



## **Global inter-comparison of microwave and infrared LST from multiple sensors (AMSR-E, MODIS, SEVIRI, GOES, and MTSAT-2)**

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Land Surface Temperature (LST) is an important diagnostic parameter of land surface conditions. Satellite LST products generally rely on measurements in the thermal infrared (IR) atmospheric window, which only allows clear sky estimates. Microwave (MW) observations can alternatively be used to derive an all-weather LST.

Here we present an inter-comparison between LST derived from the Advanced Microwave Scanning Radiometer - Earth observation system (AMSR-E), the MODerate resolution Imaging Spectroradiometer (MODIS) on-board Aqua, the Spinning Enhanced Visible and Infrared Imager (SEVIRI) on-board Meteosat Second Generation (MSG) satellites, the Geostationary Operational Environmental Satellite (GOES) and the Japanese Meteorological Imager (JAMI) on-board the Multifunction Transport SATellite (MTSAT-2).

The higher discrepancies between MW and IR products are observed over snow covered areas. MW emissivity is highly variable for snow-covered ground and not always properly accounted for by the climatological emissivity used in the retrieval. There is a conspicuous bias between MODIS and AMSR-E over desert areas, which is most likely related to the underestimation of LST by MODIS as previously reported in other studies. Inter-comparison between all IR and MW retrievals shows that the STD of the differences between MW and IR LST is generally higher than between IR retrievals. However, the biases between MW and IR LST are, in some cases, of the same order as the ones observed among infrared products. In particular, GOES presents a daytime bias with respect to AMSR-E of 0.45 K whereas the bias with respect to MODIS is 0.60 K. Given that AMSR-E can provide LST under cloudy conditions, the use of microwaves, considering simultaneous overpasses with IR, represents an increase of more than 250% of the number of available LST estimates over equatorial regions. With the MW products of a comparable quality to the IR ones, the MW LST is a very powerful complement of the IR estimates.