

**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR INSTRUMENT AND  
METHODS OF OBSERVATION  
OPAG-SURFACE**

**EXPERT TEAM ON SURFACE TECHNOLOGY AND  
MEASUREMENT TECHNIQUES  
*First Session***

Geneva, Switzerland, 13-16 October 2004

CIMO/OPAG-SURFACE/  
ET ST&MT-1/Doc. 3.3(1)

(20.IX.2004)

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ITEM: 3.3

Original: ENGLISH ONLY

**STANDARDS FOR AUTOMATED VISUAL AND SUBJECTIVE OBSERVATIONS**  
**Standards for automation of manual, visual and subjective observations**

*Submitted by Chairman*

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**Summary and Purpose of Document**

The document contains an introduction on the requirements for standards of systems measuring present weather.

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**ACTION PROPOSED**

The meeting is invited to take notice of the document and to supply suggestions or recommendations on how to provide documentation and guidelines to standardize present weather observing systems.

**References:**

1. CIMO-XIII, Abridged final report
2. CIMO MG (2003) Final report
3. CBS ET-AWS-3 (28 June - 2 July 2004) Final report.
4. CIMO Guide (WMO-No. 8, 6<sup>th</sup> edition)

## Background

### 1.1. Introduction

In the very past most observations were carried out manually and visually. Instruments were read out manually and transmission reports were generated manually as well. Moreover weather phenomena, which could not be measured or identified by instruments, were observed visually. Typically these observations are subjective and qualitative and not traceable to well defined standards or definitions. Today, by the introduction of new technologies, unattended automatic data-acquisition systems generate automatically observation reports without the interference of a human being. The whole observing system is controlled remotely and the unmanned site of the AWS is visited e.g. each half a year. Although such stations are cheaper because of reduced personnel costs, the requirements of the observing system in terms of performance are very severe. Unattended operations require an excellent performance, to be guaranteed by preventive maintenance and appropriate management policy, which is not so necessary for manned stations, where corrective maintenance can be done directly to comply with required performance.

For most of the geophysical variables measured today by instruments well-defined standard practices are recommended and published in the CIMO Guide. A number of observations, indicated as *visual and subjective* observations, which have a subjective and rather qualitative nature cannot easily be automated by using the new more or less sophisticated technologies. Nevertheless a number of systems, technologies or methods are developed to provide automatically the meteorological community with observational data, which should be representative or can be used instead of these *visual or subjective* observations. A good example is the development of *present weather systems* (see Item 3.1). Although these new developments are challenging and promising, the lack of well-defined standards describing how to derive such parameters causes confusion at the position of the user and the manufacturer. In particular, when many data sources (both *in-situ* and *remote sensing*) or multiple-sensor systems are used, the complexity of such system may generate output with very undefined measurement uncertainties. Feedback and improvement activities based on validation of this output are hazardous. Moreover, uniformity in data presentation, in particular with respect to weather observations, is crucial for meteorological applications, so standardization is a principle goal for WMO.

Therefore, not only guidance on the technology to be used has to be delivered but also rules to obtain an acceptable level of uniformity in the basic concepts of observational technology. It will not be feasible to recommend only one standard methodology to derive the specific parameters related to the obsolete visual and subjective observations. Nevertheless, standardization of data sources to be used and methods or algorithms to reduce these data are required to provide a well-specified level II data products. Such a standard is also a requirement for the manufacturer or instrument developer to be able to produce any system that complies with the user's needs.

On the other hand the users of level II data have to present clear functional specifications of the required level II data, because standardization can only be established if it complies with these specifications. For this purpose a number of (combined) CIMO and CBS ET meetings were organized. Recently the (CBS) ET-AWS met from 28 June - 2 July 2004. During this meeting the functional specifications of automatic weather stations were reviewed and modified. Also the table with required measurement uncertainties (published in the CIMO Guide, Annex 1.B) was updated. Any standard to be developed should meet these recommended specifications. However, in case the currently existing technology cannot support sufficiently the requirements, the best achievable operational measurement uncertainties should be stated. These values are also indicated in that table. It is the task of the CIMO

ETs to review and provide recommendations to modify these achievable uncertainties as appropriate.

## 1.2. System development

As stated in Doc.3.1(1) a number of parameters cannot be measured directly and methods are used to derive such parameters from a “multi-sensors system” and other sources, like active and passive remote sensing devices on board satellites. Dedicated algorithms (e.g. in PWS) are developed and still under development. In particular methods to derive observational information from a complexity of systems, like combinations of *in-situ* point measurements and ground and satellite based *remote sensing* measurement demonstrate high potential, in particular in combination with NWP producing now casting information.

Although some guidelines are available on a national base, no uniform or standard methodology is currently recommended being suitable to determine all new or alternative parameters. It is therefore a task for CIMO to provide the meteorological community and manufacturers with recommended standards. Because this activity is related to the tasks on standardization of PWS and on standardization of algorithms used in AWS this task should be carried in close co-operation with the persons responsible for these other tasks. In order to be well informed on the current state of the art of new promising technologies and their capabilities, co-operation with HMEI and satellite remote sensing experts will be necessary as well.

## Activity plan

### 2.1. Planned activities

In line with CIMO XIII, the CIMO management group has decided to continue the work on standardization of automated visual and subjective observations. Standardization of the measuring technology and algorithms to derive parameters related to this type of observations has to be proposed to CIMO.

To realize this request, further review of existing recommendations and newly available publications on this topic will be carried out. As a result, recommendations for standards will be developed and proposed at the next CIMO. Furthermore, recommended practices have to be published in an IOM report.

### 2.2. Time Table

	<b><i>Deliverable</i></b>	<b><i>deadline</i></b>
a.	IOM report on methods used in current systems, including proposal on standardization.	September 2005
b.	Report to CIMO XIV	May 2006