Weekly Report – November 3, 2023

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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TRAVEL AND MEETING REPORTS

Coral Reef Watch at the 47th US Coral Reef Task Force Meeting: CISESS Scientist Erick Geiger from NOAA Coral Reef Watch (CRW) attended the 47th U.S. Coral Reef Task Force (USCRTF) Meeting in St. Thomas, U.S. Virgin Islands (USVI), October 21-28, 2023.

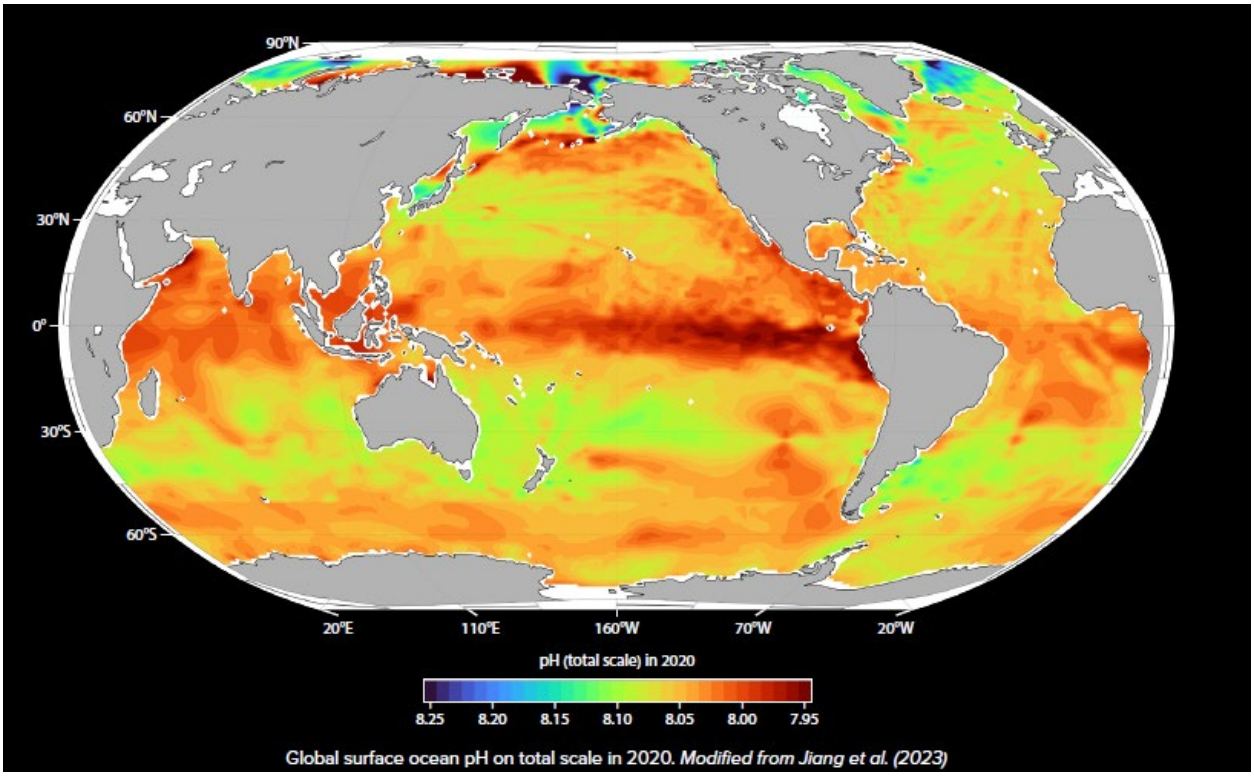
US Coral Reef Task Force

USVI 2023

In addition to the main events/presentations, Mr. Geiger held side discussions with partners about NOAA CRW's newly-developed single-pixel Virtual Stations for Florida, Puerto Rico, and the USVI. These have been exceedingly well received by the greater coral reef community and were cited in multiple USCRTF talks. Mr. Geiger also met with The Nature Conservancy's Virgin Islands Director, Dr. Celeste Jarvis, to discuss ongoing collaborations with Caribbean partners to develop additional single-pixel Virtual Stations. Of note, reports from in-water field partners indicate that **the Caribbean is undergoing a basin-wide mass bleaching event**. NOAA CRW is projecting that the extreme marine heatwave in the Caribbean will continue for many coral reefs into December 2023. More information on the meeting is at the conference website: https://dpnr.vi.gov/uscrtf23/ . *(Erick Geiger, CISESS, erick.geiger@noaa.gov, Funding: NOS).* ***This item was also submitted in the SOCD report.***

PUBLICATIONS

NOAA PMEL 50th Anniversary Issue: What We've Learned on Ocean Acidification
Citation**:** Feely, Richard A, **Li-Qing Jiang**, Rik Wanninkhof, Brendan R. Carter, Simone R. Alin, Nina Bednaršek, and Catherine E. Cosca, 2023: Acidification of the global surface ocean: What we have learned from observations. *Oceanogr*. **36**(2–3) 120–129, https://doi.org/10.5670/oceanog.2023.222. [in the special issue on the *50th Anniversary of NOAA PMEL*]. This article, co-written by CISESS Scientist Liqing Jiang, summarizes finds from global ocean observations over the last several decades by NOAA Pacific Marine Environmental Laboratory and their colleagues on the ocean's rapid uptake of anthropogenic carbon dioxide.
Summary: This study provides a high-resolution, regionally varying view of global surface ocean carbon dioxide fugacity, carbonate ion content, total hydrogen ion content, pH on total scale, and aragonite and calcite saturation states on selected time intervals from 1961 to 2020. It discusses the major roles played by air-sea anthropogenic CO_2 uptake, warming, local upwelling processes, and declining buffer capacity in controlling the spatial and temporal variability of these parameters. These changes are occurring rapidly in regions that would normally be considered ocean acidification refugia, thus threatening the protection that these regions provide for stocks of sensitive species and increasing the potential for expanding biological impacts.



Global surface ocean pH on total scale in 2020. *Modified from Jiang et al. (2023)*

More Information:
Special Issue: https://tos.org/oceanography/issue/volume-36-issue-2-3
Flipbook version: https://oceanographydigital.tos.org/flip-book/110286/579668/page/102
(Liqing Jiang, CISESS, liqing.jiang@noaa.gov; Funding: NCEI & OCADS)

U-Net Convolutional Neural Network Improves the MiRS Instantaneous Precipitation Rate
Citation**:** Liu, Shuyan; **Christopher Grassotti** and Quanhua Liu, 2023: Use of a U-Net Architecture to Improve Microwave Integrated Retrieval System (MiRS) Precipitation Rates," in *IEEE Trans. Geosci. Remote Sens.*, **61** (Sept 2023), 4105611, https://doi.org/10.1109/TGRS.2023.3315212. CISESS scientist Chris Grassotti along with CIRA and NOAA researchers Shuyan Liu and Quanhua (Mark) Liu, respectively, recently published a paper in the *IEEE Transactions on Geoscience and Remote Sensing*. The paper reported on the implementation of a U-Net convolutional neural network (CNN) architecture to improve operational satellite retrievals of instantaneous precipitation rate (PR) from the NOAA microwave integrated retrieval system (MiRS).
Summary: The U-Net architecture was implemented using NOAA-20/ATMS passive microwave retrievals from the MiRS system. The U-Net was trained using one year of collocated MiRS and Multi-Radar/Multi-Sensor System (MRMS) ground-based radar and rain gauge analysis data over the Continental US (CONUS) during 2021. Independent validation of U-Net was performed using data from 2022. Validation results showed that U-Net predictions were clearly improved relative to the original MiRS retrievals in terms of bias and root-mean-square error (RMSE), as well as categorical scores. Once trained, the extremely low computational requirements of the U-Net model predictions highlight a potentially attractive means of improving operational retrievals of satellite PRs, where the latency of product dissemination is an important consideration.

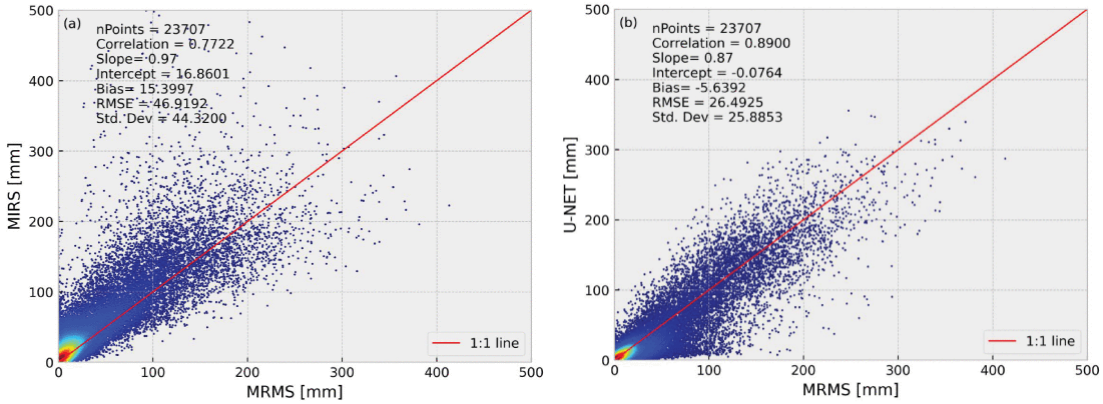


Figure: *Density scatterplots for total accumulated precipitation (mm) on a 0.25 latitude/longitude regular grid over the CONUS for (a) MiRS operational and (b) U-Net prediction (right) versus MRMS during the period of 2022-01-01 to 2022-12-31.*
(Christopher Grassotti, CISESS, christopher.grassotti@noaa.gov; Funding: JSTAR & METOP-SG)

OTHER

ESSIC Grand Challenge Project Raises first of 75 Maryland Mesonet Towers
ESSIC, the parent organization for CISESS, is continuing work on its $3 million Grand Challenges Institutional Grant from UMD, led by Ellen Williams, CISESS Executive Director. Part of the program is to develop a Maryland Mesonet of 75 towers covering the state in 10-mile intervals. The goal of the new network is to allow state emergency personnel to have real-time information on rapidly developing storms. The first Mesonet tower was raised near Ellicott City on Monday, October 30 (see photo below).

Photo by John T. Consoli for *Maryland Today*.

More information on the project can be found in the article on the *Maryland Today* website at https://today.umd.edu/umd-state-officials-turn-on-first-tower-of-statewide-weather-warning-system.
(Ellen Williams, CISESS, edw@umd.edu , Funding: UMD)