Weekly Report

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

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Products and Applications

Shortwave Albedo product again working: After being "broken" for a long time, the legacy Shortwave Albedo image product is now working for Himawari-9 AHI and for GOES-18 (see the "SW Albedo" product on SLIDER for either satellite). This product is the reflective part of the SW window band that remains after subtracting off the emitted component using the LW window band adjusted to the SW wavelength. While this product emphasizes the Earth's surface albedo (thus the name), it also enhances any excess SW radiance such as from wildfire hotspots. So, this band is typically better suited to monitor fires than the SW band alone, because of increased fire signal compared to background radiance. (Disclaimer: this is not the only imagery product that is useful for wildfire detection.) (POC: D. Hillger, S. Finley, K. Micke, CIRA, Don.Hillger@colostate.edu. Steve.Finley@colostate.edu, Kevin.Micke@colostate.edu; Funding: GOES-R).

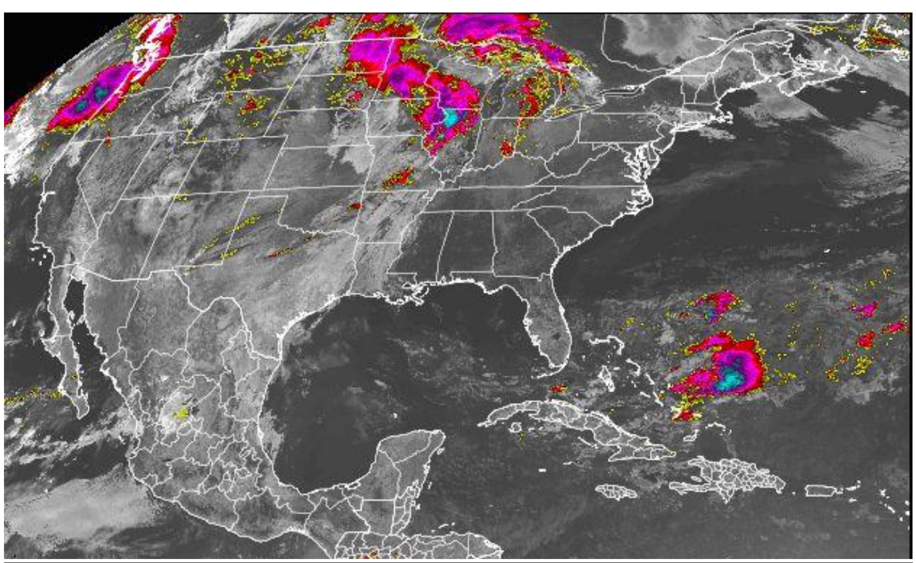

Figure: Example of the SW Albedo product for a GOES-16 CONUS view. Albedos are expressed in grey shades, whereas higher clouds are color-enhanced instead of using a cloud mask. There is an annotated color bar on SLIDER for this product, that is not seen here.

Optical Flow Products in AWIPS: CIRA is now producing optical flow motion speeds and directions from 0.64 and 10.3 µm imagery sequences for AWIPS using the 1-min GOES-16 and GOES-18 ABI mesosectors. The motions are rendered for every image pixel using advanced dense optical flow retrieval algorithms. The motions over cloud-drifts are tuned to match ancillary wind observations from airborne wind-profiling lidars. The product can be used to highlight important wind profile characteristics just like operational Atmospheric Motion Vectors and can even highlight thunderstorms growing in strong wind shear and cloud-top divergence signals associated with strong updrafts. The AWIPS production is part of an upcoming demonstration at the 2023 Hazardous Weather Testbed in Norman Oklahoma. (POC: J. Apke, CIRA and B. Line, NOAA/NESDIS/STAR, jason.apke@colostate.edu, bill.line@noaa.gov, Funding: GOES-R).

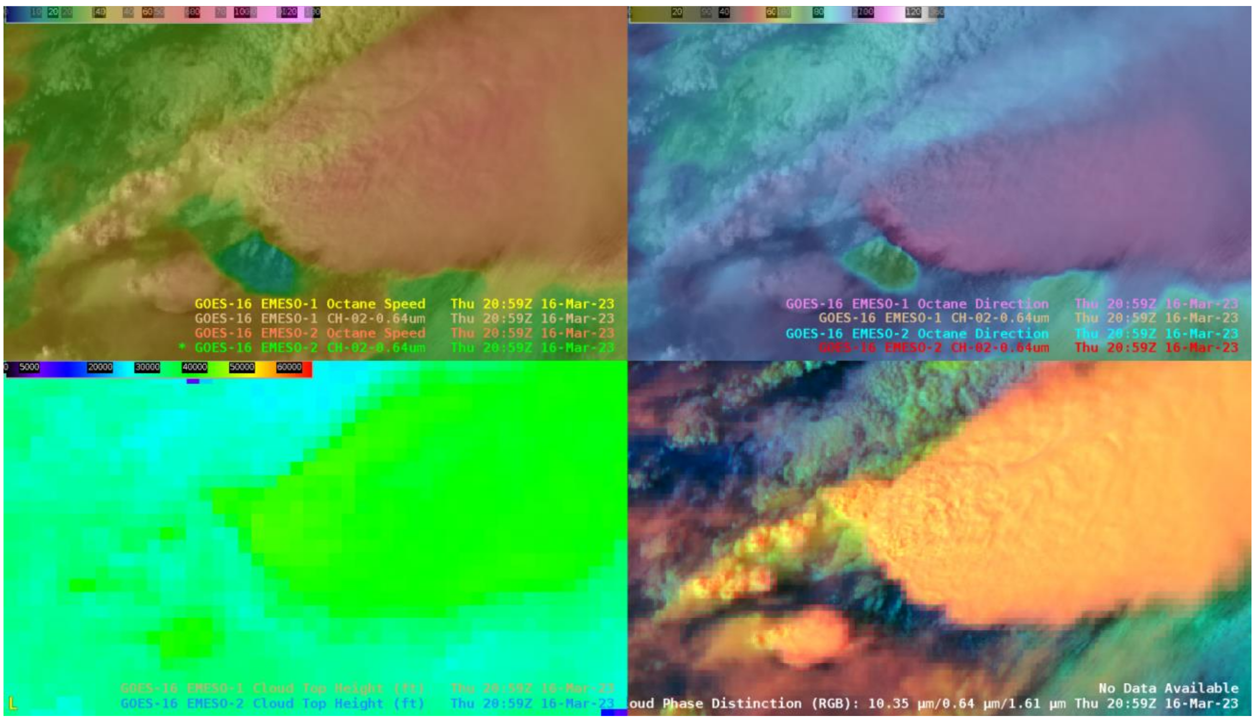

Figure: Example four panel view from AWIPS showing (*Top Left*) Optical flow Speed, (*Top Right*) optical flow direction, each blended with 0.64 µm visible imagery, and (*Bottom Left*) ACHA Cloud-Top Height, and (*Bottom Right*) the Day Cloud Phase Distinction RGB over mature deep convection on 16 Mar 2023 at 2059 UTC.

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

Citation: McGovern, A., Gagne, D.J., Wirz, C.D., Ebert-Uphoff, I., Bostrom, A., Rao, Y., Schumacher, A., Flora, M., Chase, R., Mamalakis, A., McGraw, M., Lagerquist, R,, Redmon, R.J., and Peterson T., 2023. Trustworthy Artificial Intelligence for Environmental Sciences: An Innovative Approach for Summer School. *Bulletin of the American Meteorological Society*, early online release, 14 Apr 2023, https://doi.org/10.1175/BAMS-D-22-0225.1.

Short summary: This BAMS article describes our experience developing and teaching the *2022 Summer School on Trustworthy AI for Environmental Science (TAI4ES)*, which was a collaborative effort of AI2ES (NSF AI Institute), CIRA, and NCAI (NOAA Center for AI). The summer school featured several new approaches to fully integrate the viewpoints from three disciplines, AI, environmental science, and risk communication, throughout the entire workshop. The goal was to teach a new generation of environmental scientists how to cross disciplinary boundaries and develop approaches that integrate all three disciplinary perspectives and approaches to solve important environmental science problems.

Detailed summary: This BAMS article describes our experience developing and teaching the *2022 Summer School on Trustworthy AI for Environmental Science (TAI4ES)*, a virtual event that was a collaborative effort including members from AI2ES, CIRA, and NCAI. The summer school featured several new approaches to fully integrate the viewpoints from three disciplines, AI, environmental science, and risk communication, throughout the entire workshop. The workshop consisted of two components, a lecture series in the mornings and a hack-a-thon in the afternoon. Lecture topics included trust and trustworthiness (Day 1), explainability and interpretability (Day 2), data and workflows (Day 3), and uncertainty quantification (Day 4). This year's hack-a-thon took a novel approach: It was a "Trust-a-thon" that featured pre-trained AI models and participants gained hands-on experience applying both risk communication and explainable AI techniques to those models. For the Trust-a-thon we developed challenge problems for three different application domains: (1) severe storms, (2) tropical cyclones, and (3) space weather. Each domain had an associated user persona to guide user-centered development.

The goal was to teach a new generation of environmental scientists how to cross disciplinary boundaries and develop approaches that integrate all three disciplinary perspectives and approaches to solve important environmental science problems. We had 677 participants from 63 countries register and attend online (see figure). While CIRA co-authors of the article are I. Ebert-Uphoff, A. Schumacher, R. Chase, M. McGraw, and R. Lagerquist, other CIRA members also contributed to the summer school, including K. Musgrave, K. Haynes, and A.S. Bansal. NCAI co-authors are Rao and Redmon, and other contributing NOAA members include C. Slocum.

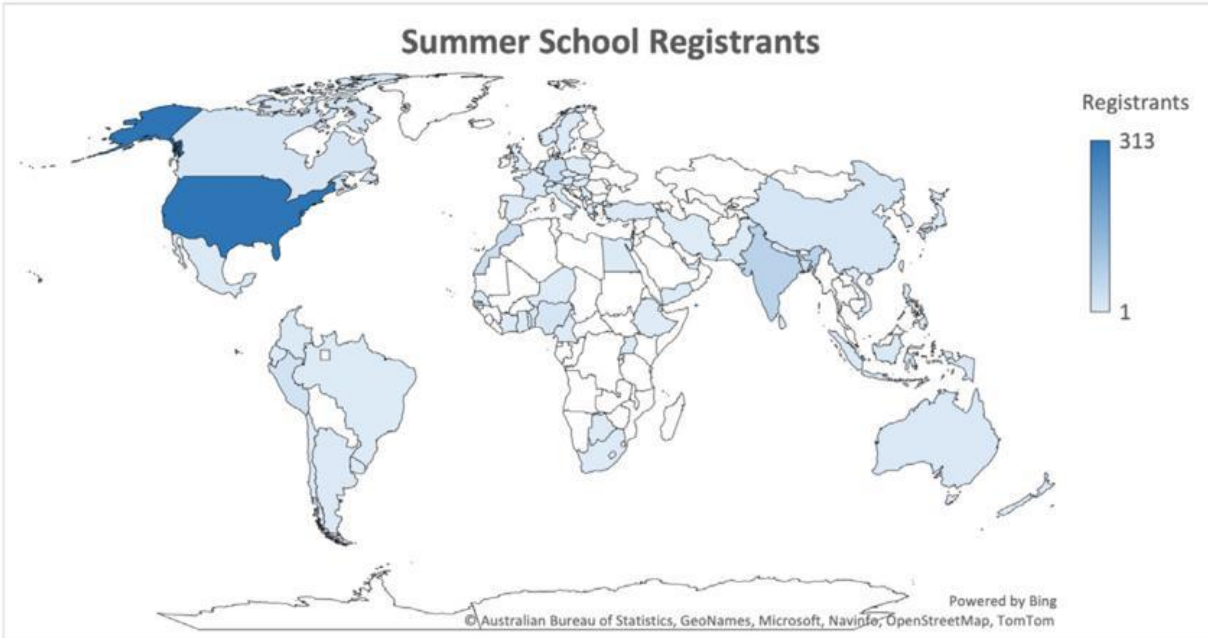

Figure: 677 participants from 63 countries attended the 2022 TAI4ES virtual summer school. This figure shows where the attendees came from with color indicating the number of participants from the different regions.

(POC: I Ebert-Uphoff, Schumacher, R. Chase, M. McGraw, and R. Lagerquist, CIRA; C. Slocum, NOAA; iebert@colostate.edu) Funding: NSF, CIRA.

Awards and Recognition

Reviewer recognition from AMS: J. Knaff received this recognition reward for reviewing 10 manuscripts for the American Meteorological Society. (POC: John Knaff, STAR, john.knaff@noaa.gov; Funding: PDRA)


THIS CERTIFICATE IS AWARDED TO

Dr. John Knaff

IN APPRECIATION FOR SERVING AS A REVIEWER FOR

Bulletin of the American Meteorological Society, Journal of Climate, Journal of the Atmospheric Sciences, Monthly Weather Review, and Weather and Forecasting

On behalf of the community of authors and readers served by AMS's scholarly publications, thank you for having reviewed:

10 manuscript(s) in 2022

Anthony J. Broccoli, AMS Publications Commissioner

Editors-in-Chief/Editorial Board Chair

Jeff Waldstreicher, Bulletin of the American Meteorological Society
Mingfang Ting and Darryn Waugh, Journal of Climate
Anne Smith, Journal of the Atmospheric Sciences
Ron McTaggart-Cowan, Monthly Weather Review
Gary Lackmann and Matt Bunkers, Weather and Forecasting

AMERICAN METEOROLOGICAL SOCIETY 1919

Media Interactions and Requests

Blog Posts and Social Media

Travel, Workshops, Conferences, and Meeting Reports

Training and Education activities

Satellite Book Club Presentation: K. Hilburn presented *GREMLIN: GOES Radar Estimation via Machine Learning to Inform NWP* at the TOWR-S Satellite Book Club Seminar Series. This presentation described development of GREMLIN, presented results using GREMLIN in numerical weather prediction, and discussed current work to implement GREMLIN in NOAA GeoCloud and make it available in AWIPS. (POC: K. Hilburn, CIRA, Kyle.Hilburn@colostate.edu; Funding: GOES-R).

CSU Guest Lecture: Bill Line (CoRP/RAMMB) gave a guest lecture titled, "Operational Applications of Satellite Data" for a Colorado State University, Department of Atmospheric Science graduate-level class. The presentation provided many examples of how GOES and JPSS satellite imagery and products are used in NWS operations forecast and warning decision-making, and in providing decision support services. (POC: B. Line, CoRP/RAMMB, bill.line@noaa.gov) Funding: PDRA

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

Other

Manuscript Reviewed: C. Slocum reviewed a manuscript submitted to Weather and Forecasting. (POC: Chris Slocum, STAR, Christopher.Slocum@noaa.gov; Funding: PDRA)

Manuscript Reviewed: John Knaff reviewed a manuscript submitted to the Journal of Climate (POC: John Knaff, STAR, john.knaff@noaa.gov; Funding: PDRA)