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Validation of Land Surface Temperature from multiple satellite instruments using worldwide in situ datasets and sensor inter-comparisons

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Land surface temperature (LST) is an important parameter for a wide variety of earth surface processes and in particular for evapotranspiration. The ESA-funded project WACMOS-ET aims at advancing the development of evapotranspiration estimates at global and regional scales using various earth observations products. As part of this project, LST is computed globally using satellite data from both low-earth orbit and geostationary instruments. More specifically, observations from the Advanced Along-Track Scanning Radiometer (AATSR), the Spinning Enhanced Visible and Infrared Imager (SEVIRI), the Geostationary Operational Environmental Satellite (GOES), and the Multi-functional Transport Satellite (MTSAT) have been used to generate LST for a three year period ranging from 2005 through 2007.

Here we present the first validation results of the project's LST component. The validation was performed by comparing satellite-derived LST a) against in situ observations acquired at stations located in various land cover types and b) against the independent observations of the well-validated MOD11 LST product which is generated from data of the Moderate Resolution Imaging Spectroradiometer (MODIS) satellite instrument onboard of the Terra platform. More specifically, in situ observations of LST were obtained from stations located in Gobabeb (Namibia), Evora (Portugal), Lake Tahoe (Unites States), as well as multiple sites of the Surface Radiation (SURFRAD) and Atmospheric Radiation Measurement (ARM) station networks. The initial results overall indicate good correspondence with the in situ datasets and with the independent satellite observations. As would be expected the LST error increases with the spatial heterogeneity of the validation site and the resulting uncertainty in the emissivity estimates. Furthermore the relationship between LST error and land cover is studied and the impact of different algorithms is investigated.