



C. Garcia Izquierdo<sup>(1)</sup>, M. Parrondo<sup>(1)</sup>, A. Merlone<sup>(2, 4)</sup>, Y.-A. Roulet<sup>(3)</sup>, A. Viola<sup>(4)</sup>, M. Casula<sup>(4)</sup>  
<sup>1</sup> Centro Español de Metrología, Tres Cantos, Spain  
<sup>2</sup> INRiM, Istituto Nazionale di Ricerca Metrologica, Torino, Italy  
<sup>3</sup> Federal Office of Meteorology and Climatology MeteoSwiss, Switzerland  
<sup>4</sup> ISP-CNR, Institute of Polar Sciences, Rome, Italy  
 mcgarciaiz@cem.es



## INTRODUCTION. Increasing the comparability of in field measurements by INTERCOMPARISONS

Air temperature measurements are performed by different combinations of thermometers and radiation shields. The response of each system (thermometer + radiation shield) to air temperature changes, residual sun radiation, wind, humidity, etc. depends on the system itself, i.e. on the characteristics of both components, shield and thermometer. This makes the worldwide comparability of air temperature measurements limited, creates inconsistencies in climate data series and reduces the accuracy and reliability of long-term air temperature data. Field intercomparisons of instruments have been identified by WMO as a useful tool to increase the comparability of measurements taken at different times, in different places, and with different equipment.

WMO, aware of the importance of air temperature measurements in meteorology and climatology and considering the strong influence of external factors on air temperature measurements, encourages the organization of comparisons of thermometers and radiation shields at different climate conditions.

In particular, no intercomparison of thermometers and radiation shields in polar climate was performed so far. In this frame, the project COAT - *Increasing the Comparability Of extreme Air Temperature measurements for meteorology and climate studies* - was selected and funded by the European Metrology Research Program, EMPIR, as a prosecution of the MeteoMet activities.

COAT project has WMO as the main supporter and it aims at organizing, conducting and analysing the results of an intercomparison of thermometers and radiation shields in the Arctic research station of Ny-Ålesund – Svalbard. The project started in October 2020 and will end in April 2024. Its consortium is composed of an international multidisciplinary team, including meteorologists, Earth science researchers and metrologists. **The three main deliverables of this project are (i) the development of a comparison protocol in agreement with WMO rules of procedure, (ii) a report with the result of the intercomparison for the involved radiation shields and thermometers, and (iii) the development of a best practice guide for air temperature measurements in polar regions.**

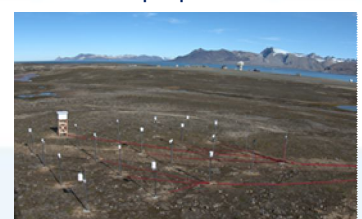
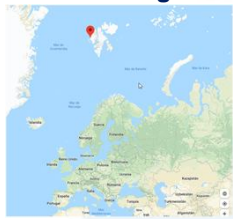
This contribution presents the status of the project, with the comparison procedure, the selection of the instruments, the description of the preliminary calibration of the involved instrumentation and their deployment in Ny-Ålesund.

## ACTIVITIES. Addressing the NEEDS

**1. Comparison Protocol:** To develop a validated protocol for planning and conducting in field intercomparisons of thermometers and radiation shields used for meteorological and climate purposes. The intercomparison protocol implements metrological concepts: it is being validated by field measurements, already started, in the Arctic (Activity 2) and then reviewed and submitted to WMO-INFCOM/SC-MINT.



**2. Conducting in field intercomparison** of thermometers and radiation shields used for meteorological and climate purposes in the Arctic.



**3. Generating documentation:** Production of documentation and guide lines for air temperature measurements in Arctic environment

## CONCLUSIONS

- The main goal of this project is to increase the comparability of field air temperature measurements by a field intercomparison.
- An agreed protocol for the intercomparison of thermometers and shield has been developed.
- The Project is focused on Arctic environment.
- A multidisciplinary team is involved.
- Field set-up and measurements are being done with strong metrological background.

## RECOMMENDATIONS

- To ensure, by field intercomparison, the correspondence between measurements.
- To create, by homogeneous intercomparison protocols, links between the results of different intercomparisons
- To consider and to analyse peculiarities of the local conditions in the design and conduction of field experiments.
- To support and promote multi - disciplinarity in projects
- To increase involvement of metrological community in field measurements to improve knowledge from user's perspective.