Weekly Report – February 20, 2026
Cooperative Institute for Satellite Earth System Studies (CISESS)
NOAA/NESDIS/STAR

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Date of Submission: 20 February 2026

HIGHLIGHTS FOR NESDIS LEADERSHIP

Use-Inspired Science

Soil Moisture Team Successfully Leveraged AWS Cloud to Advance Their Work

Soil moisture is a key state variable in most numerical weather, climate, and hydrological prediction models. The NESDIS Soil Moisture Operational Production System (SMOPS) provides global satellite-based soil moisture observations to support NOAA model research, operations, and a broad user community. Current SMOPS products are available at a spatial resolution of 25 km. However, higher-resolution satellite observations are expected to significantly enhance NOAA's numerical weather, hydrological, and climate prediction capabilities. To address this need, the STAR Soil Moisture Team, which includes CISESS Scientists Jifu Yin and Jicheng Liu, is downscaling SMOPS datasets from a 25-km resolution to a 1-km resolution using machine learning (ML) approaches. Initial implementation on local servers resulted in prohibitively high computational costs. By leveraging Amazon Web Services (AWS) with Message Passing Interface (MPI)-enabled Graphics Processing Unit (GPU) computing, the team has successfully overcome critical computational bottlenecks in the development of high-resolution soil moisture products. Test results show that the ML model training time has been reduced from approximately one week (168 hours) to about twenty minutes (speed increase: ~500 times). The consistency between training and validation errors, along with the strong agreement in error distributions across GPU ranks 0–3, shows that the ML models were successfully trained using AWS MPI-enabled GPUs (see figure).

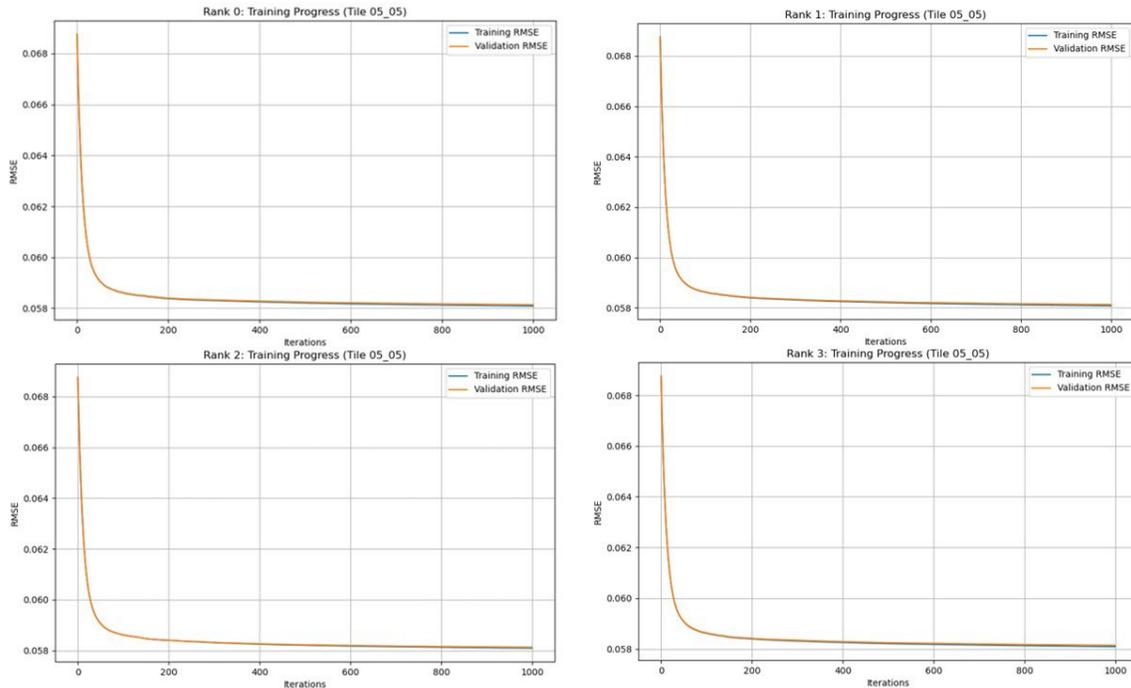*Figure: Root-mean-square error (RMSE) over a 4° × 8° sub-regional domain as a function of iteration for four GPU ranks (0–3). The training and validation RMSEs are consistent, and the RMSEs across the four ranks are in excellent agreement. These results show that the ML models were successfully trained using AWS MPI-enabled GPUs.*

(Jifu Yin, CISESS, jifu.yin@noaa.gov, Funding: IIJA & JSTAR GCOM; Jicheng Liu, CISESS, jliu1220@umd.edu, Funding: DACS, IIJA, JSTAR GCOM & METOP-SG)

TRAVEL AND MEETING REPORTS

CISESS Scientist Presents at the STAR Science Seminar Series
On 12 February 2026, CISESS Scientist Christopher Buchhaupt gave a talk titled "[Advances in Radar Altimetry for Observing Sea State and Sea Level](#)" as part of the STAR Science Seminar Series, attended by 30 people. Since 2010, a new generation of space-based ocean observations has significantly improved the monitoring of the ocean surface, providing more detailed measurements of sea-state and sea level, and making it easier to capture changes in ocean conditions, particularly in coastal and high-energy regions. Those observations play an important role in weather and ocean forecasting, long-term assessments of ocean conditions, and studies of how waves and sea level influence coastal, reef, and offshore environments. Buchhaupt introduced new parameters related to wave motion, i.e., standard deviation of vertical wave velocities and mean line-of-sight velocity, enabled by recently developed SAR algorithms. Among the results, the novel SAR altimetry algorithm described by Buchhaupt provides consistent significant wave heights (left panel of the figure). Another interesting result

is the first known demonstration of the potential of estimating snow depths from a single-frequency radar altimeter (right panel of the figure).
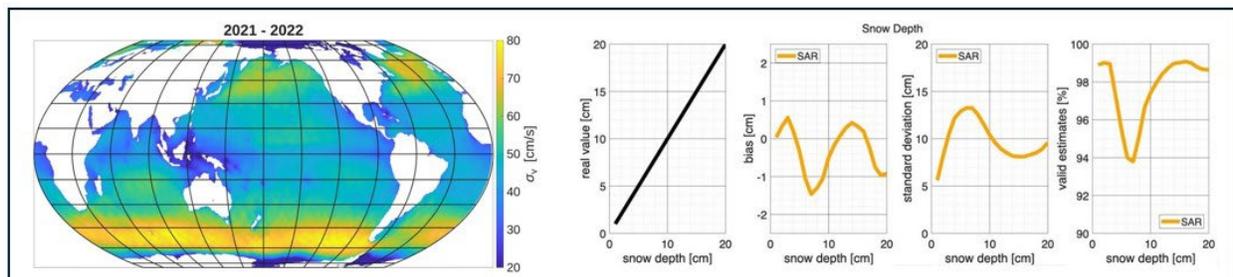

Figure: (Left) Two-year averaged Sentinel-6MF Low Resolution Mode SAR standard deviations of vertical wave velocities over the open ocean retrieved with the novel SAR algorithm. (Right) Snow-depth statistics from SAR altimetry.

(Christopher Buchhaupt, CISESS, cbuchhau@umd.edu, Funding: Jason)

MEDIA INTERACTIONS AND REQUESTS

Glaciers in Baltimore?
They're not pretty, but they'll be sticking around for a while longer. That's the message from CISESS Scientist Sinéad Farrell in an interview with Baltimore's WMAR 2 News dated 15 February 2026. The snowstorm of late January that immobilized the DC region resulted in mountains of dirty snow being piled up all over the place by snow removal crews. One especially huge accumulation of snow is found at the Old Town Mall in downtown Baltimore, the subject of the interview.

The video provides more information about this "man-made glacier" that caught Farrell's eye.

(Sinéad Farrell, CISESS, sinead.farrell@noaa.gov, Funding: Jason)

PUBLICATIONS

Learning More About the January 2025 Southern California Wildfires
Citation: Li, Fangjun, **Xiaoyang Zhang**, Mark Cochrane, Shobha Kondragunta, and Shuai An, 2026: Fire spread, intensity, and emissions observations by multiple satellites: the Southern California wildfires of January 2025. *AGU Adv.*, **7**(1), e2025AV002064, https://doi.org/10.1029/2025AV002064.
Summary: In January 2025, powerful wildfires fueled by strong Santa Ana winds burned through neighborhoods in Los Angeles, causing major damage and threatening lives. Using satellite images, CISESS Scientists Fangjun Li and Xiaoyang Zhang, along with coauthors,

investigated how fast the fires spread, how intensely they burned, and how much smoke pollutants they released. They found that the Palisades and Eaton fires spread at up to 3.7 km/hr and burned all residential areas involved during the first 24 hours. They also found that at night, the Palisades Fire burned more intensely in residential areas than concurring vegetation fires, with a mean intensity of 297 W/m². Additionally, smoke emissions showed strong diurnal variations and emission rates were as high as 1,233 kg/s in carbon monoxide (CO) and 9.7 kg/s in nitrogen oxides (NO_x). The total emissions were 406 Gg in CO and 1.8 Gg in NO_x for the Palisades Fire and 116 Gg in CO and 1.0 Gg in NO_x for the Eaton Fire. The finding reveals that the integration of multiple satellite observations is capable of providing prompt information about fire characteristics (spread rate and direction, intensity, and smoke emissions) to support safe evacuation, firefighting operations, and air quality forecasting. This is particularly critical for extreme fires in the wildland-urban interface, such as Los Angeles.
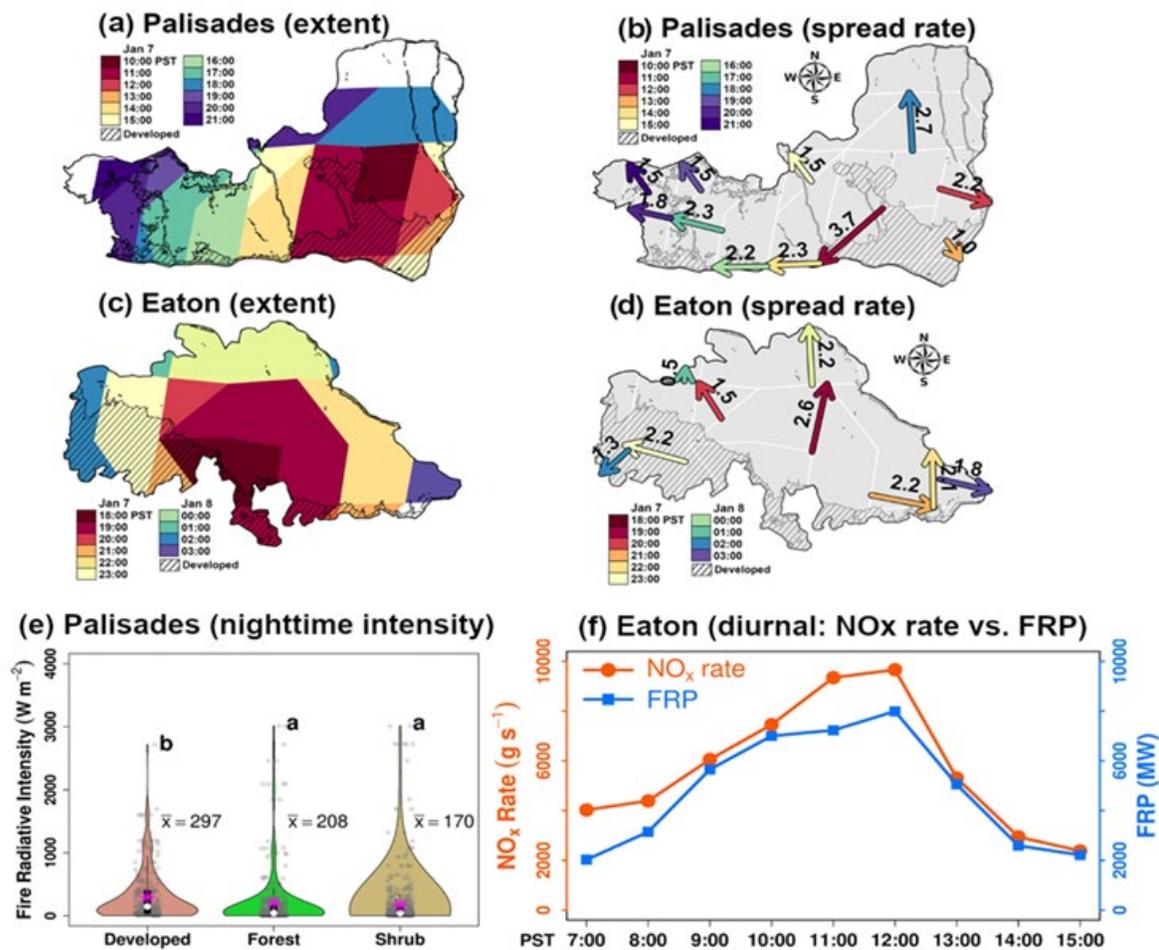

Figure: Fire extent, spread rate, intensity, and NO_x fire emissions of the Los Angles Wildfires 2025. (a-b) Hourly fire extent and maximum spread rate (km/hr) of the Palisades Fire; (c-d) the same as (a-b) but for the Eaton Fire; (e) fire intensity of concurring fires at night in developed

areas and natural vegetation; and (f) hourly variations of Tropospheric Emissions: Monitoring of Pollution-based NO_x rate and fire radiative power (FRP) on 9 January 2025 in the Eaton Fire.

(Fangjun Li, CISESS, fangjun.li@sdstate.edu, Funding: OCS; Xiaoyang Zhang, CISESS, xiaoyang.zhang@sdstate.edu, Funding: JPSS PGRR)

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