Weekly Report – April 1, 2022

Satellite Climate Studies Branch (SCSB)/CISESS

NOAA/NESDIS/STAR

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Data and Information

S-NPP Ozone Mapping and Profiler Suite (OMPS) Passes 10-Year Stability Test: CISESS Scientist Chunhui Pan performed 10-year stability performance analysis for Suomi-National Polar-Orbiting Partnership's (S-NPP's) OMPS instrument's electronic response. These results have demonstrated that OMPS has maintained good linearity stability over the last 10+ years of operation, and meets the requirement of error margins within 0.2%. Thus, the quality of the OMPS science data remains high. The electronic response used here is required to have an accuracy of less than or equal to 1% of the full-scale response. The stability of the electronic response was evaluated via charge-coupled device (CCD) detector gain, the number of electrons corresponding to one analog count of the analog to digital converter (ADC). This procedure was performed for each of 3 half CCD focal planes in the OMPS nadir system. The OMPS electronic system is designed to have a linear relationship between the input & output of a chain electronic amplifiers, including the analog-to-digital electronics. Errors caused by imperfect linear knowledge are removed via linearity calibration for science measurements. The left panel below shows each focal plane half has a stable gain values over the 10-year operation, ~42.6 for the OMPS-Nadir Profiler(NP) CCD, ~45.27 for the OMPS-Nadir Mapper (NM) LHS/CCD1 and ~45.36 for the OMPS-NM RHS/CCD2, with small offsets relative to the pre-launch thermal vacuum testing values. In the right panel, the maximum nonlinearity knowledge for each half of the focal plane over the 10+ year operation, 0.111±0.001 for the OMPS-NP LHS; 0.137±0.002 for the OMPS-NM LHS and 0.142±0.006 for the OMPS-NM RHS is plotted, which shows that the OMPS RHS has a relatively large change, indicating progressively increased nonlinearity over time.

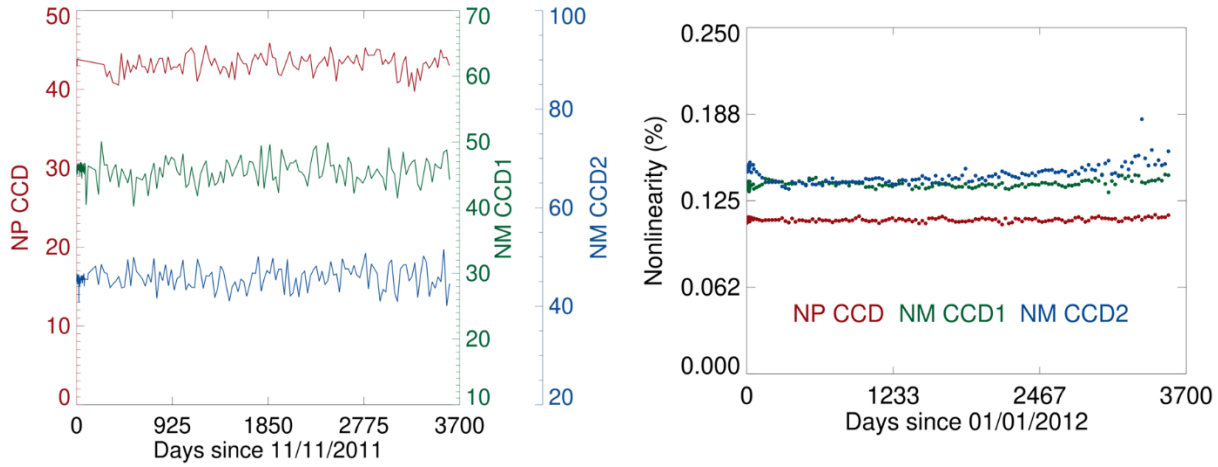
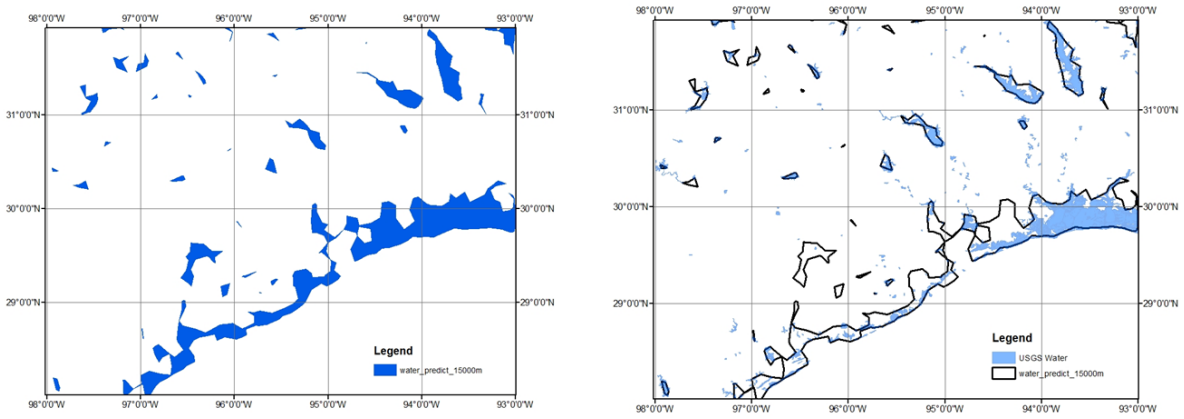


Figure 1. Right: Trend of gain values for each half focal plane over the 10-year operation for OMPS-NP (red), OMPS-NM CCD1 (green) and OMPS-NM CCD2 (blue). Left: Trends of system nonlinearity knowledge at 15000 count level for each focal plane half over the 10+ year operation for OMPS-NP CCD (red), OMPS-NM CCD1 (green) and OMPS-NM CCD2 (blue). Results suggested the performance of OMPS CCD readout noise and full well capacity are generally stable over the 10+ year operation.

(Chunhui Pan, CISESS & STAR/SMCD/SCDAB, chunhui.pan@noaa.gov , Funding: JSTAR)

Use-Inspired Science

Using NASA's Cyclone Global Navigation Satellite System (CYGNSS) for Land Applications: CYGNSS was designed to use reflected Global Navigation System reflectometry (GNSS-R) signals to estimate oceanic wind speeds. But, it also has land applications. We, the CICESS and STAR team, just completed a project that explored GNSS-R data and new CYNGSS-based methodologies for land applications. In this work, we developed a new methodology utilizing machine learning to identify water-covered land uses. The use of machine learning enabled us to increase our detection rate slightly and greatly reduced our false positive and error rates. Our effort began by validating existing efforts to detect surface waters using CYGNSS data and to improve upon existing methods as shown below. We found that the CYGNSS is sensitive to surface waters, vegetation cover types and seasonal growth periods, and although the current published methodologies worked in simple landscapes, an improved technique is required, one that builds in highly diversified landscapes such as those around population centers or agriculture areas.



Figures: The area of study in the maps above was the east central coast of Texas between 28°N and 32°N and 93°W and 98°W. The area encompasses the urbanized areas of Austin and Houston. On the left is processed and smoothed data from CYNGNSS (dark blue) and on the right is the U.S.G.S. water map (light blue) with black outlines for the CYGNSS data.

(Michael Maddox, Tom Smith, Nai-Yu Wang and Ralph Ferraro, CISESS & STAR/CRPD/SCSB, mmaddox@umd.edu , Funding: OPPA Technology Maturation Program *)*

People

GLM Team Wins the AAS Earth Science and Applications Award: The American Astronautical Society (AAS) Award for outstanding achievement in Earth or Environmental Sciences, "*recognizes the Geostationary Lightning Mapper Instrument Team for providing a novel and unique observational capability that has directly contributed to the nation's weather forecasting by improving severe weather observations, predictions, and warning lead-times, and having created new interdisciplinary research opportunities for the Earth and planetary sciences*". This Institutional Award recognizes NOAA, NASA, and Lockheed Martin considering the long history of development and the many people who have supported seeing GLM through fruition. (Scott Rudlosky, STAR/CRPD/SCSB, scott.rudlosky@noaa.gov , Funding: PDRA)

FUTURE OUTLOOK

Summary Items

Date and Name of Meeting/Event/Significant Publications *Details Below **

- 10/24-28 GEO Blue Planet Symposium (Ghana), Emily Smail ***N***

**** N: New, U: Updated, P: In previous weekly report***

Detailed Article

Newly Submitted

CISESS Scientist Emily Smail, who works with STAR/SOCD, is the Executive Director of the Group on Earth Observations (GEO) Blue Planet Initiative. They are planning their 5th Symposium for the end of October. It will be held in Accra, Ghana, and will also allow virtual participation. For information, see https://symposium.geoblueplanet.org/.
(Emily Smail, CISESS & STAR/SOCD, emily.smail@noaa.gov , Funding: Ocean Remote Sensing)