HIGHLIGHTS FOR NESDIS LEADERSHIP

Use-Inspired Science

CISESS Seed Grant Results for “Emulating Satellite Passive Microwave Brightness Temperature from the GOES Advanced Baseline Imager”: CISESS Scientists Veljko Petkovic and Malarvizhi Arulraj, with the help of PhD student, Vesta Gorooh, completed their CISESS Seed Grant designed to determine whether it is feasible for one satellite instrument to provide both high sampling (returning to a location frequently) and information rich content (large amounts of data from each location). The instrument they selected to work on for this project was the GOES-R Advanced Baseline Imager (ABI), which is the primary instrument on the GOES-R Series spacecraft. The goal of this project was to achieve highly accurate information on clouds by approximating passive microwave (PMW) observations. Since the ABI does not have a microwave channel, the PMW data was emulated from the measured radiances from ABI using machine learning methods. The ML was trained on radiance data from ABI and the Global Precipitation Measurement (GPM) Microwave Imager (GMI). A Bayesian Deep Neural Network was used to calculate data variance. The end result was to significantly expand the PMW data field compared to the swath of GMI observations. Emulated PMW observations can be used for hurricane tracking applications, data assimilation and synthetic data retrievals. This project will continue with additional funding from the NOAA High Performance Computing and Communications Program and the UMD Grand Challenges Programs. Petkovic and Arulraj plan to expand the emulated PMW field beyond the ocean surface. More details can be found online: https://cisess.umd.edu/cisess-passive-microwave-emulator-seed-grant-results/.
Figure: (a) GMI observed PMW at 14:40 UTC on 1 February 2020; (a) emulated PMW data; and (c) estimated variance of emulated PMW data.
(Veljko Petkovic, CISESS, veljko@umd.edu; Funding: JSTAR GCOM, METOP-SG, HPCC and CISESS Seed Grant)

Unique & Significant Reports

White Paper documenting a Potential NOAA Carbon Dioxide Removal Science Strategy:
CISESS Scientist Liqing Jiang contributed to the NOAA Special Report: Strategy for NOAA Carbon Dioxide Removal Research. This document was developed by the NOAA Carbon Dioxide Removal (CDR) Task Team, a cross-NOAA interdisciplinary team with relevant expertise in climate and carbon, coastal and open ocean science, aquaculture development, and ocean conservation. The paper is intended to serve as a reference for exploration of carbon removal research at NOAA. The goal has been to assemble as much information as possible in order to facilitate conversations about CDR at a high level within NOAA, and it has the potential to be used to develop an implementation plan for CDR research at NOAA in the event that Congress instructs the agency to engage in this emerging research front. Jiang co-authored the section on “Data management, synthesis activities, and product developments for decision support.” The authors emphasized the importance of continuing to provide data management support for long-term preservation, data interoperability and compatibility, and discovery and access and update its metadata and data standards to accommodate CDR research. The full report is available online: https://sciencecouncil.noaa.gov/wp-content/uploads/2023/06/mCDR-glossy-final.pdf.
(Liqing Jiang, CISESS, liqing.jiang@noaa.gov; Funding: NCEI& OCADS)
FUTURE OUTLOOK

Summary Items

Date and Name of Meeting/Event/Significant Publications Details Below *
- August 2, 2023 Global Ocean Acidification Webinar – Virtual P

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

Detailed Article

Previously Submitted
Global Ocean Acidification Webinar Series:
CISESS Scientist Li-Qing Jiang was invited to speak at a major international OA webinar series. The talk will be on “Global Ocean Acidification Indicators and the NOAA Strategy for Carbon Dioxide Removal Research.” The co-presenter Dr. Jessica Cross (NOAA), and the moderator is Dr. Richard Feely (NOAA). (https://tinyurl.com/54zjut99) (Liqing Jiang, CISESS, liqing.jiang@noaa.gov; Funding: NCEI& OCADS)

TRAINING AND EDUCATION

AMS Short Course on Career Pathways in the Satellite Enterprise: On June 29th, 2023, CISESS Scientist Joseph Patton and Sherrie Morris (NOAA/NESDIS) presented a section of a virtual American Meteorological Society (AMS) short course. The course focused on applications and opportunities in the weather satellite enterprise, with their section specifically discussing career pathways and advancement opportunities in working with satellite observations. Around 40 people attended this session virtually, with participants from around the world. People from more than 50 different countries initially registered for the short course, and an emphasis was placed on international organizations. More information about the course, including the slide sets, can be accessed here: https://rammb2.cira.colostate.edu/training/2023-ams-satmoc/. (Joseph Patton, CISESS, jpatton4@umd.edu; Funding: GOES-R AWG, GOES-R PGRR)
MEDIA INTERACTIONS AND REQUESTS

Lightning Research and Storm Safety Tips featured in UMD CMNS News and Maryland Today
CISESS Scientist Daile Zhang was interviewed by the UMD CMNS News about her research and her advice on lightning safety. Daile serves on the U.S. National Lightning Safety Council and helps organize the International Lightning Safety Day. In the article, Zhang aimed to dispel lightning myths, such as lightning never strikes the same place, and encouraged people to stay safe during storms by going indoors. The full article can be viewed online at: https://cmns.umd.edu/news-events/news/daile-zhang-essic-postdoc-lightning-safety. Zhang’s research and advice on avoiding lighting strikes are also featured in a Maryland Today article published online July 5, 2023. The article showcases unique graphics designed by Valerie Morgan to represent five persistent lightning myths, which Zhang dispels with research-based tips. The article is available online at https://today.umd.edu/umd-expert-strikes-down-myths-on-avoiding-lightning-strikes.

Figure: Illustrations created by Valerie Morgan as they appeared in Maryland Today (July 5, 2023), in which Daile Zhang dispels lightning myths. (Daile Zhang, CISESS, dlzhang@umd.edu; Funding: GOES-R AWG, GOES-R PGRR, NOAA ROSES and CISESS Seed Grant)

PUBLICATIONS

Quantifying Uncertainties in Ocean Color Retrievals
Citation: Pachniak, Elliot, Yongzhen Fan, Wei Li, and Knut Stamnes, 2023: Quantifying Uncertainties in OC-SMART Ocean Color Retrievals: A Bayesian Inversion Algorithm. Algorithms, 16(6), 301. https://doi.org/10.3390/a16060301. Summary: The Ocean Color—Simultaneous Marine and Aerosol Retrieval Tool (OC-SMART) is a data processing platform that utilizes scientific machine learning (SciML) in conjunction with comprehensive radiative transfer computations to provide remote sensing reflectances (Rrs estimates), aerosol optical depths, and inherent optical properties. CISESS Scientist Yongzhen Fan, who co-authored the paper, describes the expanded capability of OC-SMART due to quantifying uncertainties in ocean color retrievals. The study demonstrated an approach in which Bayesian inversion was used to relate measured top of atmosphere radiances and a priori data to estimate posterior probability density functions and associated uncertainties and applied the methodology to MODIS (see Figure as an example), OLCI Sentinel-3, and VIIRS sensor data.
Figure: Remote sensing reflectance data from MODIS sensor (Left), corresponding standard uncertainties (Center), and relative uncertainty (Right) for several wavelengths off the east coast of the United States on 9 March 2016. Relative uncertainty tends to be consistent for all pixels in a wavelength.
(Yongzhen Fan, CISESS, yfan1236@umd.edu; Funding: DACS, IIJA, JPSS PGRR, JSTAR & METOP-SG)