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Experimental evaluation of temperature uncertainty components due to siting conditions with respect to WMO classification

Graziano Coppa (1), Carmen Garcia Izquierdo (2), Nebojsa Jandric (3), Annarosa Quarello (4), Michal Voldan (5), and Andrea Merlone (1)

(1) INRiM, Metrology for the Quality of Life, Torino, Italy (g.coppa@inrim.it), (2) CEM, Centro Español de Metrologia, Tres Cantos, Spain, (3) IMBiH, Institut za Mjeriteljstvo Bosne i Hercegovine, Sarajevo, Bosnia and Herzegovina, (4) UniTo, Università degli Studi di Torino, Torino, Italy, (5) ČMI, Český Metrologický Institute, Prague, Czech Republic

Surface atmospheric air temperature measurements are influenced by the obstacles surrounding the measurement site itself. WMO guide #8 (Annex 1.B) establishes a qualitative/quantitative classification of measurement sites for some surface atmospheric quantities' measurements by itemizing different site conditions, in terms of obstacles proximity, ground slopes, projected shades etc. In the context of climatologic studies and in meteorology, where air temperature measurements are key and a wide multitude of instruments, in very different sites and conditions, are used, such a classification seems not sufficient.
In the framework of EMRP ENV58.MeteoMet2 project and in order to improve the WMO siting classification for air temperature measurements, a one-year lasting experiment has been devised with the aim to perform a metrological evaluation of the influence of several obstacles in air temperature measurements under a large range of atmospheric conditions.
The experiment consists in a 100 m long array of Automatic Weather Stations (AWSs), placed on a flat grass field at increasing distances from an obstacle, such that the farthest station fulfils current WMO requirements for a Class 1 site. Each AWS is equipped with one Pt100 thermometer, calibrated against reference standards, in a ventilated radiation shield; quantities of influence are also measured by dedicated sensors (hygrometers, solar radiation sensors and sonic anemometers), in some of the AWSs. Three identical experimental setups have been designed, built and characterized. Each system is built in different experimental sites, located in three different nations (Italy, Czech Republic and Spain). In each country, the effect of a different obstacle on air temperature measurements will be evaluated: asphalt roads (Italy), trees (Czech Republic) and buildings (Spain).
This work will present the data analysis results for the three experiments, employing a shared and uniform approach in order to reduce biases and provide a robust evaluation of air temperature measurement uncertainty under the different siting conditions.