Weekly Report

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

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Products and Applications

SFR Captures Early Season Snowstorm: Several western states experienced one of the earliest snowstorms ever on September 8-9. An Arctic front brought significant snowfall to the area following a period of record setting high temperatures. For instance, Denver had a 61-degree temperature drop, from 93 ˚F to 32 ˚F in less than 24 hours. The microwave SFR product captured the snowstorm as it traveled from Montana to Colorado and into New Mexico. Figure 1 is the SFR vs. Stage IV scatter plot produced from about 25 overpasses from five satellites including NOAA-20 and S-NPP. The performance statistics are shown in the scatter plot. For an early season event, the SFR product performed reasonably well with a correlation coefficient of 0.5 with Stage IV. Figure 2 presents two of the SFR images respectively from NOAA-20 and S-NPP. Also shown are the corresponding National Operational Hydrologic Remote Sensing Center (NOHRSC) modeled hourly snowfall, and the Stage IV radar and gauge combined hourly precipitation (including both rain and snow). The link below is an animation of the SFR images from this snowfall event (courtesy of Jorel Torres from CIRA):
http://cics.umd.edu/~hmeng/SFR/nesdis-snowfall-rate-animation.gif

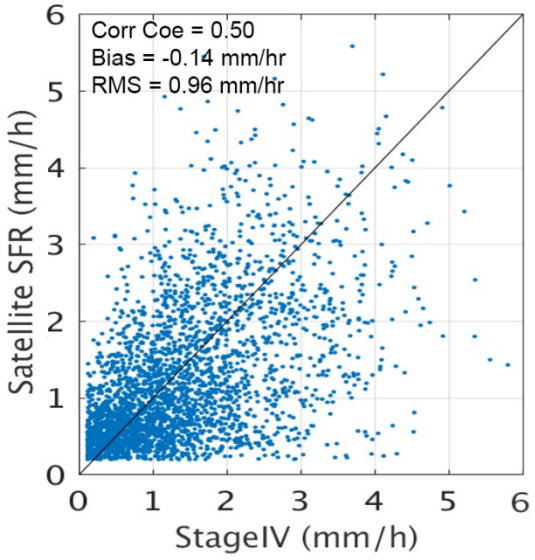

***Figure 1**. Scatter plot of SFR vs. Stage IV from the snowfall event on September 8-9.*

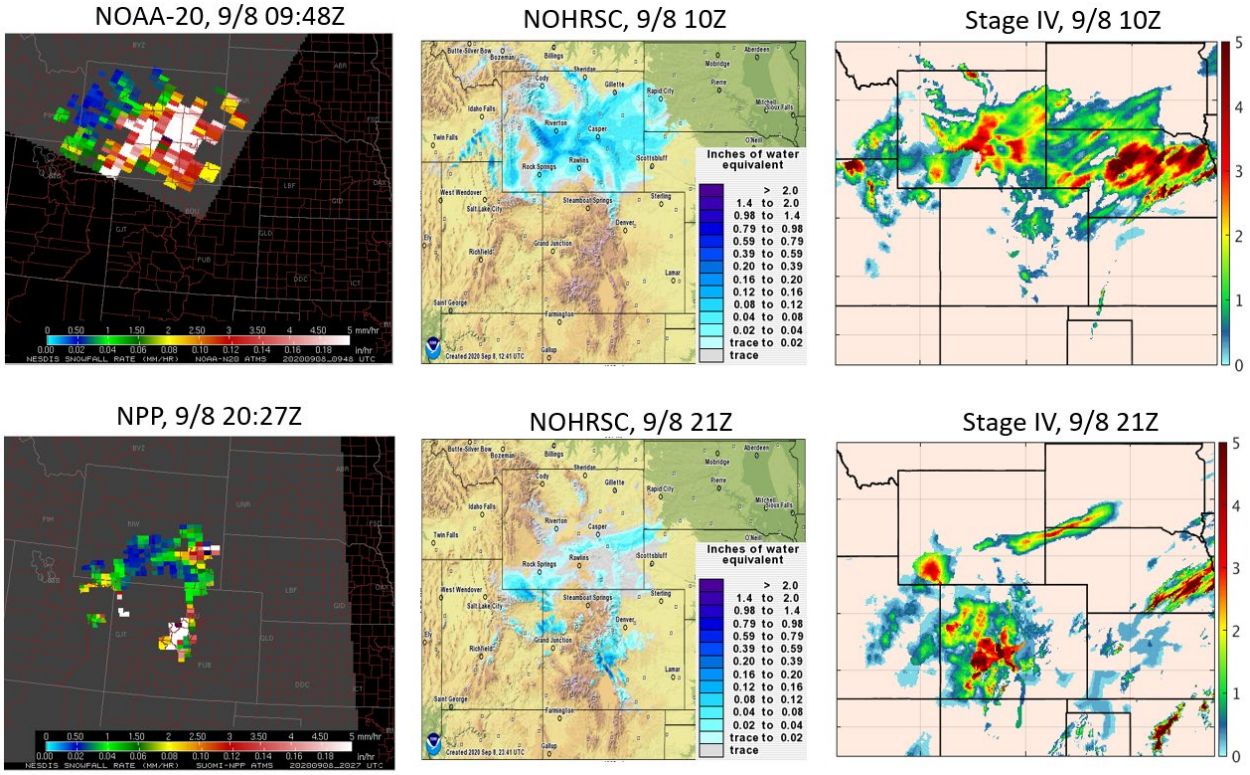

***Figure 2**. Top: NOAA-20 SFR at 9:48Z on September 8 (left), the corresponding NOHRSC hourly snow precipitation (center) and the Stage IV hourly precipitation (including both rain and snow) (right). Bottom: Same as the top but for S-NPP at 20:27Z on September 8. The SFR images are courtesy of NASA SPoRT.*

(POC: H. Meng, J. Dong, Y. Fan, C. Kongoli, R. Ferraro, *huan.meng@noaa.gov*, Funding source: JSTAR)

Publications

OMPS Nadir Profiler Performance: CISSESS Scientist Chunhui Pan has a new article accepted for publication at *IEEE Transactions on Geoscience and Remote Sensing* about the performance of the Ozone Mapping and Profiler Suite (OMPS) Nadir Profilers (NPs). These are advanced backscatter ultraviolet (BUV) hyperspectral instruments that measure ozone profiles in the Earth atmosphere and are on the Suomi-NPP and NOAA-20 satellites. The two NP sensors acquire Earth spectral images along their satellite flight path with a 16.7° wide swath, enabling weekly coverage of vertical ozone distribution in the Earth atmosphere. A successful thorough sensor calibration enables the NP sensors' data records (SDRs) to meet measurement accuracy requirements. The largest error term in the albedo calibration is the spectral wavelength calibration error, contributing approximately 60% to the overall error. On-orbit calibration of wavelength registration mitigated the wavelength errors to 0.01 nm. Long-term seasonal wavelength fluctuations are corrected by the updates of the wavelength scale and solar

calibration tables once every two weeks. The two NP sensors' SDRs are comparable to the global representative observations; each sensor has less than 2% error in Earth albedo retrieval. Improvements in NOAA-20 NP calibration program have resulted in better performance than Suomi-NPP NP for major calibration requirements. Calibration of wavelength latitude dependence will be applied to the SDR algorithm in the future when necessary.

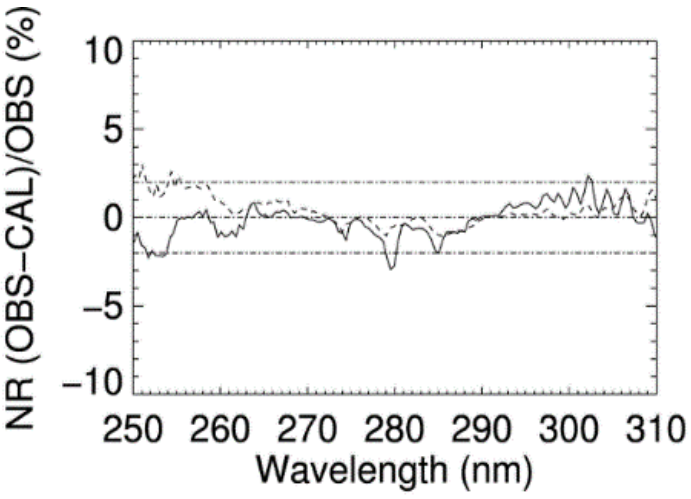

***Figure**: The albedo error versus wavelengths was evaluated via a comparison of measured normalized radiances (referred as NRs OBS) to model calculated normalized radiance (NRs CAL) for specific measurement geometries, viewing conditions and climatological data. The NRs were calculated for a set of given solar zenith and azimuth angles, ozone concentrations, surface pressures, and reflectivity values as inputs to a standard forward radiative transfer model TOMRAD. Results presented in the figure show that the wavelength-independent albedo error varies with wavelength and meets the 2% requirement for all wavelengths except for the NOAA-20 NP shorter wavelengths where albedo accuracy is allowed to increase to 3% for wavelengths between 250 and 260 nm*.

Pan, C., B. Yan, C. Cao, L. Flynn, X. Xiong, E. Beach and L. Zhou, 2020: Performance of OMPS Nadir Profilers' Sensor Data Records, *IEEE Trans. Geosci. Remote Sens.*, accepted, DOI 10.1109/TGRS.2020.3026586.

(*POC: Chunhui Pan, chunhui.pan@noaa.gov, Funding: JSTAR)*

Workshops, Conferences, and Meetings

Characterization and Radiometric Calibration Conference: The annual Conference on Characterization and Radiometric Calibration for Remote Sensing (CALCON) was held September 21-24, 2020. The Space Dynamics Laboratory (SDL) at the Utah State University hosted the meeting online. CISESS Scientist Fangfang Yu from the GOES-R ABI Calibration Support team attended this meeting, and she chaired the first technical session on Inter-Calibration and Validation of Operational Sensors on

September 21, and gave two oral presentations titled as “The East-West Response versus Scan-angle Performance of GOES-16/17 ABI Solar Reflective Bands” and “Radiometric Calibration Performance of GOES-16/17 Advanced Baseline Imagers” on September 21 and September 23, respectively. Dr. Yu also made a contribution to the pre-meeting workshop on Using the Moon as a Radiometric Calibration Reference by sharing several slides on the ABI lunar calibration. The virtual meeting was free and it attracted more than one hundred attendees around the world.

(*POC: Fangfang Yu, fangfang.yu@noaa.gov, Funding: GOES-R PGRR)*

Lean-In Session Presentation: Huan Meng gave a 5-minute talk at one of the lean-in sessions at the NOAA Satellite Community Meeting. The presentation included the input from a group of federal and Cooperative Institute employees in support of including passive microwave (MW) instruments in the next generation Geostationary platforms (R. Ferraro, Q. Liu, C. Grassotti, J. Forsythe of CIRA, P. Xie of CPC, B. Petkovic, T. Wimmers of CIMSS). The group of scientists develop PMW products that are regularly used in NWS weather forecasting. The presentation outlined the significant benefits of GEO MW and how it would revolutionize the applications of MW products in weather forecasting including monitoring of tropical cyclones and severe weather. Existing science and technology also make it feasible for GEO satellites to carry MW instruments that can realize these benefits. Most of the questions submitted in Slido were about Geo MW following the presentations, showing strong interest for such instruments in the user community.

(POC: H. Meng, huan.meng@noaa.gov, Funding source: JSTAR)