Weekly Report

CISESS
Cooperative Research Program Division (CoRP)
STAR/NESDIS
National Oceanic and Atmospheric Administration (NOAA)

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Products and Applications

Lightning Detection Antenna Repairs: This week, CISESS Scientists Joseph Patton and Guangyang Fang and Summer Intern Terrence Pierce visited one of our lightning detection stations on the campus of Howard University-Beltsville. The GPS antenna for the station had been giving us trouble, so we installed new connectors for the cable that connects the GPS antenna to the lightning detection computer, and that seems to have resolved the problem.

Figure: Photo of Terrence (left) and Guangyang (right) working on the GPS cable. The lightning detector is on the left-hand side of the picture. The triangle-shaped antenna detects the VHF radiation produced by lightning strikes.

(POC: J. Patton, jpatton4@umd.edu, Funding: GOES-R AWG, GOES-R PGRR, NOAA-NASA ROSES)
August 4th Suomi-NPP Anomaly: This week, CISESS Scientist Chunhui Pan analyzed and presented her results for a recent anomaly on SNPP that reduced radiance retrievals from the Ozone Mapping and Profiler Suite (OMPS) Nadir Profiler (NP) and Nadir Mapper (NM) by 4%. The delivery of the most recent dark LUTs on August 9th brought the OMPS SDR data quality back to nominal performance. A summary of her analysis is shown below:

Publications

A New Algorithm to Estimate Noise Equivalent Delta Temperature (NEDT): CISESS Scientists John Xun Yang and Hu Yang have a new article in press at IEEE Transactions on Geoscience and Remote Sensing, posted online 26 July 2021. The noise equivalent delta temperature (NEDT) represents the radiometric resolution and sensitivity of a radiometer. NEDT is a critical metric that needs to meet the mission requirement. Measuring NEDT allows for monitoring hardware noise and health. NEDT associated uncertainty not only affects the level-1 radiance/brightness temperature but also propagates through higher level science products. NEDT also an important parameter in simulating and assimilating satellite data for examining radiometric uncertainty propagation. The accurate measurement and estimate of NEDT are a vital component of uncertainty quantification of satellite-based data records. Agencies of EUMETSAT, UK Met Office, and NOAA have developed their own algorithms for calculating and monitoring NEDT of in-orbit microwave radiometers. However, a notable underestimate of NEDT is found at channels, such as G-band, which is prone to 1/f noise. And inconsistency has been found between different algorithms. We have reviewed the theoretical basis for determining NEDT and developed a new algorithm of clear physics and mathematics. We have done comparison and validation with the prelaunch thermal vacuum chamber (TVAC) test, in-orbit data, and simulation. The new algorithm significantly improves the estimate of NEDT,
including the G-band and advances the understanding of algorithm structures and physical foundations.

![Figure. Comparing different algorithms for estimating NEDT against TVAC measurement. The new algorithm out-performs traditional algorithms of EUMETSAT, UK Met Office and NOAA. While the 183 GHz is prone to 1/f noise, the new algorithm produces an accurate estimate of NEDT and exhibits consistent performance across all channels.](image)


(POC: J.X. Yang, jxyang@umd.edu; Funding: JSTAR)