Weekly Report

SCSB/CISESS
Cooperative Research Program Division (CoRP)
STAR/NESDIS
National Oceanic and Atmospheric Administration (NOAA)

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Products and Applications

ATMS SFR Performance in Recent Snowfall Event: A prolonged snowfall event occurred along the East Coast from January 31 to February 2 of 2021. A case study was conducted to examine the performance of the operational ATMS (S-NPP and NOAA-20) snowfall rate (SFR) product. SFR data from 13 swaths was collected and collocated with Stage IV radar and gauge combined hourly precipitation data. The table below shows the performance statistics of the two satellites. They have comparable bias and RMS but S-NPP has higher correlation with Stage IV than NOAA-20. Figure 1 displays the density scatter plots of

	Correlation Coefficient	Bias (mm/hr)	RMS (mm/hr)
S-NPP	0.49	-0.02	0.70
NOAA-20	0.40	0.01	0.71

S-NPP and NOAA-20 SFR vs. Stage IV, respectively. Figure 2 compares the NOAA-20 SFR image on February 1, 2021 17:16Z with the corresponding Multi-Radar Multi-Sensor (MRMS) instantaneous precipitation product. Similarly, Figure 3 presents S-NPP SFR retrievals with the corresponding MRMS image. In both figures, the patterns of the intense snowfall align well between the SFR images and the MRMS estimates. The SFR product displays a tendency to underestimate heavier snowfall as shown in this case. The SFR team is actively studying this issue.

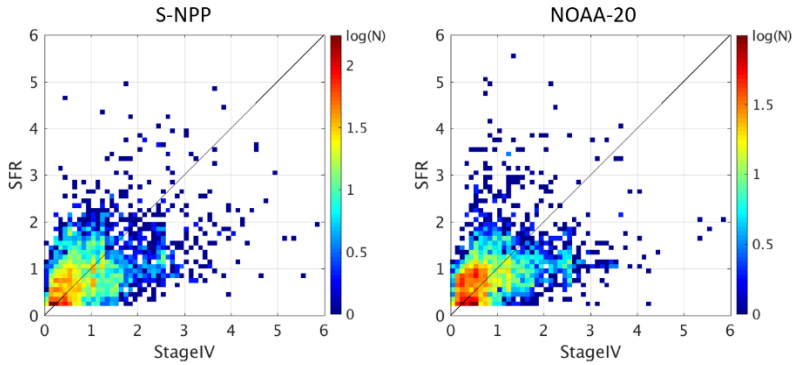

Figure 1. ATMS SFR vs. Stage IV density scatter plots for S-NPP (left) and NOAA-20 (right) from the snowfall event on January 31, 2021 to February 2, 2021.

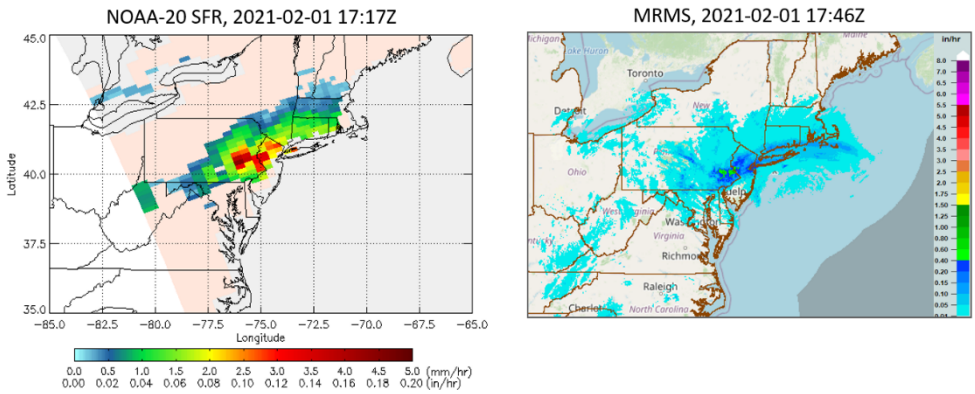

Figure 2. Comparison of snowfall rate estimates by NOAA-20 SFR on Feb 1, 2021 17:17Z (left) and the corresponding MRMS (right).

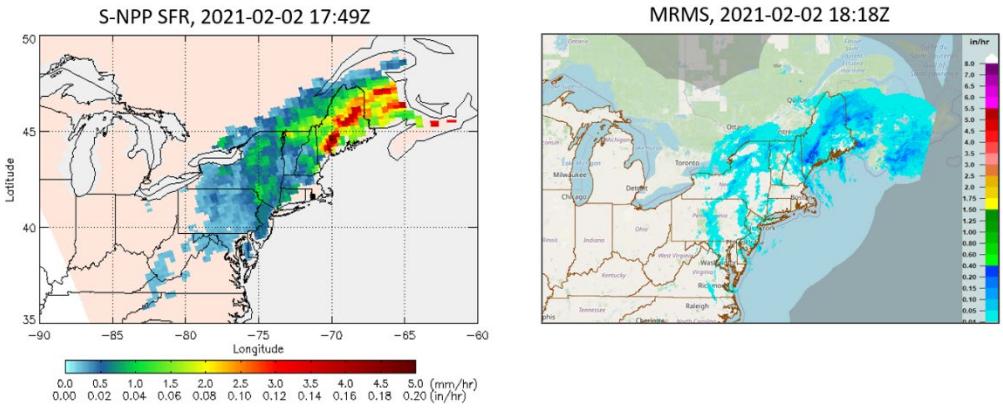

Figure 3. Comparison of snowfall rate estimates by S-NPP SFR on Feb 2, 2021 17:49Z (left) and the corresponding MRMS (right).

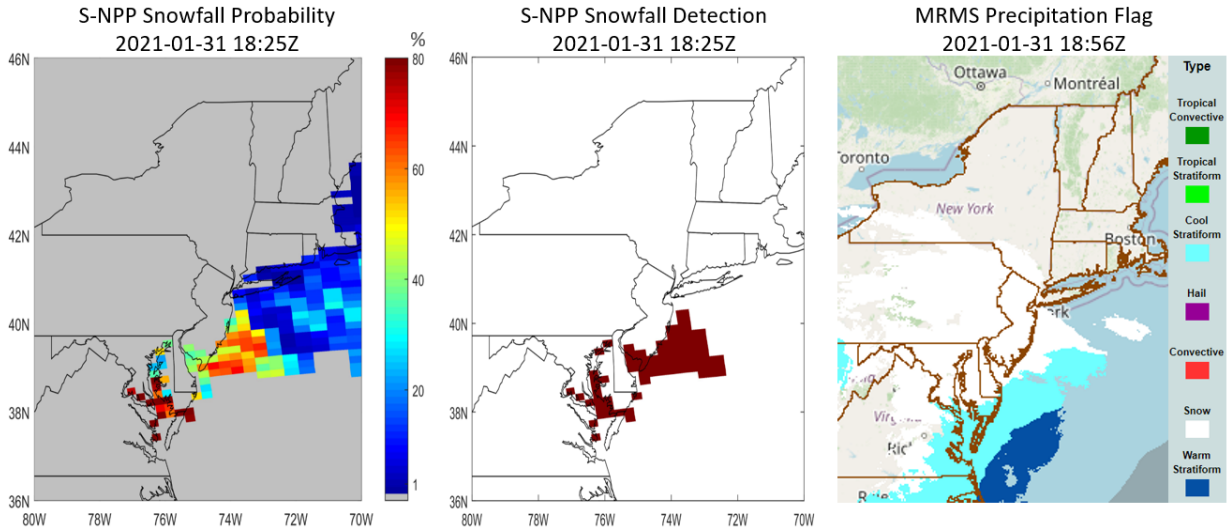

Figure 4. S-NPP over ocean snowfall probability (SP, %) on January 31, 2021 18:25Z (left), S-NPP snowfall detection product derived from SP (middle) where red indicates detected snowfall, and the corresponding MRMS precipitation flag product.

A set of experimental ATMS over ocean (ice-free ocean, coast, and sea-ice) snowfall detection (SD) algorithms has also been developed recently. A preliminary study shows that the algorithms perform well for this snowfall event. Figure 4 compares the S-NPP over ocean snowfall probability and SD images on January 31, 2021 18:25Z with the corresponding MRMS precipitation flag product. The S-NPP SD correctly identifies the snowfall off the coasts of New Jersey and Delaware and even in the Chesapeake Bay and along the Potomac River. Scientists who work on the Snowfall Rate Product include H. Meng, J. Dong, Y. You, Y. Fan, C. Kongoli, and R. Ferraro.

(POC: H. Meng, huan.meng@noaa.gov, Funding: STAR JPSS, JPSS PGRR)

Publications

3D Structure of Forests: CISESS Scientists Khaldoun Rishmawi and Chengquan Huang (Department of Geographical Sciences, University of Maryland) and Xiwu Zhan from NOAA-NESDIS Center for Satellite Applications and Research (STAR) published an article last month in the Journal *Remote Sensing*. The article demonstrated the potential of integrating measurements from The Global Ecosystem Dynamics Investigation (GEDI) Light Detection and Ranging (LiDAR) sensor with spatially contiguous observations from the Visible Infrared Imaging Radiometer Suite (VIIRS) to produce 1-km resolution wall-to-wall maps of canopy height, plant area index, and canopy fraction cover, which will benefit greatly to our efforts for improving the JPSS VIIRS Annual Surface Type product. The methodology developed through this study may allow multi-decadal monitoring of changes in key forest structural attributes using consistent

satellite observations acquired by orbiting and forthcoming VIIRS instruments. A multi-decadal record of Earth's forests 3D structure is essential for improving our understanding of the true magnitude of global forest biomass stocks, for modeling biomass change associated with forest disturbance and regrowth, and for prognosticating future net forest carbon fluxes.

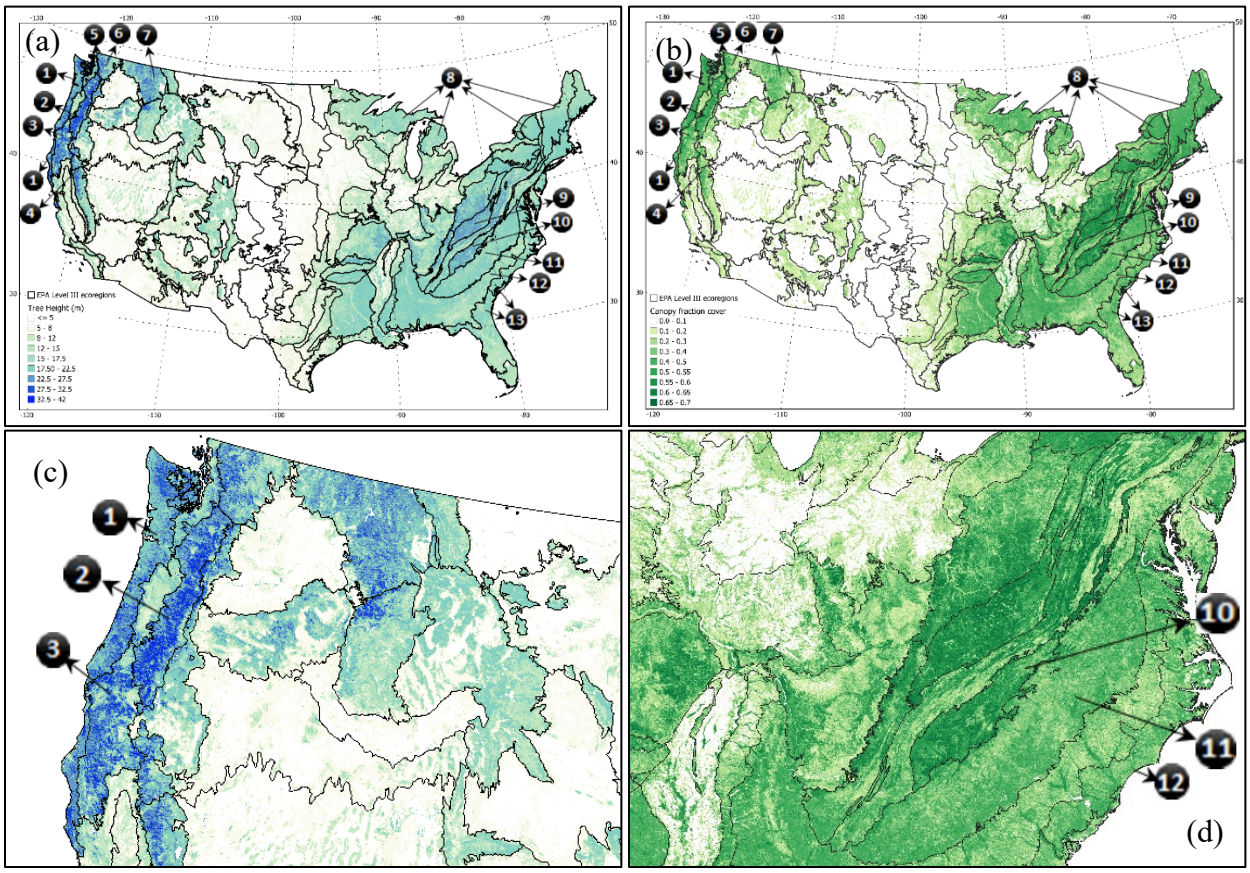

Figure 5. (**a**) Canopy height (CH) map (m) and (**b**) canopy fraction cover (CFC) maps for the conterminous US for the year 2019. Close-up examples illustrate (**c**) CH variations in the ecoregions of the Northwestern Forested Mountains, and (**d**) CFC variations between the Appalachians and the Piedmont Plateau. Key: 1 Marine West Coast Forests, 2 the Cascades, 3 Klamath Mountains, 4 Sierra Nevada, 5 Eastern Cascades, 6 North Cascades, 7 Northern Rockies, 8 Northern Hardwood Forests, 9 Central Appalachians, 10 Blue Ridge Mountains, 11 Piedmont Plateau, 12 Southern Plains, and 13 Coastal Plains.

Rishmawi, K.; Huang, C.; Zhan, X. Monitoring key forest structure attributes across the conterminous United States by integrating GEDI LiDAR measurements and VIIRS data. *Remote Sens.* **2021**, *13*, 442. https://doi.org/10.3390/rs13030442 .

Training and Education

NERTO Student Application in Progress: A NOAA Experiential Research & Training Opportunities (NERTO) application is being developed for a student of S. Shen at San Diego State University (SDSU). NERTO is for Educational Partnership Program (EPP) Cooperative Science Center-supported students participating in NOAA mission-aligned research. An initial meeting was held between the student, Jesus Perez Cuarenta, his SDSU advisor S. Shen, and the proposed NOAA sponsor T. Smith. The research project is to apply machine learning to a climate forecast. A follow-up meeting was held a few days later between them and NOAA Cooperative Science Center in Atmospheric Sciences and Meteorology (NCAS-M) and Howard University faculty J. Manswell Butty and C. Ichoku, to discuss how to proceed with the formal application. The application is now being prepared for submission to the Student Scholarship Internship Opportunity (SSIO) system.

(POC: T. Smith, tom.smith@noaa.gov, Funding: PDRA)