Weekly Report – February 07, 2025

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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TRAINING AND EDUCATION

CISESS Releases Mixed-Reality Game on Lightning Safety and Launches "XR@CISESS" Website

CISESS Scientist Guangyang Fang, along with University of Maryland students Damian Figueroa and Samuel Wiggins, have released *Faraday Lightning Safety*—a mixed-reality game now available at the Meta Store. The game demonstrates how the Faraday cage effect protects against lightning during a thunderstorm. Simultaneously, the team has launched the website "XR@CISESS" introducing their extended reality (XR) seed grant program.

In the game, players of all ages can guide Spark, a virtual owl, to safety by moving it to various locations like a car, beach, or house. As lightning strikes, Spark reacts accordingly, jumping joyfully if protected by the Faraday cage effect or fainting momentarily if exposed. The game seamlessly merges the real world with Spark's virtual environment through mixed reality, leveraging the Meta Quest 3's advanced spatial computing capabilities to project gameplay onto a virtual tabletop within the player's space. This approach creates an intuitive and comfortable experience for newcomers to immersive technology while encouraging engagement from spectators. Dr. Fang and his development team envision *Faraday Lightning Safety* as a glimpse into the future of geoscience education. Immersive technology enables users to explore complex scientific concepts interactively from anywhere in the world. The team plans to expand their work, developing more educational experiences on Geoscience topics such as the water cycle and lightning classification.

In addition to this game's release, the team has launched the "XR @ CISESS" website to showcase their immersive technology projects, such as the Terrality weather/climate data visualization app and the Virtual Proving Ground and Training Center platform. The site also highlights their outreach efforts and introduces immersive XR technology and insights into the development behind these innovative applications.

Faraday Lightning Safety is now available for free download on the Meta Quest store, and is compatible with Quest 2, Quest Pro, Quest 3, and Quest 3S headsets. A video demo of *Faraday Lightning Safety* can be found on their website.

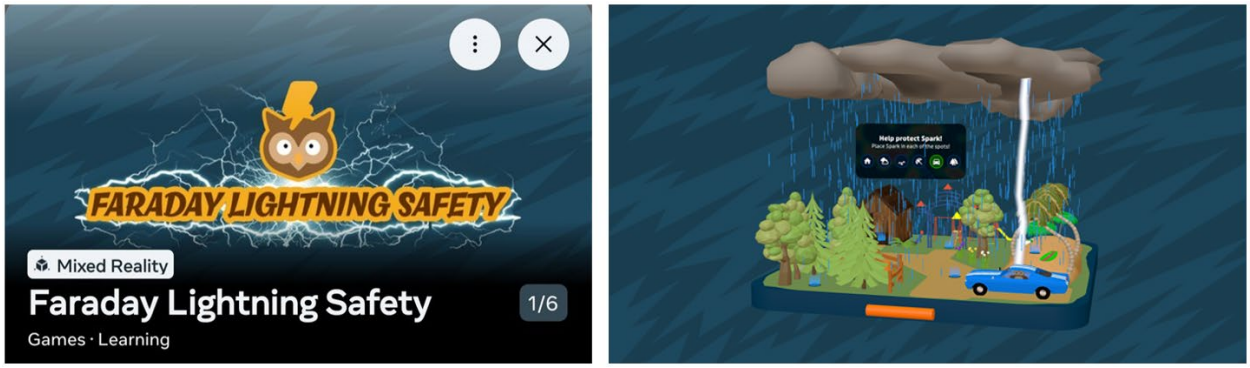

Figure. (left) The Faraday Lightning Safety game on the Meta Quest Application Store; (right) Preview of the mixed-reality gameplay.

(Guangyang Fang, CISESS, gfang@umd.edu; Funding: GOES-R AWG, GOES-R PGRR)

SOCIAL MEDIA AND BLOG POSTS

Ireland Experiences Damaging High Winds
Appropriately named Storm Éowyn galloped across the Atlantic, followed by a second hurricane-force low, delivering a one-two punch to Ireland in late January. Chris Smith, CISESS Scientist and Satellite Liaison to the NWS Weather Prediction Center and Ocean Prediction Center, details the different characteristics of these storms in his latest blog post. On 23 January, a large area of hurricane-force winds of up to 92 mph was detected by the Metop-C/ASCAT scatterometer. Significant wave heights resulted (~37 feet), confirmed by an overpassing Cryosat-2/SIRAL altimeter. As part of the NESDIS/STAR 2025 Winter Season Winds Campaign, a NOAA P-3 aircraft flew through the storms, finding good agreement between Ku-band scatterometer retrievals from the aircraft and Advanced Scatterometer radar retrievals onboard a METOP satellite.

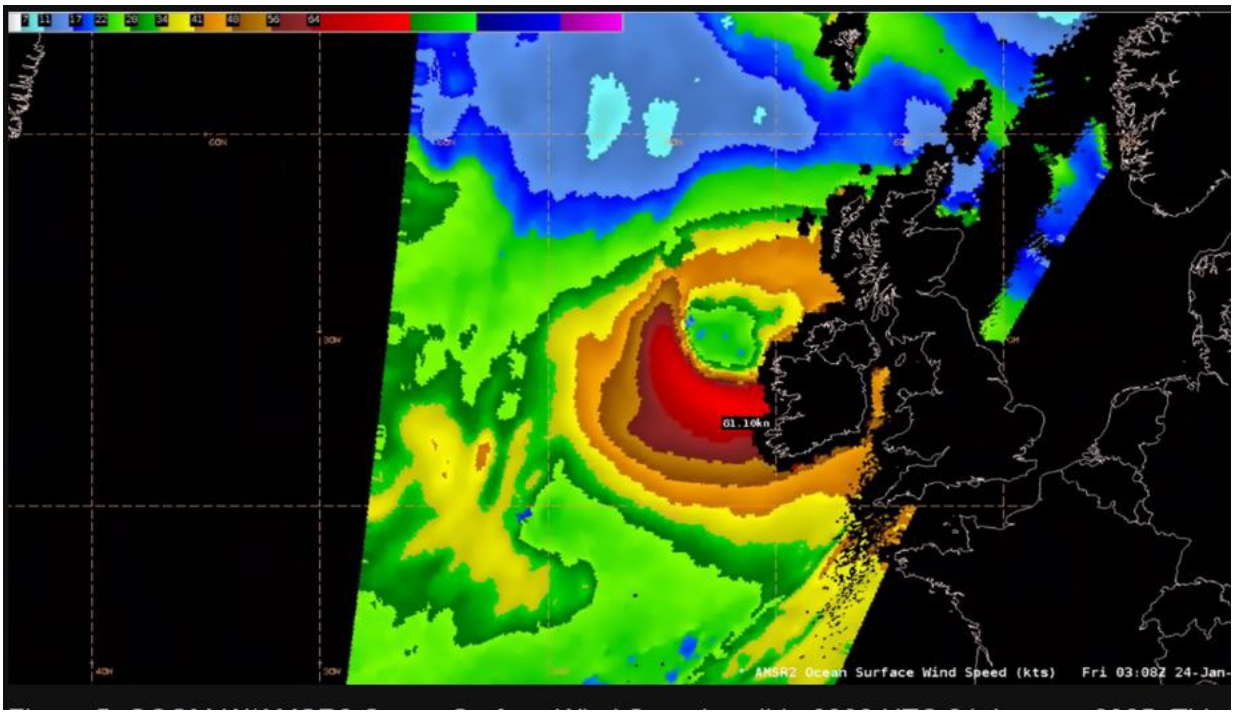

Figure. Ocean surface wind speeds valid ~0308 UTC 24 January 2025.

(Christopher Smith, CISESS, csmith70@umd.edu; Funding: GOES-R PGRR)

PUBLICATIONS

Trends in Chlorophyll, Sea-Surface Temperature, and Sea-Level Anomaly
Citation: Dash, Prasanjit, Korak Saha, Pauk DiGiacomo, Steven D. Miller, Huai-Min Zhang, Rachel Lazzaro, and **Seunghyun Son**, 2025: Trends in satellite-based ocean parameters through integrated time series decomposition and spectral analysis. Part I: Chlorophyll, sea surface temperature, and sea level anomaly. *J. Atmos. Ocean. Tech.*, 42, 91–123, https://doi.org/10.1175/JTECH-D-24-0007.1.
Summary: The ocean plays a vital role in the Earth system, so understanding how its biophysical parameters change over time around the globe is critical. In a recent study published in the *Journal of Atmospheric and Oceanic Technology*, CISESS Scientist Seunghyun Son and colleagues present a new approach to examining trends in satellite-based chlorophyll-a (Chl-a), sea-surface temperature (SST), and sea-level anomaly (SLA), essential climate variables, using European Space Agency's Climate Change Initiative records. This novel approach integrates time series decomposition and spectral analysis. Trends are investigated at different scales, from global to the smaller-scale Bay of Bengal and even smaller-scale Chesapeake Bay, coastal regions where satellite data have certain limitations. Of the three incrementally advancing time series

decomposition methods, they report that the Multiple Seasonal-Trend decomposition using LOESS (MSTL) is the best approach to use. Globally, SST and SLA show upward trends, and Chl-a has no trend. The picture is different along certain coasts and boundary currents where positive trends in Chl-a are seen. Future work will involve basin-wide analyses and examinations of seasonal and interannual variations and cross-parameter linkages.

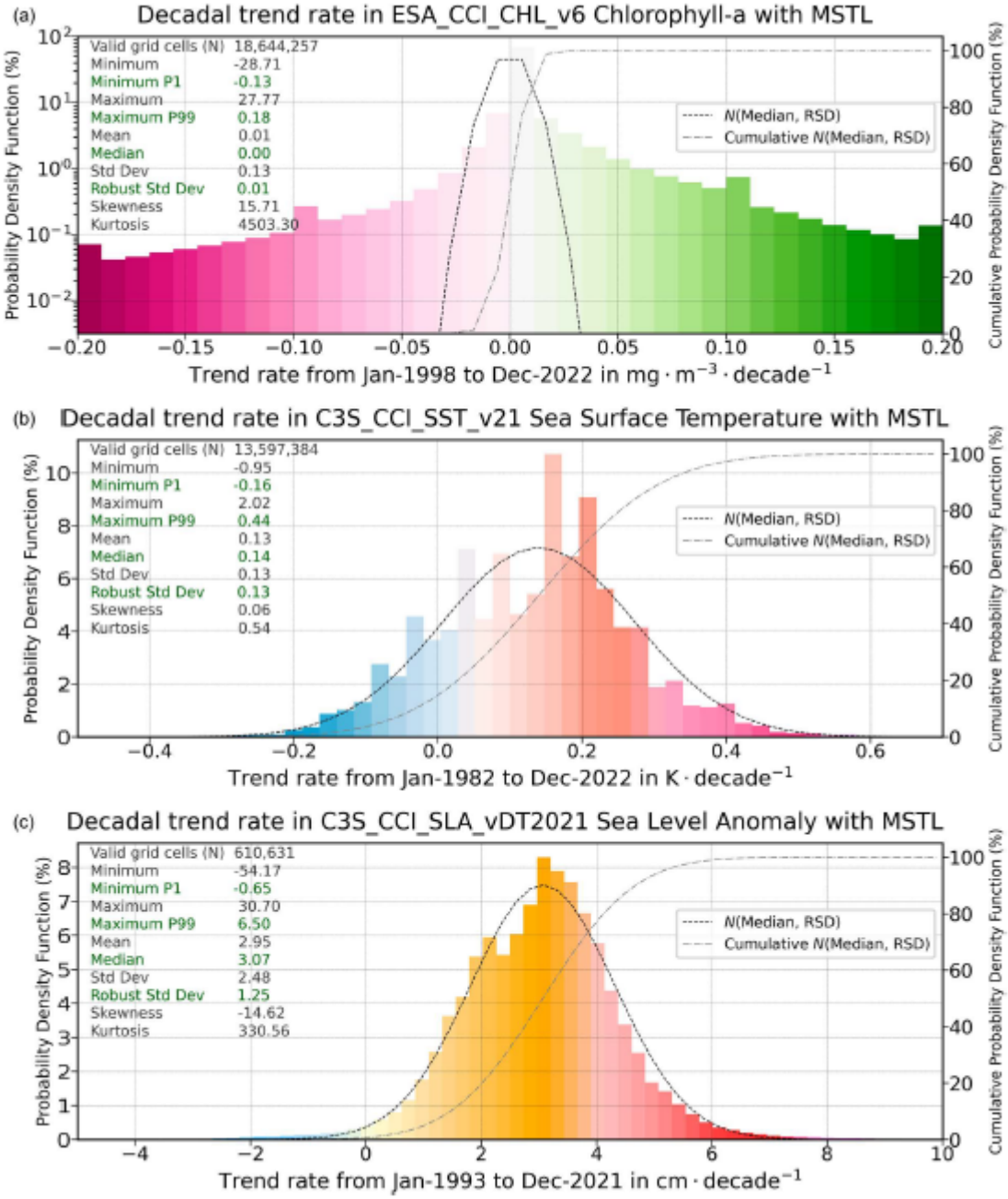

Figure. Histograms of decadal trend rates: (a) Chl-a, (b) SST, and (c) SLA. Statistical parameters

(robust in green and conventional in gray) are annotated to characterize the distributions. "Minimum P1" and "Maximum P99"are the values in ordered data at the 1st and the 99th percentile. Dashed lines represent normal and cumulative density.

(Seunghyun Son, CISESS, shson@umd.edu; Funding: ORS)

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