



Traceability of ground based air temperature measurements: a case study on the Meteorological Observatory of Moncalieri (Italy)

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Assessing climate change will depend crucially on the robustness of climate data and uncertainties associated with measurements. Measurement uncertainties can only be determined and hence minimized if proper consideration is given to the metrological traceability of the measurement results. The metrological traceability is the property of a measurement to be related to a SI (International System of Units) standard through an unbroken chain of calibrations each contributing to the measurement uncertainty [1]. This work illustrates the three principal steps to guarantee traceability to measurements of air temperature recorded by automatic weather stations:

1. The first step in traceability is related to the primary standards, which are maintained in each country by the National Institute of Metrology (NMI). The internationally agreed reference for the temperature is the International Temperature Scale (ITS-90). The fixed point cells and the transfer instruments, standard platinum resistance thermometers (SPRT), are here described.
2. The second step is the calibration: the temperature sensors are compared directly with primary standards or through secondary standards, according to the target uncertainty and the procedure adopted or required. In this work we illustrate a procedure and a calibration facility manufactured for meteorological purpose by the Italian NMI [2]. The calibration facility is a chamber, with reduced dimensions, transportable for in situ calibrations.
3. Third requirement is the evaluation of the calibration uncertainties. To account in the uncertainty budget for this type B uncertainty, in addition to the usual type A, will allow to obtain more reliable temperature data. (Type A, as defined in the Guide to the expression of uncertainty in measurement (GUM) [3], is the component of uncertainty determined by means of statistical analysis, and type B by means other than statistical analysis).

An application example of a complete traceability procedure is described for the temperature measurements recorded at the Meteorological Observatory of Moncalieri (Italy) where an unbroken temperature data series has been maintained since 1865 (www.nimbus.it/moncalieri/moncalieri.asp). The use of calibrated sensor to generate temperature data represents a fruitful example of direct cooperation between metrological and meteorological/climatology community in order to best address the need of reliable climate data. Objective strongly supported by the European joint research project “MeteoMet- Metrology for Meteorology” [2].

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