

Radiance Based VIIRS Land Surface Product Product Validation

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Abstract

The Visible Infrared Imaging Radiometer Suite (VIIRS) on board S-NPP and future JPSS series is a key instrument providing more than twenty environmental data records (EDR). As one of them, Land surface temperature (LST) is a critical parameter in meteorological, hydrological and climatological research and application. Comprehensive and reliable validation is important for algorithm development and LST application, conventional method is directly comparing with ground LST measurements when satellite overpass, named as temperature-based (T-Based) method, which is the most convincing way to evaluate the product quality, however, ground data are limited and with the problem of the scaling issue. Based on forward radiative transfer simulation, the radiance based (R-Based) method takes real time temperature and humidity profiles along with emissivity as input, and no longer depend on in situ temperature, could works as an alternative approach for global LST validation.

A comparison between NCEP, ECMWF and MERRA2 reanalysis data shows NCEP temperature and water vapor profiles at 0.25x0.25 grid has best agreement with sounding data for R-Based method. Both T-Based and R-Based LST validation are performed at SURFRAD sites over a long period, the results indicate VIIRS LST has a good accuracy satisfying mission requirement (< 2.5 K) and R-Based method yield even better standard deviation (< 1.5K). Both the current operational LST and the enterprise LST designed for future are evaluated using R-Based method, enterprise LST provide better result over bare area due to the more accurate emissivity input. Granule level R-based validation is also implemented and shows the potential of more complete validation over various surface types where T-Based method is not applicable.