Products and Applications

**California Category 5 Atmospheric River Event as seen by MiRS Products**: CISESS Scientists Christopher Grassotti prepared an analysis of the 24 October, a powerful Category 5 (the maximum possible) atmospheric river (AR) occurred over the northern and central parts of California. The storm system featured record breaking precipitation, leading to flooding and mudslides in some locations, along with dangerous winds exceeding 70 miles per hour at higher elevations. San Francisco recorded its fourth highest single-day rainfall amount of over 4 inches. Satellite passive microwave measurements are one of the observational tools that allow depiction of these extreme events, since microwaves are less affected by clouds and precipitation. NOAA’s Microwave Integrated Retrieval System (MiRS) water vapor retrievals from NOAA-20/ATMS on this day were used to visualize the structure of the AR off of the California coast. Figure 1 shows the total precipitable water (TPW) retrieved over the region, indicating that the plume of very high TPW (greater than 40 mm) extends well west of the coast and even beyond 150 W longitude. Figure 2 shows four vertical cross-sections of the retrieved water vapor anomaly, along different longitudes in the eastern Pacific. The anomaly is calculated with respect to the mean retrieved conditions at each location for the preceding 10 days (14-23 October).

**Figure 1. MiRS NOAA-20/ATMS retrieved TPW (descending and ascending orbits) on 24 October 2021 over the eastern Pacific and West Coast region. The atmospheric river is clearly seen. Locations of the four vertical cross-sections shown in Figure 2 are indicated by the dashed lines.**
Figure 2. Vertical cross-sections of MiRS NOAA-20/ATMS retrieved water vapor anomalies along four longitudes (140 W, 135 W, 130 W, and 125 W) over the eastern Pacific between 20 N and 50 N latitude. Data are for descending orbits on 24 October 2021. The structure of the atmospheric river is depicted, with anomalies exceeding 400% just off the California coast.

Several features are notable. First, the structure of the AR is clearly seen in all the cross-sections as an elevated core of large positive anomalies, with the magnitude of the anomalies increasing closer to the coast. Second, close to the coast, at 125 W longitude the retrieved water vapor anomalies are very large, exceeding 400% in a broad set of layers above 800 hPa. Third, the vertical distribution of the maximum anomaly varies with longitude. For example, further west at 140 and 135 W, the maximum anomaly appears to be focused above 500 hPa, while closer to the coast at 130 and 125 W, the anomaly extends further toward the surface seeming to focus in the 600-800 hPa layer. MiRS retrievals are a significant input to the operational blended TPW and blended layer water vapor products, and the accurate depiction of AR events can help operational forecasters increase situational awareness and potentially improve forecasts and warnings to the public.

(POC: C. Grassotti, christopher.grassotti@noaa.gov; Funding: ISTAR, JPSS PGRR, METOP-SG)

Stray Light Corrections for the NOAA-20 OMPS Nadir Mapper: CISESS Scientist Chunhui Pan prepared a new calibration Look Up Table (LUT) of Stray Light Coefficients for the Ozone Mapping and Profiler Suite (OMPS) Nadir Mapper on NOAA-20. It is used to generate the OMPS Sensor Data Records. The figure below shows the correction results at spatial resolution of 17km x 12km for 196 spectral channels. 1200 Earth view images were used in the analysis.
Since the stray light signal varies with Earth view latitude, a trade-off study via measurement latitude was conducted and the calibration LUT was an average value result from the trade of study. Ratio of stray light signals to the measurement signal indication the short wavelengths have higher level of the stray light up to 54% at 298 nm. Compared to 100% stray light level that was observed in the Suomi-NPP at the same wavelength, the NOAA-20 NM stray light improved significantly in the sensor performance. The left figure compares the calibration results with NASA’s results. The results are highly consistent. Slightly difference is caused by the different spatial resolution.

Figure: Summary stray light correction result for NOAA-20 Nadir Mapper Sensor Data Records. (POC: C. Pan, chunhui.pan@noaa.gov; Funding: JSTAR)

Training and Education

Zhang speaks at the ASU Sun Devil Weather and Climate Club: Daile Zhang was invited to give a zoom talk at the Arizona State University Sun Devil Weather and Climate club monthly meeting on October 29. The Sun Devil Weather and Climate club serves its undergraduate meteorology program and is run by the undergraduate students in the School of Geographical Sciences & Urban Planning. Daile talked about her work on lightning detection from space as well as the Global Electric Circuit in which thunderstorms and lightning play a key role. The students showed strong interests in her work and ball lightning. Daile also shared her story of how she became a lightning scientist with the students.

(POC: Daile Zhang, dlzhang@umd.edu, Funding: GOES-R AWG, GOES-R PGRR, NOAA-NASA ROSES)