

EUSTACE: combining different components of the observing system to deliver global, daily information on surface air temperature

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Day-to-day variations in surface air temperature affect society in many ways and are fundamental information for many climate services; 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 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.

Here we reflect on our experience so far within the Horizon 2020 project EUSTACE (2015-June 2018) of using satellite skin temperature retrievals to help us 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 and developing new statistical models of how surface air temperature varies in a connected way from place to place.

We will present an overview of progress, i.e.:

- providing new, consistent, multi-component estimates of uncertainty in surface skin temperature retrievals from satellites for land, ocean and ice;
- estimating surface air temperature over all surfaces of Earth from surface skin temperature retrievals;
- using new statistical techniques to provide information on higher spatial and temporal scales than currently available, making optimum use of information in data-rich eras

and a brief introduction to the other components of the project.

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- **Integrating In-situ / satellite data sources**