



EU Surface Temperature for All Corners of Earth – the EUSTACE project

Nick Rayner (1), Renate Auchmann (2), Janette Bessembinder (3), Stefan Brönnimann (2), Yuri Brugnara (2), Laura Carrea (4), Darren Ghent (5), Elizabeth Good (1), Katie Herring (1), Jacob Høyer (6), John Kennedy (1), Albert Klein Tank (3), Finn Lindgren (7), Colin Morice (1), Chris Merchant (4), John Remedios (5), Ag Stephens (8), and Rasmus Tonboe (6)

(1) Met Office Hadley Centre, Exeter, United Kingdom (nick.rayner@metoffice.gov.uk), (2) Oeschger Centre, University of Bern, Bern, Switzerland, (3) KNMI, de Bilt, The Netherlands, (4) University of Reading, Reading, UK, (5) University of Leicester, Leicester, UK, (6) Danish Meteorological Institut, Copenhagen, Denmark, (7) University of Bath, Bath, UK, (8) CEDA, STFC, Harwell, UK

Day-to-day variations in surface air temperature affect society in many ways; however, daily surface air temperature measurements are not available everywhere. A global daily analysis cannot be achieved with measurements made in situ alone, so incorporation of satellite retrievals is needed. To achieve this, we must develop an understanding of the relationships between traditional (land and marine) surface air temperature measurements and retrievals of surface skin temperature from satellite measurements, i.e. Land Surface Temperature, Ice Surface Temperature, Sea Surface Temperature and Lake Surface Water Temperature. These relationships can be derived either empirically or with the help of a physical model.

Here we discuss the science needed to produce a fully-global daily analysis (or ensemble of analyses) of surface air temperature on the centennial scale, integrating different ground-based and satellite-borne data types. Information contained in the satellite retrievals would be used to create globally-complete fields in the past, using statistical models of how surface air temperature varies in a connected way from place to place. As the data volumes involved are considerable, such work would need to include partnerships with statisticians and computer scientists to enable the development of new “Big Data” analysis methods.

To achieve this, the EUSTACE project will:

- provide new, consistent, multi-component estimates of uncertainty in satellite retrievals of surface skin temperature;
- identify inhomogeneities in daily surface air temperature measurement series from meteorological stations and correct for these over Europe;
- estimate surface air temperature over all surfaces of Earth from surface skin temperature retrievals from satellites;
- use new statistical techniques to provide information on higher spatial and temporal scales than currently available, making optimum use of the information in data-rich eras.

EUSTACE will undertake this work between January 2015 and June 2018. An overview will be given of the challenges faced, together with information on how interested users can become involved.