

Weekly Report – September 13, 2024
Cooperative Institute for Satellite Earth System Studies (CISESS)
NOAA/NESDIS/STAR

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Use-Inspired Science

Development and Testing of a Scanning Microwave Radiometer

With the support of a CISESS Seed Grant, a scanning microwave radiometer Level-1 product has been developed in the CISESS Remote Sensing Laboratory (RSL) and tested in a field campaign. The instrument is designed as a Dicky-type radiometer with center frequency of 22GHz and can be used for atmosphere and surface microwave remote sensing studies. The main feature of the instrument includes high stability and sensitivity, wide scanning angle, remote data collecting and monitoring, and a remote control for scanning mode. The RSL also provides significant training opportunities for students, including summer and year-round interns, in addition to lab tours and hands-on educational activities for visitors.

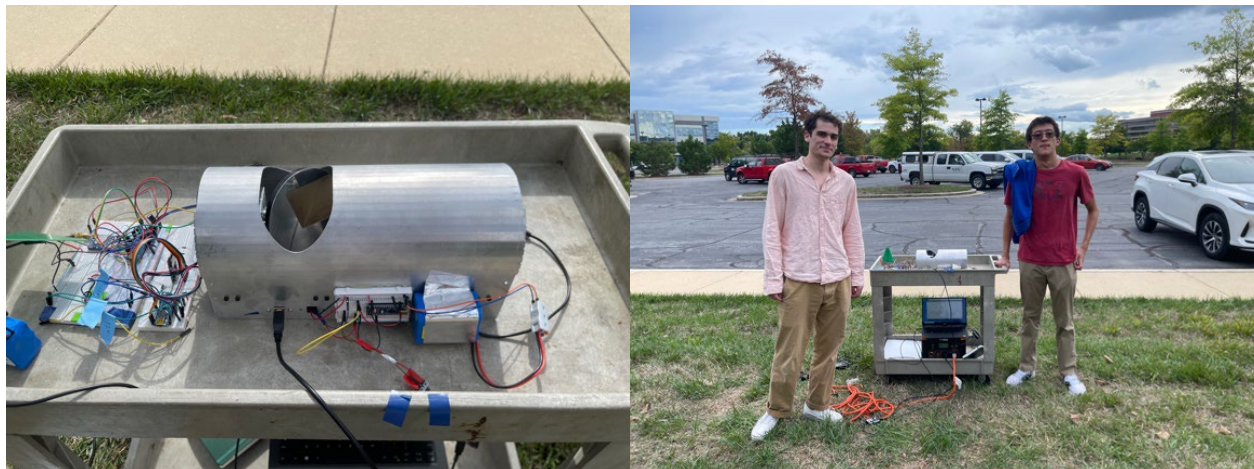


Figure: (Left) Dicky-type scanning microwave radiometer developed in the CISESS Remote Sensing Laboratory (Right) CISESS interns Matias Calderon and Jason Chen during a field campaign to test the radiometer on August 19th, 2024 in College Park. (Photos provided by Hu (Tiger) Yang.)

(Hu Yang, CISESS, huyang@umd.edu; Funding: JSTAR, CISESS Seed Grant)

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People

Joseph Patton Advocates for Policy to Benefit the Scientific Community

On Tuesday, September 10th, CISESS scientist Joseph Patton and three other Maryland researchers met with legislative aides and policy advisors for U.S. Senators Ben Cardin and Chris Van Hollen (MD) and Congressman Glenn Ivey (MD-4th District, which includes College Park) in the House and Senate buildings to advocate for bills that would benefit scientific researchers. These bills included the RESEARCHER Act, which aims to ensure that graduate and postdoctoral researchers have the resources and financial stability they need to carry out their important work by directing federal research agencies to develop and implement policies that address the financial insecurities of researchers. Patton also advocated for the Keep STEM Talent Act, which would allow individuals who are foreign nationals with advanced degrees in STEM fields to obtain non-immigrant visas while also seeking permanent resident status, and the National Windstorm Impact Reduction Program Reauthorization Act, which would reauthorize the federal government to appropriate funds to conduct research into mitigating impacts to life and property from windstorms, including hurricanes, tornadoes, and severe thunderstorms. The researchers were also given the opportunity to briefly meet with Rep. Ivey. The meetings were productive and opened a line of communication to the Congressional representation for Maryland, allowing the researchers to promote sound science policy that would benefit UMD and other institutions of higher education across the US.



Figure: UMD researchers advocating for policy to benefit scientific researchers in the U.S., outside Rep. Ivey's office in the Longworth House Office Building, Washington D.C. on 9/10/24. From left to right, Rahat Sharif (PhD candidate, UMD/AGNR), Joseph Patton (Faculty researcher, UMD/ESSIC/CISESS), Akanksha Singh (PhD candidate, UMD AOSC), and Caterina Mogno (Postdoctoral researcher, UMBC/NASA Goddard). (Photo provided by Joseph Patton.)

(Joseph Patton, CISESS, jpatton4@umd.edu, Funding: GOES-R AWG, GOES-R PGRR)

SOCIAL MEDIA AND BLOG POSTS

Satellite Liaison Captures August Pacific Hurricane Activity in Latest Blog

On Tuesday, August 27th, CISESS Scientist and Satellite Liaison to the NWS Weather Prediction Center (WPC) and Ocean Prediction Center (OPC), Christopher Smith, posted to the Satellite Liaison Blog on the train of tropical activity marching across the Central and Eastern Pacific. The post focused on the satellite imagery used as WPC issued an advisory for Hurricane Gilma as part of its backup operations for the National Hurricane Center (NHC). In addition, the Satellite Liaison featured Hurricane Hone as it impacted Hawaii and products that will be useful for OPC operations such as the OceanSat-3 Scatterometer (OSCAT) and the GOES GREMLIN product that simulates radar reflectivity using GOES-ABI imagery and GLM data. The Satellite Liaison Blog serves as an outlet for liaisons to share publicly the science and satellite tools making their way into NWS operations, gathering feedback for maximizing operational capabilities of satellite products. Smith has posted to the Satellite Liaison Blog over 15 times in the past year to engage the satellite user community on the science and tools two of the national centers are using in their forecasts and decision making. Check out the blog and sign up for email notifications of new postings at <https://satelliteliaisonblog.com/>.

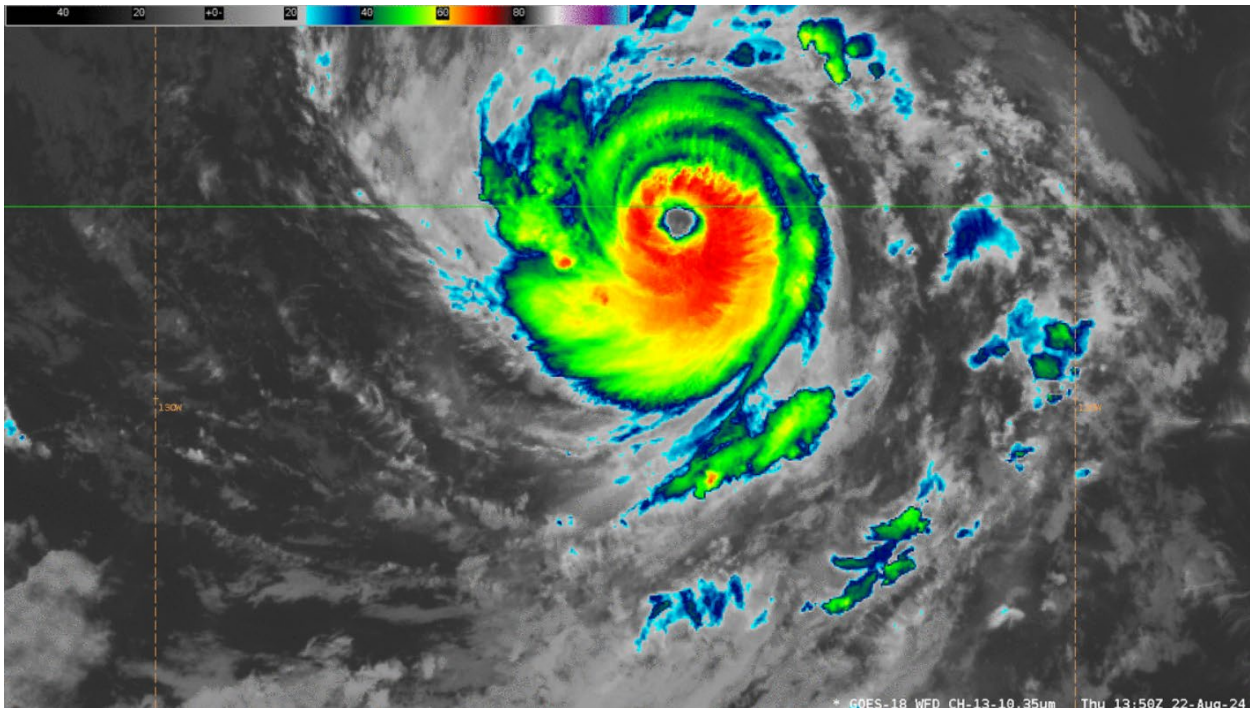


Figure: GOES-West Clean IR Longwave Window Band 13 valid 22 August 2024, which was used by WPC to inform the 1500 UTC advisory for Hurricane Gilma as a Category 3 major hurricane.

(Christopher Smith, CISESS, csmith70@umd.edu; Funding: GOES-R PGRR)

PUBLICATIONS

Citation: Hamer, Sophia; **Jennifer Sleeman** and Ivana Stajner, 2024: Forecast Aware Model-Driven Neural Learning for Air Quality Bias Correction. *Proc. IEEE Int. Conf. on Geoscience and Remote Sensing Symp. 2024*, Athens, Greece, Inst. Electr. Electron. Eng., pp. 3040-3044, doi: 10.1109/IGARSS53475.2024.10641346. **Summary:** As air quality (AQ) forecasting is critical to vulnerable populations, any changes to AQ forecast systems require rigorous processing, testing, and validation. When systematic and deterministic errors are present that the currently deployed model does not address, a post-processing correction, called a bias correction, is applied to correct for these errors after the forecast model runs. Extreme AQ events tend to occur without a strong signal leading up to the event and this behavior tends to cause existing methods to either under or over compensate for the bias. CISESS Consortium scientist Jennifer Sleeman (UMBC) co-authored a study on a new method that combines unsupervised learning and a forecast-aware bi-directional Long Short-Term Memory (LSTM) network to perform bias correction for operational AQ forecasting using AirNow station data for ozone and PM_{2.5} in the continental US. Using an unsupervised clustering method trained on station geographical features such as latitude and longitude, urbanization, and elevation, the learned clusters direct training by partitioning the training data for the LSTM networks. LSTMs are forecast-aware and implemented using a unique way to perform learning forward and backwards in time across forecasting days. The study showed that the cluster-based forecast-aware LSTMs perform significantly better than the base forecast bias correction (see Figure) for critical AQ forecasts.

O3 Concentration (2019-07-23 13:00:00 GMT - 2019-07-25 12:00:00 GMT;
Station ID: 60793001) Combined LSTM Model

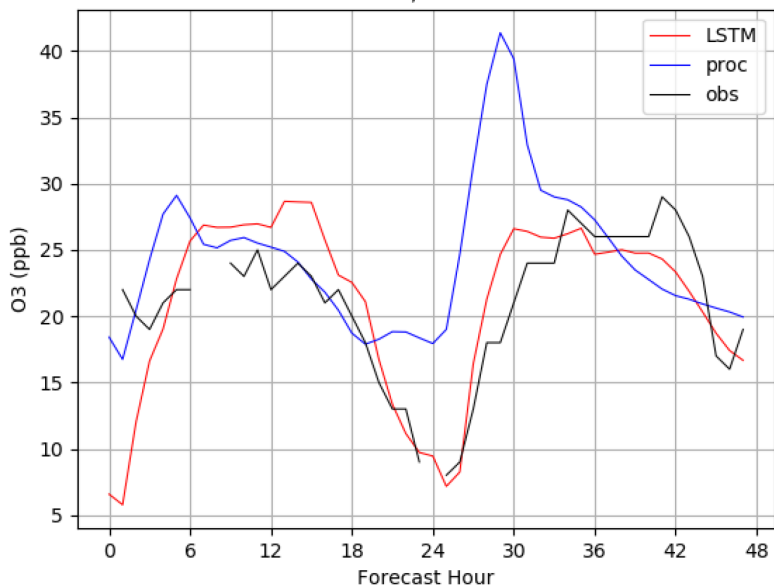


Figure: Ozone Long Short-Term Memory (LSTM) Results for K=25 with latitude and longitude as clustering variables - Station 60793001 Located in Morro Bay, California. "Proc" represents the forecast mode, "obs" represents the AirNow ground truth, and LSTM represents the result of the LSTMs.

(Jennifer Sleeman, CISESS & UMBC, jennifer.sleeman@jhuapl.edu; Funding: EMC)