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Measurement Quality Classifications for Surface Observing Stations on Land

Krunoslav Premec
(WMO Secretariat)

WMO OMM
World Meteorological Organization
Organisation météorologique mondiale

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Siting Classification for Surface Observing Stations on Land

Siting Classification for Surface Observing Stations on Land

- the common ISO/WMO standard 19289:2014(E);
- originally approved by CIMO-XV (2010).

Classification for:

1. AIR TEMPERATURE AND HUMIDITY;
2. PRECIPITATION;
3. SURFACE WIND;
4. GLOBAL AND DIFFUSE RADIATION;
5. DIRECT RADIATION AND SUNSHINE DURATION.

Classes: 1 (considered as reference site) to 5 (an inappropriate environment for a meteorological measurement that is intended to be representative).

Siting Classification for Surface Observing Stations on Land (Cont'd)

Purpose:

- to help determine the given site's representativeness on a small scale.

- a site with a poor class number (large number) **can still be valuable for a specific application** needing a measurement in this particular site, including its local obstacles.

Siting Classification for Surface Observing Stations on Land (Cont'd)

- helps the network managers to better take into consideration the exposure rules, and thus it often improves the siting. At least, the siting environment is known and documented in the metadata;

- this classification is defined to condense the information and facilitate the operational use of this metadata information;

- a site as a whole has no single classification number. Each parameter being measured at a site has its own class, and is sometimes different from the others.

Measurement Quality Classifications for Surface Observing Stations on Land

Measurement Quality Classifications for Surface Observing Stations on Land

- Instrument performance monitoring is also critical to ensure sustained quality of observations (CIMO-15).
- Experts from CIMO ET OIST and ET DIST have developed the classifications that are complementary to the siting classifications.
- Purpuse: to provide **a simple assessment of instrument quality, maintenance and calibration state**, leading to a further indication of the likely quality of observational data produced at the site.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

The quality of meteorological measurements:

- is determined by the instruments used, the system configuration and siting, and the definition and knowledge of the measurand.
- evolves with time due to internal and external factors affecting the measuring system.
- the information required to define an optimal maintenance, calibration and verification regime comes from laboratory and field tests, user experience and manufacturer's documentation.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

- Annex 1.A of the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8), Volume I, Chapter 1: **Operational measurement uncertainty requirements and instrument performance**

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

1) Measuring system uncertainty:

- encompasses the instrument, including embedded sensor(s), as well as;
- the contribution of external components, such as radiation shields/screens, mounting arms, cabinets, pressure heads, data loggers and instrument performance changes over time (instrument drift).

Each of those has inherent uncertainties that contribute to the measuring system uncertainty.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

2) Siting measurement uncertainty

- is associated with instrument exposure that is the effects from nearby objects on the environment that the instrument is measuring (for example, trees, walls, and fences, large areas of water or pavement).

3) Overall measurement uncertainty, (expanded measurement uncertainty)

- is the combination of the: measuring system uncertainty and the siting measurement uncertainty.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

Assumptions:

(a) the sampling rate is higher than the Nyquist frequency - no component of uncertainty due to under sampling; and

(b) the response time is sufficient - no component of uncertainty due to insufficient response time.

When measuring systems implement a combination of sensors to derive the required measurand, all of these need to be considered during calculation of the measuring system uncertainty.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

- This classification scheme does not replace or encompass the siting classification scheme, but works hand in hand with it.
- Each measurand at a site has its own associated class for the measurement quality classification scheme and the siting classification scheme.
- The measuring system uncertainty and siting measurement uncertainty (or classes) must both be fully characterized for each measurand to determine the overall measurement uncertainty of data from a site.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

In a descriptive sense, classes are:

a) **Class A**: Measurement meets the WMO required measurement uncertainty and stated achievable measurement uncertainty;
b) **Class B**: Measurement has a wider uncertainty interval than class A;
c) **Class C**: Specifications and/or ongoing maintenance and calibration are more relaxed than class B;
d) **Class D**: Initial specifications are wider than class C or no information is available, and quality of the data over time is not known.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

Examples are:

a) **Class A**: the measurements at reference climatological or research stations;

b) **Class B**: the measurements at synoptic or controlled aeronautical stations;

c) **Class C**: the measurements at well-maintained public weather stations;

d) **Class D**: the measurements at crowdsourced weather stations.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

The Table:

- gives detailed descriptions with metrics defining how to achieve and maintain each performance class;
- covers the measurands and reports the measurement uncertainty that must be fulfilled for each class;
- also gives examples of the contribution of the instrument and additional components to the measurement uncertainty.

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

Measurands:

1. Air temperature (1 min average)
2. Relative humidity (1 min average)
3. Atmospheric pressure (1 min average)
4. Wind speed (2 and 10 min average)
5. Wind direction (2 and 10 min average)
6. Liquid precipitation amount (daily)
7. Liquid precipitation intensity (1 min average)
8. Global downward solar radiant exposure (daily)
9. Sunshine duration (daily)
10. Visibility (MOR) (1 and 10 min average)

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

Measurand	Item	Class A	Class B	Class C	Class D
Air temperature (1 minute average)	Target Uncertainty	0.3 K	0.5 K	1.0 K	> class C or unknown
	Uncertainty Example for analogue instrument in a radiation shield	Sensor: 0.10 K Drift: 0.02 (0.02)* K Screen: 0.25 K Logger: 0.02 K Total: 0.3 K	Sensor: 0.30 K Drift: 0.09 (0.03)* K Screen: 0.35 K Logger: 0.10 K Total: 0.5 K	Sensor: 0.40 K Drift: 0.25 (0.05)* K Screen: 0.70 K Logger: 0.20 K Total:0.9 K	-
	Resolution	0.1 K	0.1 K	1 K	-
	Calibration Regime	Yearly	3 yearly	5 yearly	None or unknown
	Verification Regime	6 monthly	Yearly	Yearly	None or unknown
	Maintenance Regime	Yearly	Yearly	Yearly	None or unknown

Measurement Quality Classifications for Surface Observing Stations on Land (cont'd)

To maintain the target uncertainty over time, instruments and associate interfaces should, at the indicated intervals, undergo:

(a) Calibration against a traceable standard, to SI units where these exist;

(b) Field checks or verifications at one or several points, performed between laboratory calibrations;

(c) Maintenance to retain the desired measurement uncertainty.

Decision 6 (CIMO-17)

Decision 6 (CIMO-17)

CIMO noted with appreciation the progress made to the Measurement Quality Classifications for Surface Observing Stations on Land, which is provided in the Annex to the present decision.

The commission urges CIMO Members who expressed their concerns with some parts of the scheme, **to submit their proposals for improvement to the Task Team on Classification Schemes, and to actively contribute to the work of the Task Team**.

The Commission requests the Task Team to improve the document according to the inputs received.

Decision 6 (CIMO-17) (cont'd)

The Commission requests its president to arrange for approval of the classification scheme by correspondence by the Commission.

The Commission authorises its President to approve inclusion of the scheme as an annex to the Volume I, Chapter 1 of the Guide to Instruments and Methods of Observation, upon its approval.

The Commission authorizes the Secretariat to make editorial changes, if needed.

Decision 6 (CIMO-17) (cont'd)

The Commission requests its Management Group to consider the development of relevant guidance material.

The Commission invites Members to implement the Measurement Quality Classifications for Surface Observing Stations on Land as appropriate and encourages them to share their experience with the implementation of this classification scheme in order to decide at a later stage whether it could be promoted as a common WMO-ISO standard.

CIMO Task Team on Classification Schemes

CIMO Task Team on Classification Schemes

1. Examine available experiences on implementation of the siting classification scheme and assess the need and, as appropriate, propose possible ways for updating the classification scheme.
2. Revise the siting classification scheme as required, in collaboration with ISO.
3. Develop guidance documentation and relevant outreach material for Members on implementation of the siting classification scheme.
4. Keep under review and if appropriate refine the scheme for classification of surface measurement quality.
5. Develop guidance and outreach material for Members on implementation of the scheme for classification of surface measurement quality.

CIMO Task Team on Classification Schemes

Chair: Ms Jane Warne (Australia)

Vice-chair: Ms Mareile Wolff (Norway)

Proposed core members from RA-II:

Mr Jankai Wang (China)

Mr Satoshi Hagiya (Japan)

Proposed ad-hoc member from RA-II:

Ms Choi Jeongmin (Korea)

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Thank you
Merci

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