

WORLD METEOROLOGICAL ORGANIZATION

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

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

(GENEVA, SWITZERLAND, 22-26 SEPTEMBER 2008)

CIMO/OPAG-SURFACE/
ET-ST&MT-2/Doc. 3.3(1)
(9.IX.2008)

ITEM: 3.3

Original: ENGLISH

REPORTS ON THE PROGRESS IN ADDRESSING THE WORK PLAN OF THE EXPERT TEAM

Surface measurements in extreme weather conditions

Requirements for instruments on meteorological icing

(Submitted by Mr A. Heimo)

Summary and purpose of document

This document presents a summary of the results achieved by the COST 727 Action on Atmospheric Icing on Structures Measurements and data collection on icing. It provides, among other recommendations for measurements under icing conditions.

ACTION PROPOSED

The meeting is invited to consider the work done under COST 727 and the proposed recommendations. The meeting is further invited to agree on their adequacy for inclusion on the CIMO Guide and on the next steps to be taken in view of including such recommendations in the CIMO Guide.

Expert Team on Surface Technology and Measurement Techniques

Report: Dr. A. Heimo

Work Plan 2007-2010/Task 3a/ET-A1/: Specifications

No.	Task description	Person responsible	Action	Deadline	Deliverables	Deadline
-----	------------------	--------------------	--------	----------	--------------	----------

3	Surface measurements in extreme weather conditions					
---	--	--	--	--	--	--

3a						
----	--	--	--	--	--	--

	Describe requirements on instruments on meteorological icing					
--	--	--	--	--	--	--

		A. Heimo				
--	--	-----------------	--	--	--	--

	1. Analyze and describe the problem					
--	-------------------------------------	--	--	--	--	--

	2. Investigate into tests experiences etc of icing					
--	--	--	--	--	--	--

	3. Recommend best practices					
--	-----------------------------	--	--	--	--	--

				Jul 2008 report to CIMO XV	Jul 2010	
--	--	--	--	----------------------------	----------	--

Summary

Background

The accuracy of the surface measurements of various meteorological variables is essential for meteorological services, researchers in climatology (e.g. climate change), aeronautical meteorology, etc. It is therefore essential to characterize the effects of ice accretion on the sensors and, when possible, to prevent it.

The WMO Guide for meteorological measurements does not define the temporal reliability of sensors, e.g. the required availability of data per year or per month, so that most meteorological services have specified their own targets for availability of data. Similar targets are defined also for other applications. Furthermore, the WMO Guide does not separately consider severe weather conditions like icing, even if low temperature is specified in the requirements. In the same way, the manufacturers typically specify their instruments' performance for severe weather conditions by taking into account low temperature (for instance operating range: -40°C... + 50°C), but not icing. Presently, icing events are defined as periods of time where the temperature is below 0°C and the relative humidity is above 95%, a very simplified approach. Usually low air temperature is not a major problem for meteorological observations: for many sensors, this is taken into account e.g. by using shaft heating for anemometers with rotating parts (at small and/or mobile automatic stations, the power supply may not be sufficient even for shaft heating).

It must be noted that most activities on developing requirements for instruments in harsh climatic environments focus on icing conditions only (*i.e.* in extremely cold mountainous/Arctic climates). Therefore, equipment for dusty and dry deserts, humid and hot tropics and oceans with a harsh climate need further investigation. For these climates only very limited guidance material is available on the implementation and maintenance of automatic observing systems and, therefore, further studies are necessary. Moreover, not only the performance and maintenance issues of a system are a point of concern but also destruction of instruments caused by extreme weather should be considered (*e.g.* tropical cyclones reaching 300 km/h or more.)

In line with past developments and published material on this matter, documentation on the requirements for instruments for observations in harsh climatic conditions has to be generated. Moreover, as stated in the recommendations in the EUMETNET SWS II report, more attention to this topic should be given in a future revision of the CIMO Guide.

Results: Measurements under icing conditions

The following results have been obtained as joint venture with the ongoing COST-727 Action “*Measuring and forecasting atmospheric icing on structures*” which was established in April 2004.

The preliminary activity of the Action was dedicated to gathering available information for comprehensive state-of-the-art reports which has been recently published¹. It contains information on:

Definition of icing: it is recommended to adopt the ISO12949 standard.

Past and present activities: International projects such as WMO/CIMO Instrument Inter-comparison, EUMETNET SWS I and II projects, EU/WECO and NEW ICETOOLS projects as well as entities such IEC/CENELEC, ISO and IW AIS are shortly presented.

Standards: Prevailing standards in use (ISO, IEC and WMO) dedicated to icing on structures and icing measurements are shortly presented.

Measurements under icing conditions: As the WMO has presently no specific recommendations for measurements performed under icing conditions, a set of recommendations is presented concerning classification of sites and classification of sensors depending on severity of icing and the site climatic environment.

Requirements and availability of ice detectors: It is shown that requirements on ice detectors are dependent of the user’s requirement (wind energy, power lines, meteorology etc.) and on the application. Installation procedures are presented, depending on users requirements together with validation and verification processes.

Examples of existing data and experiences with existing ice detectors: A number of available long term experiments are presented concerning icing measurements and characterization of icing sensors. These activities have taken place in numerous countries like Finland, Germany, Slovak Rep., Norway, Czech Rep., UK, and indirectly from France, Switzerland, Sweden, Bulgaria, Russia, Canada, etc.

Recommendations for future activities: The establishment of test centres within the COST-727 Action (Phase 2) have a temporary character. It is recommended that long-term international calibration stations are established with a sufficient financial support for continuous operation. These test/calibration centres are to be recognized for delivering approved certificates for icing detectors and ice-free sensors.

Present activities

¹ COST-727, Atmospheric Icing on Structures: 2006, Measurements and data collection on icing: State of the Art Publication of MeteoSwiss, 75, 110 pp.

The ongoing activities in the COST-727 Action are dedicated to R&D and will concentrate on research on in-cloud icing, measurement on atmospheric icing, modelling and forecasting of icing processes, improved forecasting systems, verification of existing icing sensors and mapping of icing occurrences and potentials in Europe.