RH STDDEV) should not exceed the given target</p> <p>Gross errors: the number of gross errors during 1 month should not exceed a percentage of all single observations of that particular station</p> <p>Threshold requirement</p> |

Baseline OSCAR/Requirements

Table 2. Links to requirements for global NWP, for surface variables, in OSCAR/Requirements

| <i>Air pressure (at surface)</i> | <i>Air temperature (at surface)</i> | <i>Wind vector over the surface (horizontal)</i> | <i>Specific humidity</i> |
|---|---|---|---|
| ID 250 | ID 253 | ID 320 | ID LT 303 |
| http://www.wmo-sat.info/oscar/variables/view/10 | http://www.wmo-sat.info/oscar/variables/view/12 | http://www.wmo-sat.info/oscar/variables/view/183 | http://www.wmo-sat.info/oscar/variables/view/161 |

Thank you

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<https://community.wmo.int/activity-areas/wigos>



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