Weekly Report – January 10, 2025

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Use-Inspired Science

NESDIS Snowfall Rate Product Actively Tracked the 2025 New Year Blizzard

CISESS Scientist Yongzhen Fan gives a timely update on Winter Storm Blair, the new year's significant and expansive blizzard that bombarded the contiguous United States with a blustery mix of snow, ice, and high winds. The storm first made landfall in the northwest U.S. on 3 January and quickly swept across the Midwest and the East Coast within 3 days, causing significant snow accumulations of up to twenty inches in Kansas and up to 8.7 inches in the Washington D.C. metropolitan area. The NOAA/NESDIS Snowfall Rate (SFR) product actively tracked the winter storm, providing timely snowfall rate estimations to some NWS weather forecast offices. The NESDIS SFR product is retrieved from measurements of passive microwave sensors onboard a constellation of low-earth-orbit satellites, including S-NPP, NOAA-20, NOAA-21, NOAA-19, Metop-B, Metop-C, and GPM. The SFR product and NOAA National Operational Hydrologic Remote Sensing Center (NOHRSC) hourly snowfall ground observations agreed well. The 96-hour accumulated snow water equivalent from the SFR product also showed good agreement in snowfall extent and total amount with the accumulated snowfall depth from the Snow Data Assimilation System during the entire event.

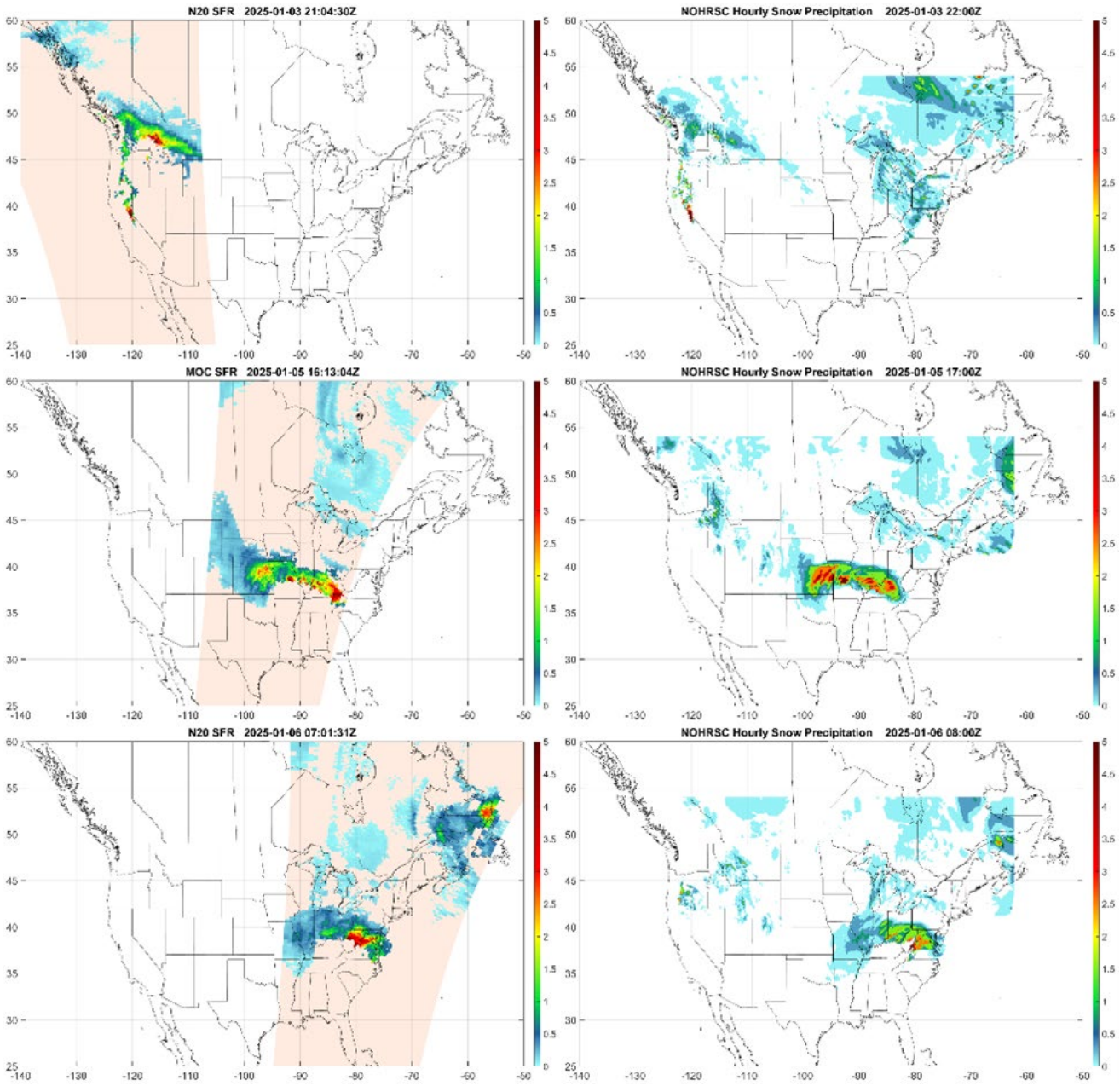

Figure. The SFR product (left-hand panels) and NOHRSC observations (right-hand panels) tracking the evolution of the snowstorm across the contiguous U.S. during the period 3–6 January 2025.

(Yongzhen Fan, CISESS, yfan1236@umd.edu; Funding: DACS, JSTAR, LEO, METOP-SG)

TRAVEL AND MEETING REPORTS

Wenhui Wang Presented at the 2024 SPIE Asia-Pacific Remote Sensing Forum

The 2024 SPIE Asia-Pacific Remote Sensing meeting was held in Kaohsiung, Taiwan at the beginning of December 2024. CISESS Scientist Wenhui Wang was in attendance, presenting her work on the intercomparison of NOAA-21/NOAA-20/Suomi National Polar-orbiting Partnership (S-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) solar reflective bands with NASA Plankton, Aerosol Cloud and Ocean Ecosystem (PACE) Ocean Color Instrument (OCI) and JPL Earth Surface Mineral Dust Source Investigation (EMIT) hyperspectral observations made over pseudo-invariant calibration sites in desert areas, such as those in Algeria and Libya. First, time series of VIIRS visible and near-infrared bands (VisNIR) top-of-the-atmosphere (TOA) reflectances were compared with matching PACE OCI observations from 11 April 2024 to 15 October 2024. Preliminary results suggest that S-NPP VisNIR reflectances agree better with PACE OCI than NOAA-20 and NOAA-21. Finally, TOA reflectances in VIIRS shortwave infrared bands and VisNIR I-bands were compared with co-located EMIT observations over the desert sites for the period June-November 2023. Preliminary results indicate that VIIRS and EMIT reflectances agree within 3% in most cases, noting that uncertainties may be larger due to the limited number of cases available and residual bidirectional reflectance distribution function and atmospheric effects.

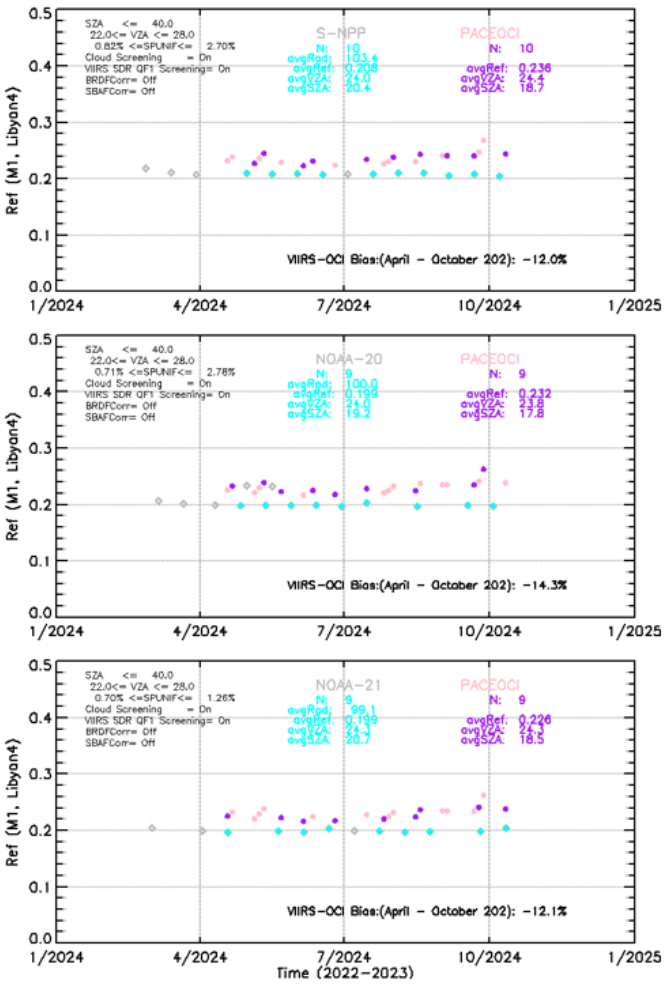

Figure. Examples of S-NPP (top), NOAA-20 (middle), and NOAA-21 (bottom) VIIRS (blue dots) and PACE OCI (purple dots) TOA reflectance time series over the Libyan-4 site for band M1 (0.412 um). VIIRS and OCI data points without matching data are colored grey and pink, respectively.

(Wenhui Wang, CISESS, whwang1@umd.edu; Funding: JSTAR)

PUBLICATIONS

Examining the ocean-circulation-induced magnetic field

Citation: Trossman, David S., Robert H. Tyler, and Helen R. Pillar, 2024: Physical oceanographic factors controlling the ocean circulation-induced magnetic field. Phil. Trans. R. Soc. A, 382, 20240076, https://doi.org/10.1098/rsta.2024.0076.

Summary: In an article published in the journal *Philosophical Transactions of the Royal Society A*, CISESS Scientist David Trossman and colleagues characterize the ocean conductivity content (Σ), the depth-integrated conductivity-weighted velocity (Tσ), and the ocean circulation-induced magnetic field (OCIMF), mainly determined by Σ and Tσ, over the period 1993 to 2017, the longest time span of these quantities analyzed to date. The most recent version of the Estimating the Circulation & Climate of the Ocean (ECCOv4r4) ocean state estimate was used to generate the data for the analyses. Time series of the inputs and outputs to the OCIMF model revealed significant trends in the ocean conductivity content, ocean conductivity transport, and the OCIMF. The authors suggest that measurements from instruments such as Electro-Magnetic APEX floats or acoustic Doppler current profilers and Conductivity, Temperature, and Depth sensors, along with magnetic data, could be used to estimate OCIMF. Observing system simulation experiments would have to be performed to determine how many of these instruments are needed and where they should be ideally placed to improve ECCOv4r4-derived OCIMF estimates. Ideas for future work on oceanographic applications of magnetic data are given.

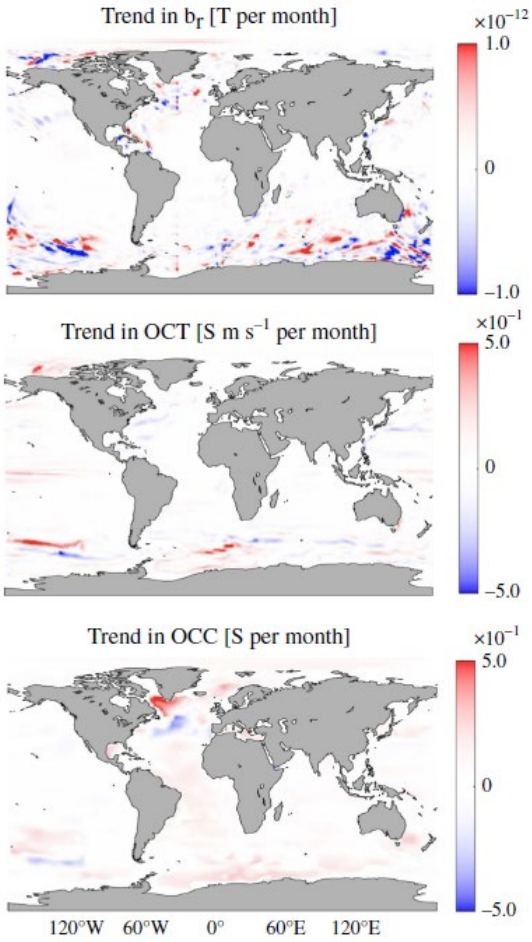

Figure. Trends in ECCOv4r4-derived (top) radial component of OCIMF, (middle) ocean conductivity transport, and (bottom) ocean conductivity content.

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

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