

WIGOS Data Quality Monitoring System (WDQMS)

Performance targets of upper-air land stations



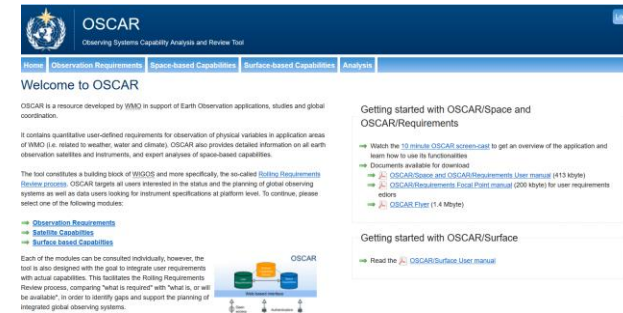
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Performance targets of upper-air stations

- 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 one sounding at 12 UTC up to 100 hPa is required. The target is two soundings at 00 and 12 UTC, up to 10 hPa required.
- The provision of time and coordinates in Binary Universal Form for the Representation of meteorological data (BUFR) data as well as the provision of high-resolution BUFR data of all radiosonde stations is recommended (2 s).



➤ **Provisional GBON: sounding interval 12h**
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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%
- Geopotential height: achieving 100 hPa = 97%
achieving 50 hPa = 95%

Performance targets of RA VI

| <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: 25–50% (depending on RA) TRQ: 95–100% (depending on RA) | Percentage of monthly data availability of the upper-air (radiosonde) land network according to the schedule as outlined in OSCAR/Surface (number of soundings received per month compared to number of soundings expected per month) |
| Timeliness: percentage data received by HH+100 – the entire sounding (BUFR) or TEMP parts CD (Traditional Alphanumeric Code (TAC)) HH+50 – up to 100 hPa (BUFR) or TEMP parts AB (TAC) | 95% 90% | Percentage of data received by target times (HH+100 or HH+50) to be calculated on a monthly basis Targets relate to percentage of data received, not expected Threshold requirements |
| Geopotential height: percentage achieving 100 hPa 50 hPa | 97% 95% | Targets relate to percentage of data received, not expected Threshold requirements |

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 upper-air land observations as outlined in *WMO-No. 1224* are:
 - 10 K for temperature
 - 15 m/s for wind vector
 - 30% for relative humidity



Performance targets of RA VI - temperature

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

| <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> |
|------------------|-----------------------------------|--|---|--|
| Temperature (K) | 0.5 K | 1.5 K | 10 K <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 temperature observations (T BIAS) over all levels 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 temperature (T STDDEV) over all levels 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 - 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/ MVD</i> | <i>Precision – target for standard deviation/ 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) over all levels should not exceed the given target RMSVD as a measure of precision: on average (several days), the daily calculated RMSVD of wind over all levels 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/ MVD</i> | <i>Precision – target for standard deviation/ 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) over all levels 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) over all levels (from the surface to the tropopause) 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) = 65m
- Target for standard deviation (precision) = NA
- Threshold for gross errors = NA

| <i>Parameter</i> | <i>Trueness – target for bias/ MVD</i> | <i>Precision – target for standard deviation/ RMSVD</i> | <i>Threshold for gross errors</i> | <i>Comment</i> |
|---|--|---|-----------------------------------|-----------------------------------|
| Observation-minus-background 100 hPa geopotential height difference (m) | 65 m | | | Equates to 1 hPa error at 100 hPa |

Baseline OSCAR/Requirements

Table 4. Links to requirements for global NWP, for upper-air variables, in OSCAR/Requirements

| <i>Atmospheric temperature</i> | <i>Wind (horizontal)</i> | <i>Specific humidity</i> |
|---|---|---|
| ID LT: 257 ID HT: 255 | ID LT: 313 ID HT: 311 | ID LT: 303 ID HT: 302 |
| http://www.wmo-sat.info/oscar/variables/view/13 | http://www.wmo-sat.info/oscar/variables/view/179 | 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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