Weekly Report – November 17, 2023

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Data and Information

Progress Report on Bio-GO-SHIP: A Global Analysis of Large-Scale Changes to Ocean Plankton Systems
Consortium Scientist Adam Martiny (UCI) submitted his July 1, 2022 to June 30, 2023 Progress Report to the NOAA Global Ocean Monitoring and Observing program (OAR/GOMO) on November 1st. The Bio-GO-SHIP is a partnership between NOAA and university researchers to quantify the global biodiversity of pelagic plankton. A global quantification of plankton biodiversity, size structure, and optical properties offers a series of opportunities for integration between *in situ* and remote sensing observations. We are performing DNA sequencing, high-throughput particle imaging, particle chemistry, and inherent optical properties on three GO-SHIP cruises covering ~400 stations each. Two cruises have been completed so far:

- **GO-SHIP A16N Expedition** (March 6 to May 9, 2023) going from Port Saupe, Brazil to Reykjavik, Iceland, the team collected high-resolution bio-optical and biological measurements and samples from a custom flow-through seawater system and the CTD rosette Niskin bottles.
- **GO-SHIP I05 Expedition** (July 22 to September 14, 2023) going from Fremantle, Australia to Cape Town, South Africa, we collected a more limited suite of biological samples, including DNA, POM, and HPLC pigment samples.

The DNA analysis is in process but the preliminary results shows good coverage of pelagic plankton in the samples collected (see Figure).

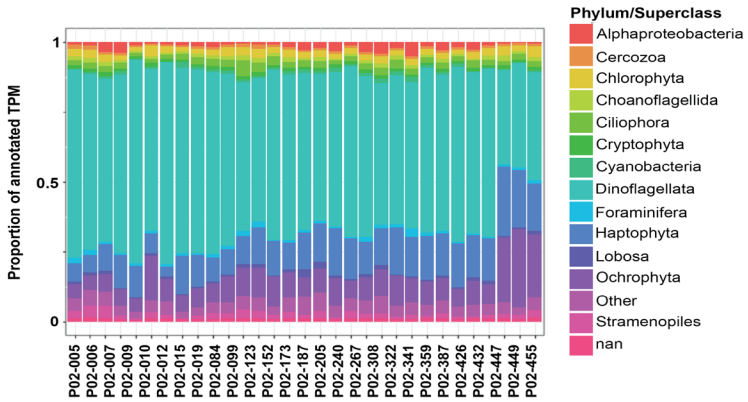

Figure: Taxonomic distribution of metatranscriptomic data from P02 shows coverage of major eukaryotic planktonic lineages.
(Adam Martiny, CISESS & UCI, amartiny@uci.edu, Funding: GOMO)

TRAVEL AND MEETING REPORTS

CISESS Scientist Daile Zhang Presents Her New Book at the CTR Wilson Meeting

Daile Zhang and her coauthor Ron Holle virtually presented their new book–*Flashes of Brilliance: The Science and Wonder of Arizona Lightning* –at the CTR Wilson meeting on November 16, 2023. They discussed the motivation of writing the book and introduced the content of each chapter. The audiences were interested in creating undergraduate level courses and materials based on the book. The CTR Wilson Institute for Atmospheric Electricity holds its annual General Assembly at a United Nations world heritage site - the city of Bath. The meeting discusses the latest knowledge at the forefront of science and technology of atmospheric electricity. Ron is a meteorological consultant in Oro Valley, Arizona, and worked as a research meteorologist at the National Severe Storms Laboratory and Vaisala before he retired. Daile Zhang leads the CISESS Atmospheric Electricity Group along with Guangyang Fang.

(Daile Zhang, CISESS, dlzhang@umd.edu; Funding: GOES-R AWG, GOES-R PGRR, NOAA ROSES and CISESS Seed Grant.)

TRAINING AND EDUCATION

CISESS Scientists at UMD provided Outreach Event for Local Students

CISESS hosted a field trip for a 6th grade class from New Hope Academy (Landover Hills, MD). Twenty students and five adults visited the UMD ESSIC Buidling from 9:30-2:30 on November 7th and participated in educational activities led by CISESS scientists. During the morning session, Dr. Malar Arulraj and Dr. Veljko Petković led the students in a “making a cloud in a bottle” activity and showed them remote sensing images from their birthdays that they could print and bring home. The students also completed a scavenger hunt. Following lunch and outdoor activities, Dr. Guangyang Fang and CISESS intern Ashmita Pyne provided VR demonstrations in the CISESS Visualization Lab and Dr. Daile Zhang and Joseph Patton taught the students about lightning observations and safety. In addition, Dr. Hu Yang showed students the CISESS Remote Sensing Lab and led hands-on activities, including building ultrasonic radar in a breadboard and wearing specially-designed “bat eyes” that allow students to experience sensing objects using ultrasound. Bekkah Lampe (NOAA Office of Education) sent cloud charts and stickers; Caroline Donovan (NOAA Coral Reef Conservation Program) delivered coral reef

activity booklets and other materials; and Cazzy Medley (ESSIC) provided educational and fun giveaways for the students. Kate Cooney organized and coordinated the event.

Figure: A 6th grade class from New Hope Academy visited ESSIC/CISESS on 11/7/2023. (Top from left to right) Malar Arulraj explains how to "make a cloud in a bottle"; Veljko Petković uses a Lego model to teach about satellites; Hu Yang leads student a wearing "bat eyes". (Center) Intern Ashmita Pyne instructs students wearing VR headsets. (Bottom from left to right) Guangyang Fang explains VR visualization; Hu Yang demonstrates an ultrasonic breadboard; Joseph Patton & Daile Zhang teach a lightning safety game. (Center photo by G. Fang; Top right and bottom center photos by K. Cooney; all other photos by A. Hughes.)

(Kate Cooney, kscooney@umd.edu; Hugo Berbery, berbery@umd.edu; Funding: CISESS Task I)

PUBLICATIONS

Gap-Filling Chlorophyll-*a* Satellite Data using Artifical Intelligence

Citation**: Zheng, Guangming**; Christopher W. Brown, and Paul M. DiGiacomo, 2023: Retrieval of oceanic chlorophyll concentration from GOES-R Advanced Baseline Imager using deep learning. *Remote Sens. Environ.*, **295**, 113660, https://doi.org/10.1016/j.rse.2023.113660.

Summary: The ocean color data [Chl-*a*] from NOAA-20 (JPSS) Visible/Infrared Imager Radiometer Suite (VIIRS) has many cloud-caused gaps due to the low sampling frequency of a polar-orbiting instrument. This study looked at whether these gaps could be filled by data from the geostationary Advanced Baseline Imager (ABI) on GOES-16 (see figure) using a Deep Learning neural network. The ABI is not designed to measure [Chl-*a*]so that limitation must be overcome. The Deep Learning tests showed that it is possible to detect open ocean color features with strong contrast such as across eddies and fronts but the results were disappointing in coastal waters and occasionally in the open oceans. Nevertheless, the process showed promise for gap-filling VIIRS [Chl-*a*]data.

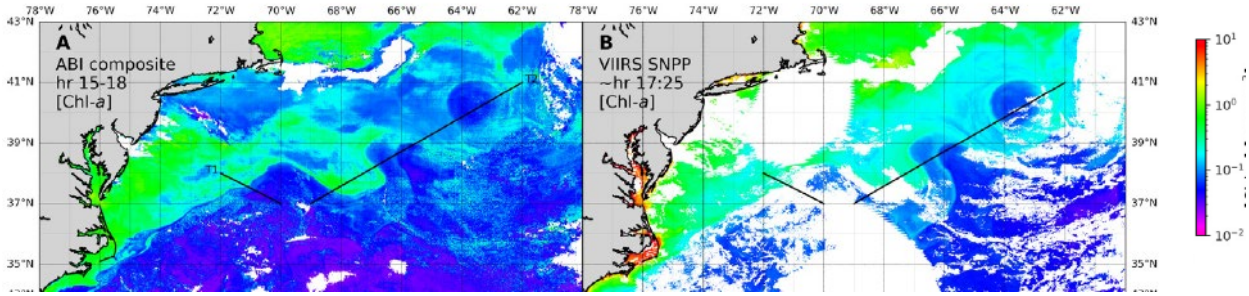

Figure: [Chl-a] maps showing the Gulf Stream off the Mid-Atlantic Bight on August 6, 2018, derived from (A) ABI (daily composite) and (B) VIIRS with its gaps from cloud cover.

(Guangming Zheng, CISESS, guangming.zheng@noaa.gov , Funding: Ocean Remote Sensing and JSTAR)