European Metrology
Research Programme
Delivering Impact

Confidence in climate data

Central to our understanding of climate change are reliable Earth models. These models depend on complex measurements for validation of variables such as ice cover, cloud cover, sea level and temperature that can only be made from space using satellites. The Earth observation community needs to be able to compare and combine these satellite data, regardless of the conditions under which they were collected, to ensure robust climate forecasts.

Europe's National Measurement Institutes working together

The European Metrology Research Programme (EMRP) brings together National Measurement Institutes in 23 countries to address key measurement challenges at a European level. It supports collaborative research to ensure that measurement science meets the future needs of industry and wider society.

Challenge

The instruments used on board satellites to make measurements of key climate variables are calibrated prior to launch to ensure their accuracy. However, instrument performance can change during launch into space, and once in flight instruments operate in a very different environment to that in which they were calibrated. Changes in instrument response post-launch, due for example to the effects of reduced gravity, can be estimated but this makes the calculation of measurement uncertainties – and therefore the accuracy of the measurements – problematic.

Without sufficient knowledge of how accurate measurements are, it is very difficult to compare climate data produced from different sources, using different methods, at different points in time. This limits the usefulness of available data, both historic and current. Improved uncertainty evaluation methods are required to enable greater confidence in climate data and the climate projections they underpin.

Solution

The EMRP project *European metrology for Earth observation and climate* carried out research to better understand the performance of climate monitoring instrumentation in space and the measurement uncertainties that arise in this operating environment. Based on this extensive study, project researchers developed a method that enables the most robust comparison to date of historic and modern climate data from satellites. The method is freely-available to climate researchers in a good practice guide.

Impact

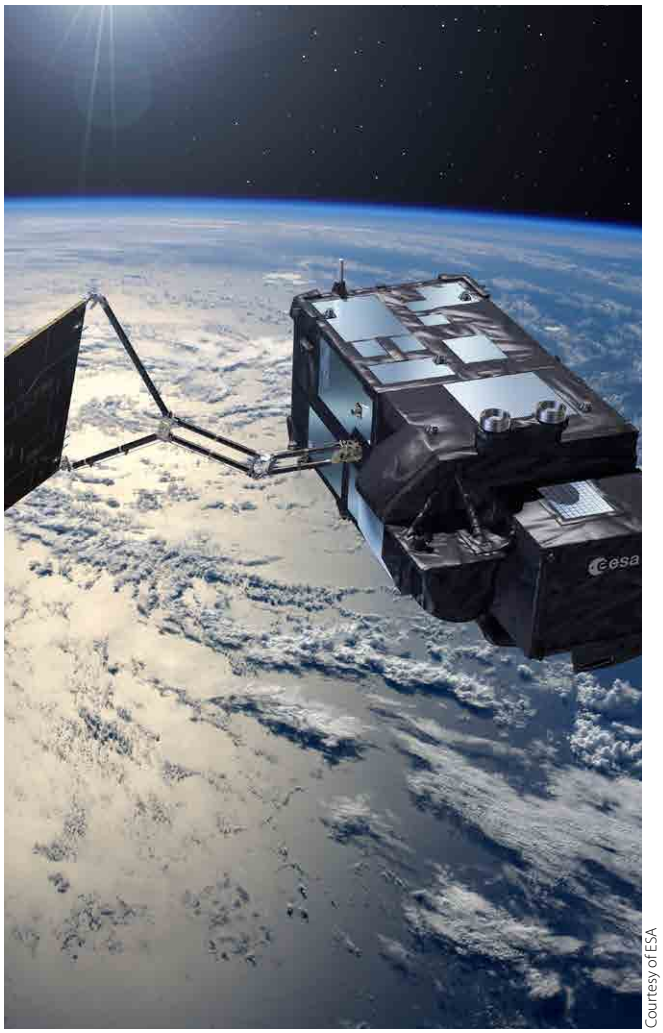
The UK Met Office generates some of the most comprehensive climate projections ever produced, to help decision-makers assess the UK's risk exposure to climate change and inform mitigation and adaptation strategies. These predictions are guided by climate data generated from a number of sources, both historic and current.

The Met Office will use the new uncertainty evaluation method developed within the project, to enable the combination of climate data collected on the most recent European Sentinel satellite missions with its existing datasets. This opens up a significant amount of additional climate data to the Met Office for climate monitoring and modeling purposes, improving the quality and range of measurements available to guide its climate projections.

The method and the research it is based on have also been assembled into a course and textbook for Earth observation scientists, to be made freely-available online in the near future, due to continuing funding support from EMRP. This is a significant step towards improving understanding and use of measurement uncertainty evaluation in the climate research community and will contribute to improved climate models and projections.

Earth observation metrology

The EMRP project *Metrology for Earth observation and climate* developed new measurement standards, methods and calibration facilities to support the validation of sensors used in Earth observation satellites, both prior to and during flight. These outputs will ensure that accurate, laboratory-quality measurements of key climate parameters can be made from space and used to underpin robust predictions of changes to the Earth's climate.



Courtesy of ESA

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