Weekly Report

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

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Products and Applications

GPM-API package includes TC PRIMED: The GPM-API package can now obtain, process, and visualize data from the Tropical Cyclone PRecipitation, Infrared, Microwave and Environmental Dataset (TC PRIMED). TC PRIMED is a dataset of tropical cyclone observations and products from the low-Earth orbit satellites of the GPM Constellation such as intercalibrated passive microwave brightness temperature, retrieved rainfall, spaceborne precipitation radar variables from the Global Precipitation Measurement (GPM) and Tropical Rainfall Measuring Mission (TRMM) satellites, and nearly-coincident infrared brightness temperature. TC PRIMED also includes tropical cyclone information like position and intensity and environmental diagnostics and fields.

GPM-API (https://pypi.org/project/gpm-api/) is a Python interface to download, read, process, and visualize products from the GPM data archive. GPM-API was developed independently of TC PRIMED and has recently included utilities to interface with TC PRIMED data on the Amazon Web Service (AWS) Simple Storage Service (S3) bucket. The AWS S3 bucket for TC PRIMED is available as part of the NOAA Open Data Dissemination (NODD) program. Users can learn more about the GPM-API package here: https://gpm-api.readthedocs.io/en/latest/, and go through the tutorial specific to TC PRIMED here: https://gpm-api.readthedocs.io/en/latest/tutorials/tutorial_TCPRIMED.html. (POC: Naufal Razin, CIRA, naufal.razin@colostate.edu; Chris Slocum, NOAA STAR, christopher.slocum@noaa.gov)

References

Ghiggi, G., 2024: GPM API Version 0.3.4. EPFL. https://pypi.org/project/gpm-api/. https://doi.org/10.5281/zenodo.7753488.

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

Citation: Krell, E., Mamalakis, A., King, S.A., Tissot, P. and Ebert-Uphoff, I., The influence of

correlated features on neural network attribution methods in geoscience, *Environmental Data Science*, vol. 4, e29, May 2025. https://doi.org/10.1017/eds.2025.19

Summary: EXplainable Artificial Intelligence (XAI) techniques can help identify how AI models make predictions. In the case of gridded spatial data, the explanation is often a heatmap that highlights the influential spatial regions in the input data. However, geospatial data typically exhibit substantial autocorrelation, and any kind of correlation in the input feature can distort the XAI results. This paper explores ways to deal with this issue.

Detailed Summary: This manuscript makes the following contributions: (1) A synthetic benchmark framework to analyze how correlated features influence attributions. (2) An investigation in how correlation impacts network's learning and hence the attributions. (3) Strategies to detect and mitigate potential issues with attributions for a given network without having to compare to a ground truth attribution. (4) Demonstration that superpixel-level XAI may offer additional insight into the network.

(POC: I. Ebert-Uphoff, CIRA, iebert@colostate.edu) Funding: NSF AI Institute (AI2ES).

Awards and Recognition

Media Interactions and Request

Imagery Production Team Imagery of North American Fires Featured: In mid-May, wildfires erupted across Minnesota and southern Canada. Satellite visuals created by the Imagery Production Team made available in CIRA's Satellite Library were used by several high-profile media outlets to highlight the wildfires. More information and links can be found below. (POC: D. Smith, dakota.smith@colostate.edu K. Erickson, kim.erickson@colostate.edu, J. Reiter, josh.reiter@colostate.edu, CIRA) Funding: GOES-R.

Washington Post: "Several wildfires are burning in Minnesota, fueled by hot and dry conditions". https://www.washingtonpost.com/weather/2025/05/14/minnesota-wildfires-canada-hot-dry-fuel/?utm_campaign=wp_main&utm_source=twitter&utm_medium=social

CBS News: “Satellite imagery shows rapid growth of Minnesota wildfires”. https://www.tiktok.com/@cbsnews/video/7503961235906497838?lang=en

AccuWeather: “Satellite imagery captured three wildfires rapidly growing”. https://www.facebook.com/watch/?v=1636776273670803

Blog Posts and Social Media

Travel, Workshops, Conferences, and Meeting Reports

CIRA participation at the 2025 NOAA HWT: CIRA researchers Jason Apke, Dan Bikos, and Kyle Hilburn participated in the 2025 NOAA Hazardous Weather Testbed Satellite Proving Ground experiment hosted by the National Severe Storms Laboratory, which brings together developers with National Weather Service forecasters to evaluate the operational utility of emerging satellite products for convection warning operations. This year, CIRA demonstrated the Optical flow Code for Tracking, Atmospheric motion vector, and Nowcasting Experiments (OCTANE) cloud-top divergence and MesoAnywhere (pseudo 1-min imagery) products along with the GOES Radar Estimation via Machine Learning to Inform NWP (GREMLIN) system now produced on CONUS and 1-min mesoscale sectors. Forecasters at the testbed provide feedback through blogs (https://goesrhwt.blogspot.com/) and surveys, which will be summarized after the experiment in Fall 2025. (POC: J. Apke, K. Hilburn, and D. Bikos, CIRA,

jason.apke@colostate.edu, kyle.hilburn@colostate.edu, dan.bikos@colostate.edu) Funding: NOAA/GOES-R.

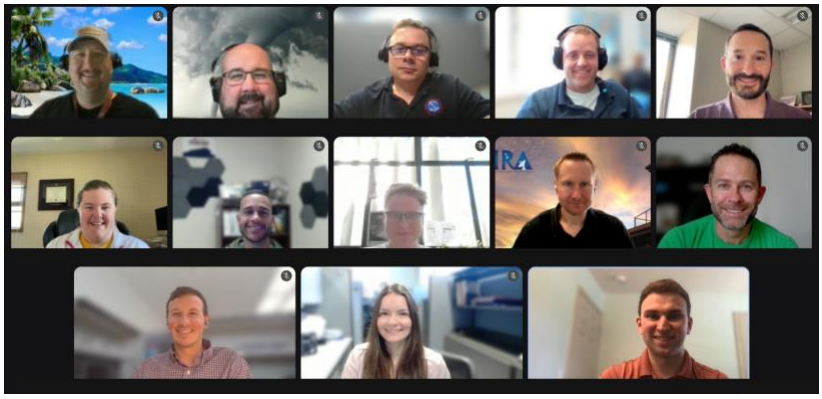
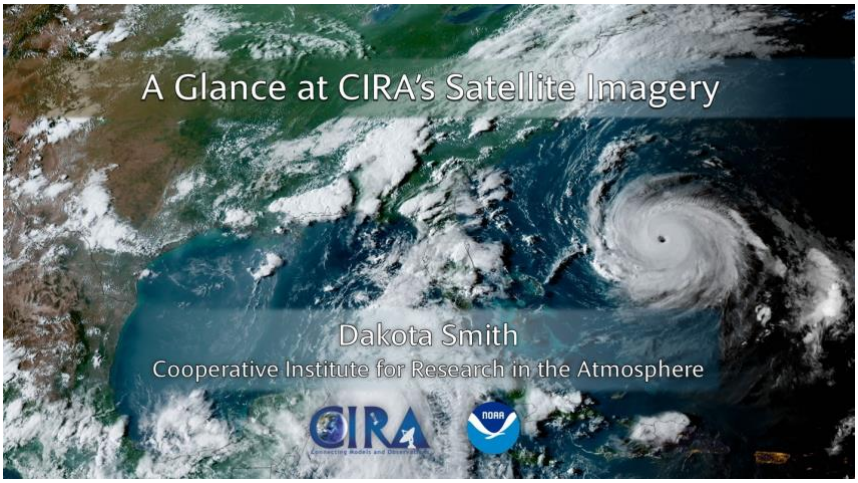


Figure: *Forecasters and Developers who participated in Week 1 of the 2025 NOAA HWT Satellite Proving Ground Experiment.*

Dakota Smith Presents in NASA Science Mission Directorate Monthly Highlights Meeting: On May 15, 2025, Dakota Smith showcased the work of the Imagery Production team during the monthly NASA SMD Highlight Meeting. Dakota was the guest speaker for the Joint Agency Satellite Division portion of the meeting. Recent imagery as well as resources to access CIRA's satellite imagery were highlighted.



Training and Education activities

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

Other

Stephanie Ortland reviewed a manuscript for the American Meteorological Society's Artificial Intelligence for the Earth Systems (AIES) journal. (POC: Stephanie Ortland, CIRA, stephanie.ortland@colostate.edu)

Taiga Tsukada reviewed a manuscript for the Meteorological Society of Japan's Scientific Online Letters on the Atmosphere (SOLA) journal. (POC: Taiga Tsukada, CIRA, taiga.tsukada@colostate.edu)

Jason Apke reviewed a manuscript for the Journal of Geophysical Research: Atmospheres. (POC: J. Apke, CIRA, jason.apke@colostate.edu).