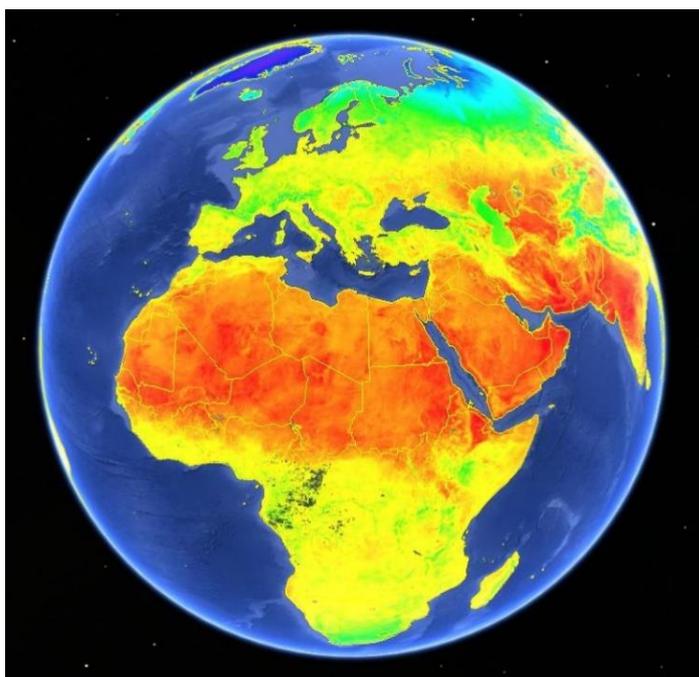


climate change initiative

→ LAND SURFACE TEMPERATURE NEWSLETTER



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Objectives of the project

The land surface temperature (LST) CCI project, which is funded by the European Space Agency (ESA) as part of the Agency's Climate Change Initiative (CCI) Programme, aims to deliver a significant improvement on the capability of current satellite LST data records to meet the challenging Global Climate Observing System (GCOS) requirements for climate applications to realise the full potential of long-term LST data for climate science.

Accurate knowledge of LST plays a key role in describing the physics of land-surface processes at regional and global scales as they combine information on both the surface-atmosphere interactions and

energy fluxes within the Earth Climate System. LST provides a metric of surface state when combined with vegetation parameters and soil moisture and is one of the drivers of vegetation phenology. Furthermore, LST is an independent temperature data set for quantifying climate change complementary to the near-surface air temperature ECV based on in situ measurements and reanalyses.

The team has produced the first data products from a variety of satellites to provide an accurate view of temperatures across land surfaces both regionally and globally of up to 20 years currently. Consistency between products and better characterisation of uncertainties are key advancements with these products. These data are delivering new insights to scientists working at leading climate centres.



Science highlights

User interaction and feedback is critical for developing the best LST products possible to meet climate needs. **The recent LST_cci User Workshop, held virtually 24-26 June 2020, provided the ideal forum for capturing user needs.** The 3-day event was conducted via videoconference for the online presentations and breakout groups complemented by offline interactions through a Padlet forum (Figure 1). Over 100 participants registered for the event and each of the twelve sessions was attended by between 45 and 70 participants. The event included a mixture of oral and online poster presentations, plenary discussions, and three breakout sessions addressing the following themes: i) user requirements; ii) uncertainties; and iii) climate services.

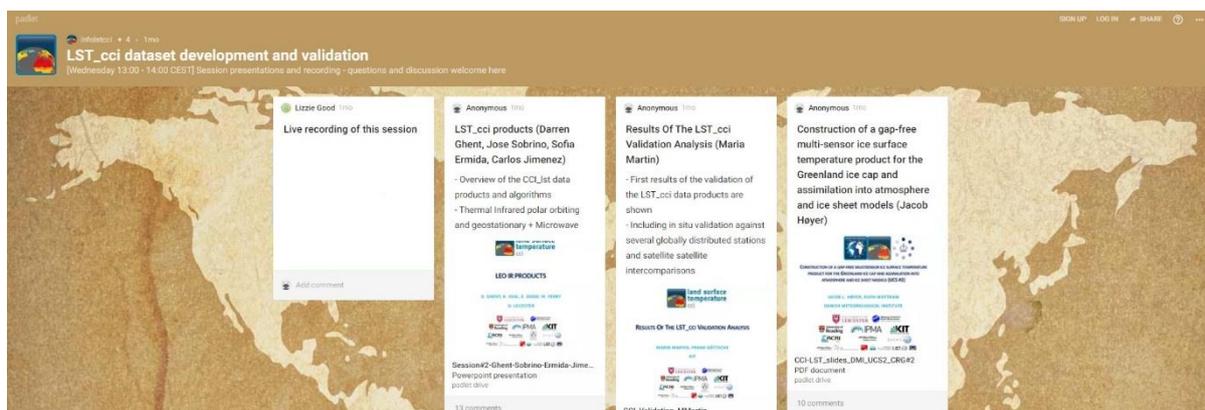


Figure 1: Example of Padlet interactive forum during the LST_cci User Workshop

Key messages which emerged from the workshop are as follows:

- ❖ There is a strong and vibrant community for LST products and with some innovative science being carried exploiting LST data; a couple of examples being:
 - Using LST as a diagnostic to evaluate soil moisture-surface flux relationships in land surface models during dry spells
 - Climatic analyses of drought occurrence using LST data and relating this to subsequent fire activity
- ❖ There is a growing use of uncertainty information.
- ❖ Improved cloud masking in the CCI products remains a key request from users.
- ❖ The choice of optimum spatial resolution for end-users is critical, and gridded data at the highest possible spatial resolution should be available.
- ❖ Software and documentation are important to help users propagate LST data and associated uncertainties to their application specific resolutions.
- ❖ To continue promoting the complementary benefits of LST to T_{2m} in the wider community, particularly for some regions such as Africa and the Arctic where T_{2m} observations are sparse.

- ❖ Updating Climate Data Records to nearer to current time would help with promoting LST_cci Products amongst users more familiar with T_{2m} .
- ❖ The workshop was deemed a big success and such a format offers a perfect framework for more regular workshops for the community.

The feedback received from the user community will help drive improvements in the LST_cci ECV Products to better meet the needs for existing and planned climate applications and services. All User Workshop presentations and posters are available from <https://padlet.com/infolstcci>.

Examples of the breadth of LST ECV products available are shown in Figure 2. This includes **global and regional cloud free data** from thermal infrared sensors and **global all sky data** from microwave sensors. Analysis has delivered the first long-term time series of LST from the 18-year Terra MODIS ECV product (Figure 3). Both absolute monthly daytime and night-time LST and anomalies with respect to monthly climatology have been produced.

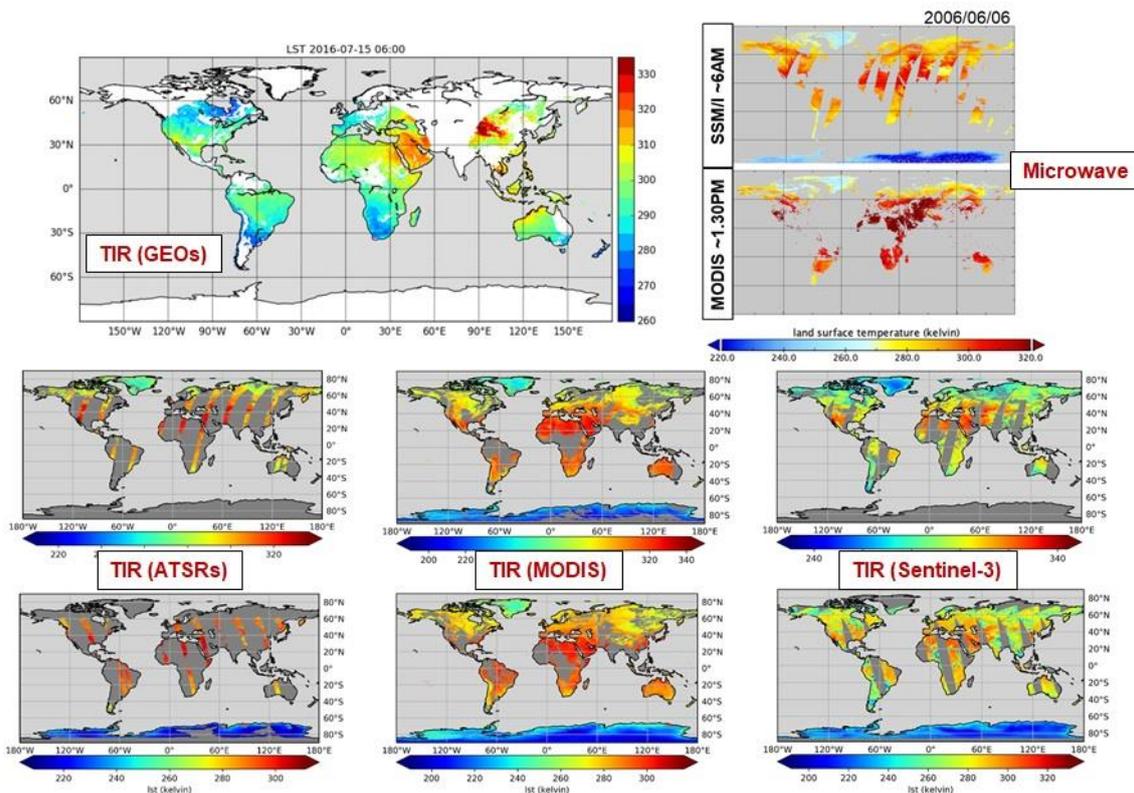


Figure 2: Example multi-sensor LST CCI output products available from the LST CCI public workspace

The algorithms, cloud detection methods, uncertainty models and processing chains continue to be advanced to deliver the best possible climate data records for LST. Please contact the Science Lead (Darren Ghent – djg20@le.ac.uk) to request access. Project documents are available on the Project website <http://cci.esa.int/lst>.

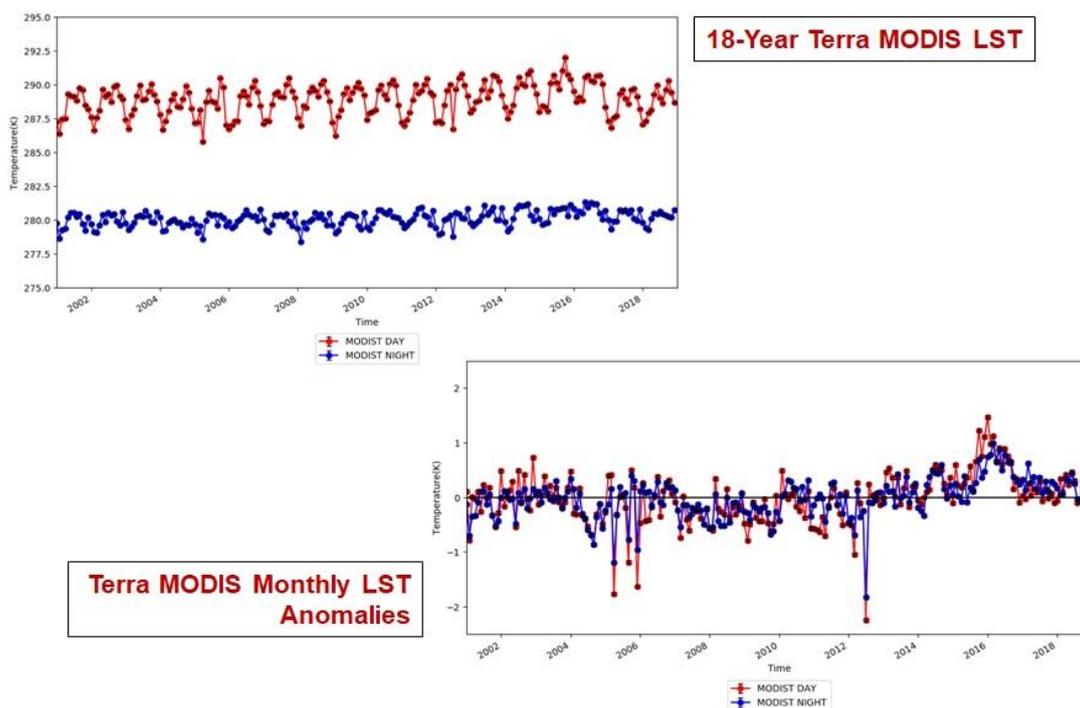


Figure 3: Monthly daytime (red) and night-time (blue) Level-3C absolute LST (top) and LST anomalies (bottom) for the 18-year Terra-MODIS LST CCI ECV Product from 2001 to 2018

Project Team

The Consortium is based on a close collaboration between the following partners:

- [University of Leicester](#) (primary)
- [ACRI-ST](#)
- [NCEO](#): National Centre for Earth Observation
- [University of Reading](#)
- [UK Met Office](#)
- [ESTELLUS](#)
- [UVEG](#): University of Valencia
- [KIT](#): Karlsruhe Institute of Technology
- [IPMA](#): Instituto Português do Mar e da Atmosfera
- [Ruhr University](#)
- [DMI](#): Danish Meteorological Institute
- [Max Plank Institute](#)

- [LIST](#): Luxembourg Institute of Science and Technology
- [Meteo Romania](#)

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ESA Technical Officer is Simon Pinnock: (simon.pinnock@esa.int)

Events

Presentations on LST CCI will be made at the AGU Fall Meeting in December 2020 in the EarthTemp session chaired by the International LST and Emissivity Working Group (ILSTE).