



ESA DUE GlobTemperature project: Infrared-based LST Product

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One of the purposes of the GlobTemperature project is to provide a product of global Land Surface Temperature (LST) based on Geostationary Earth Orbit (GEO) and Low Earth polar Orbit (LEO) satellite data. The objective is to use existing LST products, which are obtained from different sensors/platforms, combining them into a harmonized product for a reference view angle. In a first approach, only infra-red based retrievals are considered, and LEO LSTs will be used as a common denominator among geostationary sensors.

LST data is provided by a wide range of sensors to optimize spatial coverage, namely: (i) 2 LEO sensors - the Advanced Along Track Scanning Radiometer (AATSR) series of instruments on-board ESA's Envisat, and the Moderate Resolution Imaging Spectroradiometer (MODIS) on-board NASA's TERRA and AQUA; and (ii) 3 GEO sensors - the Spinning Enhanced Visible and Infrared Imager (SEVIRI) on-board EUMETSAT's Meteosat Second Generation (MSG), the Japanese Meteorological Imager (JAMI) on-board the Japanese Meteorological Association (JMA) Multifunction Transport SATellite (MTSAT-2), and NASA's Geostationary Operational Environmental Satellites (GOES).

The merged LST product is generated in two steps: 1) calibration between each LEO and each GEO that consists in the removal of systematic differences (associated to sensor type and LST algorithms, including calibration, atmospheric and surface emissivity corrections, amongst others) represented by linear regressions; 2) angular correction that consists in bringing all LST data to reference (nadir) view.

Angular effects on LST are estimated by means of a kernel model of the surface thermal emission, which describes the angular dependence of LST as function of viewing and illumination geometry. The model is adjusted to MODIS and SEVIRI/MSG LST estimates and validated against LST retrievals from those sensors obtained for other years (not used in the calibration). It is shown that the model leads to a reduction of LST differences between the two sensors, indicating that it may be used to effectively estimate/correct angular dependence in LST. A global set of kernel model parameters is finally obtained by adjusting the model to either a GEO and a LEO or the two LEOs (poles).

A first version of the merged product will be released in 2016, available for download through the GlobTemperature portal. This includes only the calibration process (step 1), incorporating LST data from SEVIRI, GOES, MTSAT and MODIS; information on directional effects added as an extra layer of information. A second version of the dataset with a better incorporation of the angular correction is currently in preparation.