

## Weekly Report

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CIRA  
STAR/NESDIS  
National Oceanic and Atmospheric Administration (NOAA)

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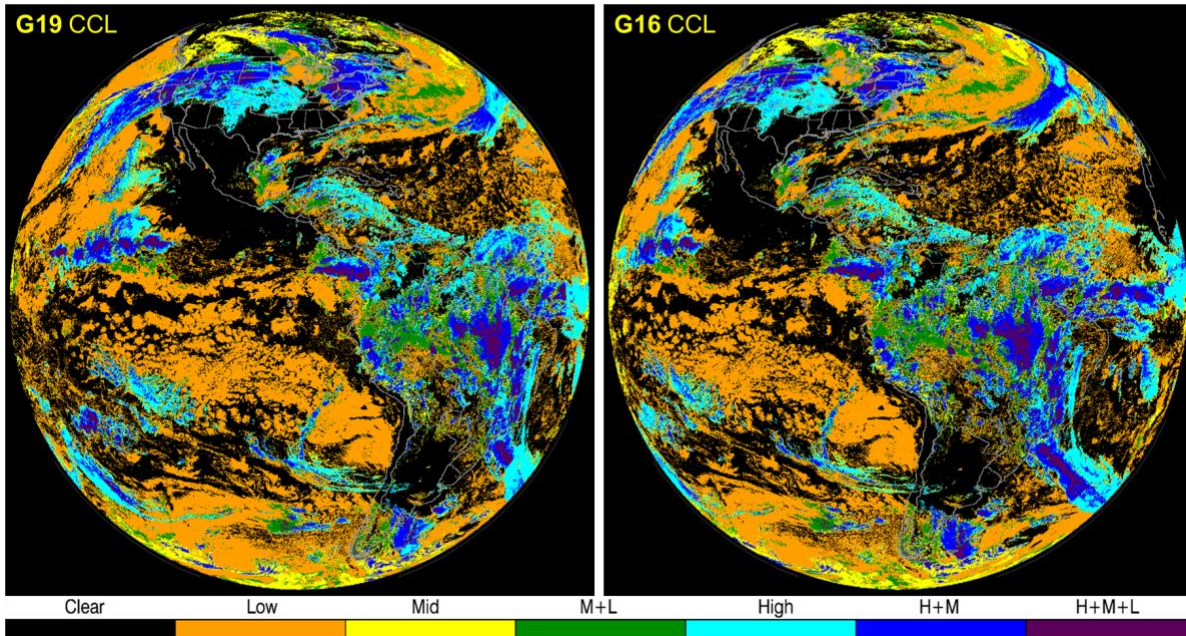
Submitted by: Maranda Hutson  
Date of Submission: 07 March 2025  
Prepared by: CIRA and STAR contributors

### **Products and Applications**

**GOES-19 CCL Products Pass Provisional Validation Review:** The GOES-19 ABI Level 2 Cloud Cover Layers (CCL) product underwent a NOAA Provisional Peer/Stakeholder Product Validation Review on March 5. The product, whose evaluation was conducted by CIRA scientists under the direction of NOAA/NESDIS's Cloud Team Lead, Mark Kulie, passed the review to attain provisional validation maturity. This certifies that the GOES-19 version of this product can officially be distributed via PDA, CLASS, and NODD. CIRA scientist John Haynes presented the product quality evaluation and validation results on behalf of the CIRA team, which includes scientists Yoo-Jeong Noh and Brandon Daub. The review demonstrated that the product meets provisional performance requirements for GOES-19, which launched in June 2024. CCL quantifies the vertical placement of clouds in the atmosphere, an important quantity for aviation interests. Development of this product has greatly benefited from CIRA's close relationship with the Aviation Weather Center. (POC: J. Haynes, Y. J. Noh, B. Daub, [john.haynes@colostate.edu](mailto:john.haynes@colostate.edu); Funding: GOES-R)

OR\_ABI-L2-CCLF-  
M6\_G19\_s20250331700206\_e20250331709514\_c20250331717038.nc

OR\_ABI-L2-CCLF-  
M6\_G16\_s20250331700211\_e20250331709519\_c20250331718283.nc



**Figure:** Visual comparison of CCL cloud layers for both GOES-19 (left) and GOES-16 (right) full disk.

**Publications (Citation: followed by a short Summary: (Why & so what), & detailed summary):**

**Citation:** Radford, J.T., Ebert-Uphoff, I. and Stewart, J.Q., 2025. A Comparison of AI Weather Prediction and Numerical Weather Prediction Models for 1–7-Day Precipitation Forecasts. *Weather and Forecasting*. Early online release, March 3, 2025. <https://doi.org/10.1175/WAF-D-24-0081.1>. **Summary:** This paper analyzes the performance of an AI-based global weather prediction model, GraphCast, regarding precipitation. While those models are usually evaluated using computer-science oriented criteria, such as root mean square error, here we use meteorological metrics, including grid-based, neighborhood-based, and object-based metrics. **Detailed summary:** Pure AI-based weather prediction (AIWP) models have made waves within the scientific community and the media, claiming superior performance to numerical weather prediction (NWP) models. However, these models often lack impactful output variables such as precipitation. One exception is Google DeepMind’s GraphCast model, which became the first mainstream AIWP model to predict precipitation, but performed only limited verification. We present an analysis of the ECMWF’s IFS-initialized and the NCEP’s GFS-initialized GraphCast precipitation forecasts over the contiguous United States and compare to results from the GFS and IFS models using 1) grid-based, 2) neighborhood, and 3) object-oriented metrics verified against the ECMWF Reanalysis v5 (ERA5) and the NCEP/EMC Stage IV precipitation analysis datasets. We affirmed that GFS- and IFS-initialized GraphCast models perform better than the GFS and IFS in terms of root mean squared error and stable equitable errors in probability space, but the GFS and IFS precipitation distributions more closely align with the ERA5 and Stage IV

distributions. Equitable threat score also generally favored GraphCast, particularly for lower accumulation thresholds. Fractions skill score for increasing neighborhood sizes shows greater gains for the GFS and IFS than GraphCast, suggesting the NWP models may have a better handle on intensity but struggle with location. Object-oriented verification for GraphCast found positive area biases at low accumulation thresholds and large negative biases at high accumulation thresholds. (POC: J. Radford, I. Ebert-Uphoff, CIRA, [Jacob.Radford@colostate.edu](mailto:Jacob.Radford@colostate.edu), [iebert@colostate.edu](mailto:iebert@colostate.edu). Funding: NOAA-GSL and CIRA ML Strategic Initiative)

## Awards and Recognition

## Media Interactions and Request

## Blog Posts and Social Media

**New Satellite Liaison Blog Post:** Bill Line published a blog post titled “Early March 2025 Blowing Dust”. The post highlights a widespread and long-lasting blowing dust event using various GOES imagery products and explains how NWS forecasters utilized the imagery in operations. See Figure below. The link to the post can be found [here](#). (POC: Bill Line, [bill.line@noaa.gov](mailto:bill.line@noaa.gov), 970-279-1832)

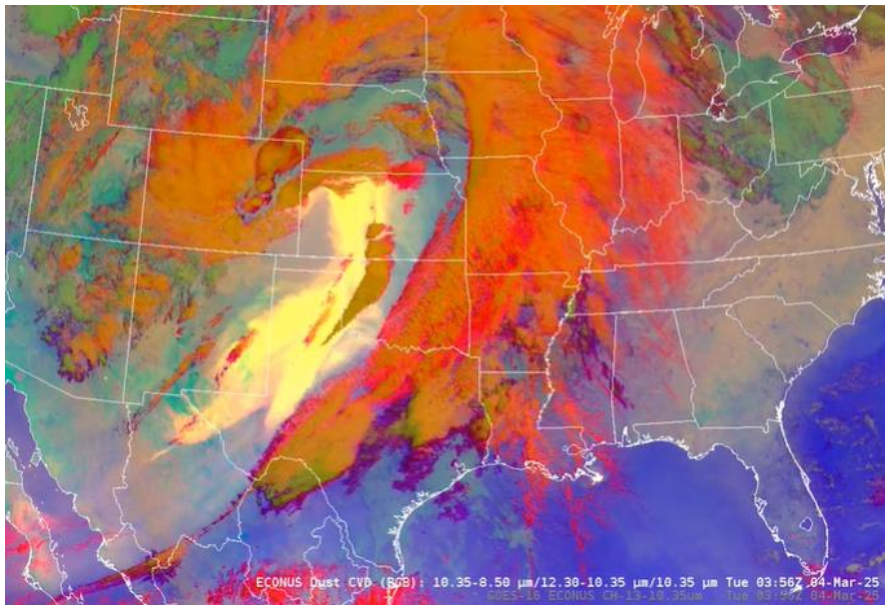
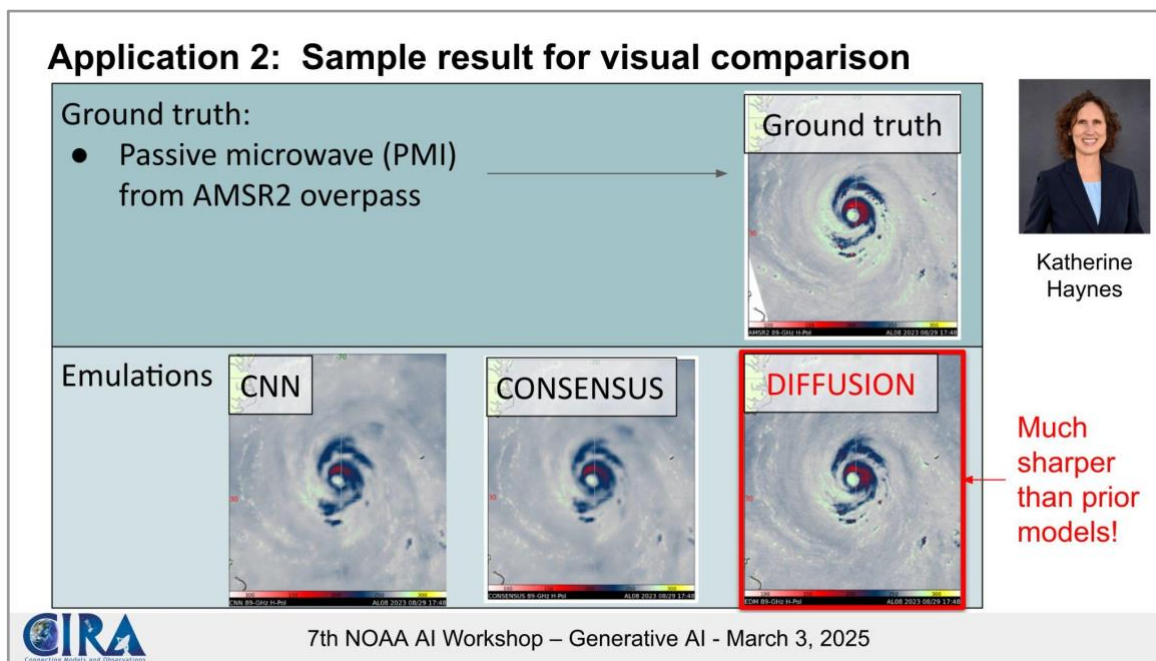


Figure. GOES-East Color Vision Deficiency (CVD) Dust RGB captures widespread blowing dust (bright green/yellow) being wrapped into a central US low pressure system. Imagery is from AWIPS.

## Travel, Workshops, Conferences, and Meeting Reports

**Presentation at 7th NOAA AI Workshop:** NOAA hosted a half-day, virtual workshop on March 3, 2025 that focused on **Generative AI (GenAI) in Earth and space sciences**. Two CIRA scientists, Imme Ebert-Uphoff and Lander Ver Hoef, gave a lightning presentation entitled **“Two Applications of Diffusion Models at CIRA: 1) Nowcasting Satellite Imagery and 2) Emulating Passive Microwave Imagery”**, that highlighted work by Randy Chase, Katherine Haynes, Lander Ver Hoef, and Imme Ebert-Uphoff. The figure below highlights results obtained by a diffusion model developed by Kathy Haynes that emulates passive microwave imagery from GOES imagery. There were 174 participants during this presentation. (POC: I. Ebert-Uphoff, L. Ver Hoef, K. Haynes, R. Chase, CIRA, [iebert@colostate.edu](mailto:iebert@colostate.edu), [Lander.Ver\\_Hoef@colostate.edu](mailto:Lander.Ver_Hoef@colostate.edu), [Katherine.Haynes@colostate.edu](mailto:Katherine.Haynes@colostate.edu), [Randy.Chase@colostate.edu](mailto:Randy.Chase@colostate.edu). Funding: ONR and NOAA)



A slide from CIRA’s presentation at NOAA’s Generative AI workshop event on March 3, 2025, demonstrating the benefits of using so-called “diffusion models”, a Generative AI algorithm.

**Training and Education activities**

**Future Meetings and Events (dates, meeting/event, location, staff involved)**

**Other**

Don Hillger reviewed a manuscript for *Remote Sensing* about DNB/NCC cal/val for JPSS-3 and 4. (POC: D. Hillger, CIRA, [don.hillger@colostate.edu](mailto:don.hillger@colostate.edu))

T. Tsukada reviewed a manuscript for Atmosphere-Ocean. (POC: T. Tsukada, CIRA, [taiga.tsukada@colostate.edu](mailto:taiga.tsukada@colostate.edu))