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Metrology for Climate Sciences: The European Metrology Network for Climate and Ocean Observation

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Environmental observations of essential climate variables (ECVs) and related quantities made by satellites and in situ observational networks are used for a wide range of societal applications. To identify a small climate trend from an observational record that is also sensitive to changes in weather, to seasonal effects and to geophysical processes, it is essential that observations have a stable basis that holds for multiple decades, whilst still allowing for changes in the observation instrumentation and operational procedures. To achieve this, all aspects of data collection and handling must be underpinned by robust quality assurance. The resultant data should also be linked to a common reference, with well-understood uncertainty analysis, so that observations are interoperable and coherent; in other words, measurements by different organisations, different instruments and different techniques should be able to be meaningfully combined and compared.

Metrology, the science of measurement, can provide a critical role in enabling robust, interoperable and stable observational records and can aid users in judging the fitness-for-purpose of such records. In addition to Global Climate Observing System (GCOS) monitoring principles, metrology's value, and the role of National Metrology Institutes (NMI) in observations, has been recognised in initiatives such as the Quality Assurance Framework for Earth Observation (QA4EO) established by the Committee on Earth Observation Satellites (CEOS) and in the implementation plans of the World Meteorological Organization's (WMO's), Global Atmosphere Watch and the European Ocean Observing System.

The European Association for National Metrology Institutes (EURAMET) has recently created the

“European Metrology Network (EMN) for Climate and Ocean Observation” to support further engagement of the expert communities with metrologists at national metrology institutes and to encourage Europe’s metrologists to coordinate their research in response to community needs. The EMN has a scope that covers metrological support for in situ and remote sensing observations of atmosphere, land and ocean ECVs (and related parameters) for climate applications. It also covers the additional economic and ecological applications of ocean Essential Ocean Variable (EOV) observations. It is the European contribution to a global effort to further enhance metrological best practice into such observations through targeted research efforts.

In late 2019 and early 2020 the EMN carried out a survey to identify the need for metrology within the observational communities and held a webinar workshop to prioritise the identified needs. Here we present the results of the survey and discuss the role that metrology can play in the climate observing system of the future.