**Progress towards long-term land surface temperature datasets for climate studies**

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Land surface temperature (LST) is the mean radiative temperature of all objects comprising a surface, as measured by ground, air and spaceborne sesnors. It provides the thermodynamic temperature driving outgoing longwave flux (surface to atmosphere and space); differences with air temperature control sensible heat.

The increasing availability of long-term LST data and a much improved understanding of LST have galvanised an increasing number of climate users, e.g., better representations of near-surface air temperature; diagnosis of dry spells in climate models; time series of surface temperature for the Arctic. LST is recognised as an important, driving physical variable for the land surface in the climate system, controlling partitioning of energy and fluxes of water/carbon.

In this presentation, we overview the high quality and applicability of the longest serving (> 15 years), single sensor family data sets available from the thermal infrared instruments, the Along Track Scanning Radiometers (ATSR) and Moderate Resolution Spectro-radiometers (MODIS). We show how algorithm performances have been verified and validated, emphasizing the effects of new knowledge of emissivity, treatment of water vapour and handling of cloud effects.

The efficacy of LST records for climate has been much improved by: estimation of contextual, pixel-level uncertainties; diurnal data sets from geostationary orbit (particularly the SEVIRI instrument); characterisation of clear versus cloudy sky bias through the use of re-analysed microwave data. We highlight significant progress and provide a summary of state-of-the-art for future long-term data sets and analyses for LST; geostationary and microwave data will play key roles.

Progress in LST has been greatly enhanced through the efforts of the CEOI WGCV LPV subgroup (<http://lpvs.gsfc.nasa.gov/LST_home.html>) and a new collective, the International Land Surface Temperature and Emissivity Working Group (ILSTE-WG) unifying users and providers (<http://ilste-wg.org/>); support has been provided by the ESA GlobTemperature and NASA Measures projects.