Weekly Report – May 3, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

Submitted by: Debra Baker & Maureen Cribb
Email: drb@umd.edu
Phone: 301-405-5397

Date of Submission: 3 May 2024

TRAINING AND EDUCATION

CISESS Participation at Maryland Day, 27 April 2024

It was a cool and cloudy Saturday, with the threat of rain, but that didn't stop CISESS scientists from joining in on the fun of Maryland Day on the campus of the University of Maryland. Maryland Day is the university's largest annual community outreach event. In the ESSIC section of the Earth Sciences tent, CISESS scientists engaged with the public, young and old, with interesting activities and plenty of informative handouts on everything from coral reefs from the Coral Reef Watch group to playing with a lab-built prototype microwave radiometer to learning about lightning and how to be safe in thunderstorms. Of particular interest to visitors was the virtual reality demonstration of real weather data, where they donned special headsets and "flew through" a hurricane. All in all, Maryland Day was a great opportunity for CISESS scientists to show off their research and hopefully inspire the next generation of scientists!

Photo credits: Kate Cooney, Maureen Cribb, Erick Geiger, Cazzy Medley

Figure: Photos of some of the CISESS scientists (and their interns) at Maryland Day. Top row: Erick Geiger; Daile Zhang, Joseph Patton, Christopher Smith; Matias Calderon (student intern), Hu "Tiger" Yang. Bottom row: Guangyang Fang, Ashmita Pyne (student intern); Jifu Yin, Ashmita Pyne, and visitors; Ashmita Pyne and young visitors.

PUBLICATIONS

A New Way of Enabling Reliable Uncertainty Propagation
Citation: Steckler, Stephen, Marko Orescanin, Scott W. Powell, Pedro Ortiz, and **Veljko Petković**, 2024: Scaling uncertainty quantification from patches to scenes through discontinuity-aware stitching. *IEEE Geosci. Remote Sens. Lett.* **21**, 1002305, https://doi.org/10.1109/LGRS.2024.3383749.

Summary: The application of machine-learning tools to, for example, predict geophysical fields has recently become popular. A geophysical field covering a large geographic area is typically created by combining small scenes to build the larger scene. However, there can be discontinuities in the final field, making it look uneven, because of the discontinuities that can arise along the edges of small scenes when they are "stitched" together. Machine-learning techniques have been developed to smooth things out in the final field. However, how the uncertainties that occur when combining the small scenes propagate during this smoothing has not yet been properly quantified. This needs to be addressed to ensure the successful application of these machine-learning tools to different scientific fields.

CISESS scientist Veljko Petković and his coauthors present a novel approach to enable reliable uncertainty propagation in a recent article published in the journal *IEEE Geosciences and Remote Sensing Letters.* It uses a Bayesian U-Net model to establish an uncertainty baseline then specialized aggregation techniques to create full scenes while preserving their inherent uncertainties. This approach provides useful insights into consistent geospatial uncertainty quantification, laying the foundation for probabilistic forecasting in safety-critical applications.

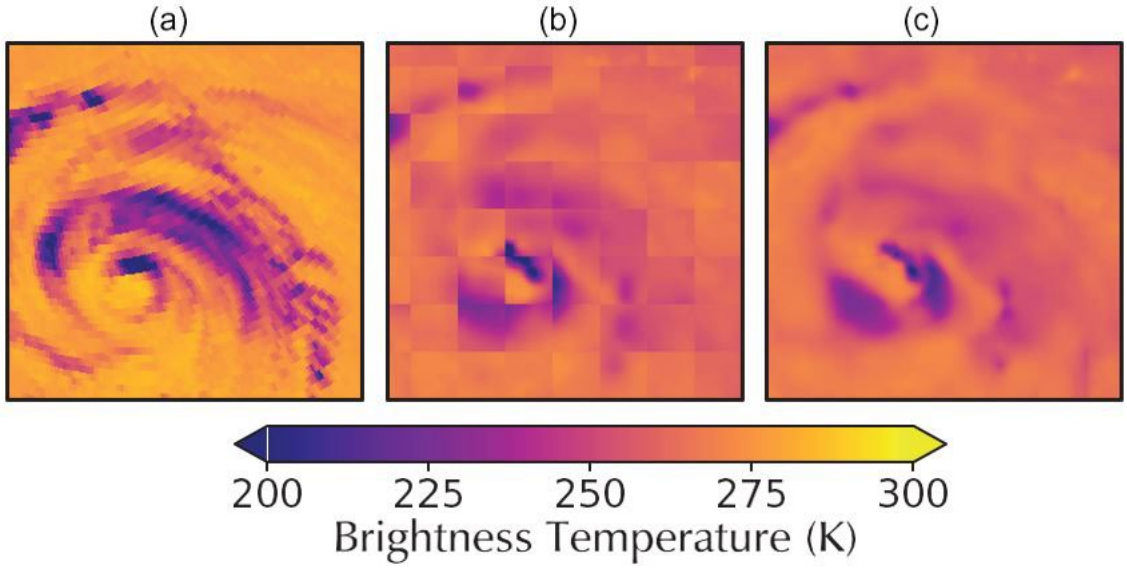

Figure: Hurricane Teddy: (a) Observed microwave-imager brightness temperatures at 0354 UTC 19 September 2020, and predicted brightness temperatures (b) before and (c) after the new approach is applied.

(Veljko Petković, CISESS, veljko@umd.edu; Funding: JSTAR GCOM, METOP-SG, HPCC)

(Maureen Cribb, CISESS, mcribb@umd.edu, Funding: Task I)