Weekly Report – January 24, 2025

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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TRAVEL AND MEETING REPORTS

CISESS Participation in the Scientists Serving Communities 2025 Workshop

CISESS was well-represented at the Climate Resilience Network (CRN) Scientists Serving Communities Workshop, held at the University of Maryland Riggs Alumni Center on January 8-9. UMD ESSIC Associate Director Ralph Ferraro oversaw the workshop and gave remarks, and the new ESSIC & CISESS Director Lars Peter Riishojgaard provided a welcome address. CISESS Deputy Director Hugo Berbery, Tom Smith (CISESS/NOAA), and numerous other ESSIC scientists also participated. Kate Cooney moderated a panel on "Organizing Participatory Science, Working with Technology" that was held on January 8. The panel included Kayle Krieg (UMD Sea Grant Extension), Madeline Potter (UMD Extension), Stephanie Lansing (UMD Environmental Science & Technology), and Joy Rafey (UMD Extension & MD Master Naturalist Program) and was highly attended by university, federal, and state researchers, other subject matter experts (e.g., Master Gardeners), members of MD community groups, and other regional stakeholders. Kate Cooney also co-led a panel with Jennifer Collins (UMD ESSIC/CRN) and moderated by Cazzy Medley (ESSIC) on "Middle School/High School Internships and Directed Research" that was held on January 9. The session was a great opportunity to promote the CISESS Summer Internship Program and share ideas for experiential learning and other outreach activities.

Figure. (Left) ESSIC/CISESS Director Lars Peter Riishojgaard welcomes the audience. (Right) CISESS Deputy Director Hugo Berbery comments during a panel session. Photo credit: Cazzy Medley (ESSIC)

(Kate Cooney, CISESS, kscooney@umd.edu; Funding: CISESS Task 1)

Christopher Smith, Yongsheng Zhang, and James Frech Present at the American Meteorological Society Annual Meeting

The 105th American Meteorological Society Annual Meeting took place in New Orleans, LA during the week of 13 January 2025, convening members of the weather, water, and climate communities. Twenty-five CISESS scientists participated, giving talks, presenting posters, and holding booth sessions on a wide range of topics, such as validating satellite products using a ground-based bistatic radar to improving Atlantic hurricane forecasts by assimilating Global Navigation Satellite Systems radio occultation information. Examples of research shared are given by CISESS Scientists Christopher Smith, Yongsheng Zhang, and James Frech.

CISESS Scientist and Satellite Liaison to the NWS Weather Prediction Center (WPC) and Ocean Prediction Center (OPC), Christopher Smith, gave a talk during the "Advancing Hazards Forecasting and Decision Support through NOAA Testbeds and Proving Ground" session. Smith presented on datasets of opportunity that are being evaluated to be made available to WPC and OPC through Advanced Weather Interactive Processing System workstations, as well as success stories for experimental satellite products that have successfully been transitioned to operations and are used for forecaster decision making. Promotion of the inaugural WPC/OPC and Operations Proving Ground Satellite Experiment to evaluate satellite products in development for ocean and precipitation applications, set to occur in June of 2025, was also discussed.

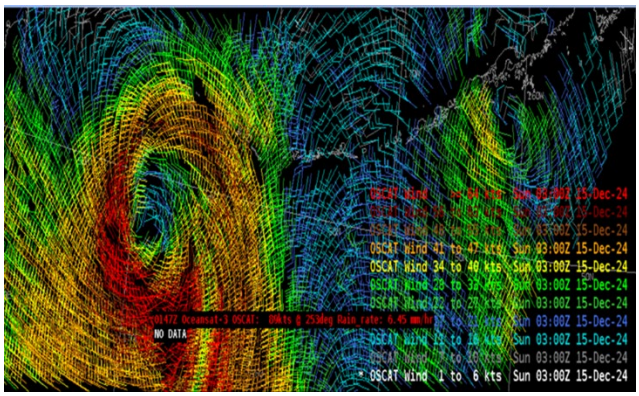

Figure. Example of an OceanSat-3 scatterometer dataset, a product under evaluation at the OPC. Here, winds of about ninety knots at 0147 UTC 15 December 2024 were measured as a hurricane-force low moved towards Alaska's Aleutian Islands.

CISESS Scientists Yongsheng Zhang and James Frech expounded on their recent work on satellite oceanographic products scientific stewardship and development at NCEI based on machine learning. Satellite oceanographic data application research conducted by the NCEI

Satellite Oceanography Group results in a better understanding of the ocean climate, as it provides effective scientific data stewardship and generates new value-added satellite ocean surface products. Zhang and Frech have trained a random forest model to synthesize satellite-retrieved sea-surface-height anomaly (SSHA) and in-situ depth-equivalent ocean bottom pressure observations from NCEI-archived NOAA Deep-ocean Assessment and Reporting of Tsunamis records for exploring validation and improvement of the gridding of multi-satellite SSHAs.

Figure. Yongsheng Zhang (right) discussing his work with NESDIS/NCEI Director, Derek Arndt (left). Photo credit: Xungang Yin (NCEI)

(Christopher Smith, CISESS, csmith70@umd.edu; Funding: GOES-R PGRR; Yongsheng Zhang, CISESS, yongsheng.zhang@noaa.gov; Funding: NCEI; James Frech, CISESS, james.frech@noaa.gov; Funding: NCEI)

PUBLICATIONS

A Deep Dive Into Global Tides
Citation: Tyler, Robert H., and **David S. Trossman**, 2024: Oceanic and ionospheric tidal magnetic fields extracted from global geomagnetic observatory data. Phil. Trans. R. Soc. A, 382, 20240088, https://doi.org/10.1098/rsta.2024.0088.
Summary: The ocean conductivity content (OCC) can potentially be monitored using magnetometric remote sensing of the ocean tidal magnetic fields. Any changes in these tidal magnetic fields could reveal changes in OCC and, by proxy, the ocean heat content. The main goal of the study by CISESS Scientist David Trossman and his colleague recently published in the journal *Philosophical Transactions A* was to develop a long-term (1965–2015) baseline dataset of the tidal amplitudes and phases at 288 land geomagnetic observatories located around the world. Trossman also investigated ways of extracting the tidal signals using as predictors either the customary time-harmonic bases of the constituent frequencies or bases derived from ephemerides and gravitational potential theory. One finding is that the best predictor for fitting ocean lunar tidal signals is the filtered radial component, noting that slightly better fits are obtained if principle-component rotation is first performed. Also, the best predictors use ephemerides rather than time-harmonic bases. The fits of ocean lunar tidal signals tend to be better near ocean regions with strong tides flowing along gradients of bathymetry and the radial component of the main field, with low-latitude island observatories having better fits overall. The authors note that more optimal approaches may be designed for regional studies and studies involving the fusion of data from multiple observatories.

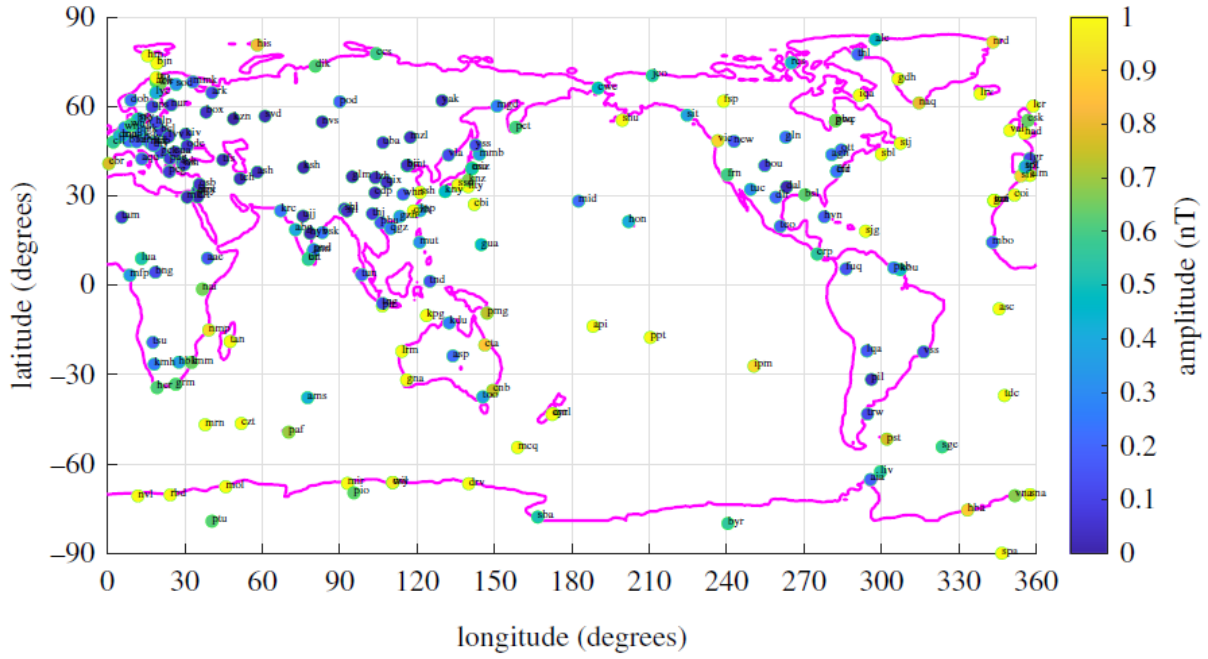

Figure. Amplitude of the nighttime 'oceanic' M2 magnetic tide (radial component). Amplitudes tend to be higher in the ocean basins.

(David Trossman, CISESS, trossman@umd.edu; Funding: ORS)

(Maureen Cribb, CISESS, mcribb@umd.edu, Funding: CISESS Task I)