Weekly Report – May 6, 2022

Satellite Climate Studies Branch (SCSB)/CISESS

NOAA/NESDIS/STAR

Acting Branch Chief: John Knaff

Submitted by: John Knaff
Email: John.Knaff@noaa.gov
Phone: 970-491-8881

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Partnerships

NOAA's Academic Partnership with CISESS/University of Maryland Earth System Science Interdisciplinary Center (ESSIC) provided Outreach Opportunities at MD Day:

Maryland Day is the University of Maryland's largest community outreach event. As Maryland Day resumed in person this year, ESSIC returned with its tent on Science and Tech Way. Thirteen CISESS personnel joined the team of volunteers led by ESSIC Communications Coordinator Chrysandra (Cazzy) Medley. CISESS scientists and staff members who donated their time to the effort included Christopher Buchhaupt, Kate Cooney, Michael Evans, Guangyang Fang, Heather Mattern, William Miller, Alexey Mishonov, Isaac Moradi, Joseph Patton, Jingjing Peng, student intern Terrence Pierce, John Xun Yang, and Daile Zhang. Cazzy coordinated with federal partners at NOAA and NASA to get materials for distribution on diverse topics ranging from extreme weather and GOES-R series satellites to climate change and coral reefs.

Building Enthusiasm for Coral Reef Research:

The MD Day volunteers promoted coral reef work that NOAA does in conjunction with the University of Maryland under CISESS task leaders Jacqueline De La Cour (National Ocean Service) and Sarah O'Connor (NCEI Oceans). Caroline Donovan, the Communications Director at the NOAA Coral Reef Conservation Program, hand-delivered to ESSIC several boxes of materials, which were distributed by CISESS/ESSIC volunteers at MD Day. The figure below shows a sampling of the resources that were handed out to visitors. Among the most popular coral reef-related materials were copies of the NOAA National Coral Reef Monitoring Program Status Reports for the U. S. coral reef jurisdictions. Parents and educators were also excited by a children's booklet called "Discover Coral Reefs" and a leaflet titled "10 Ways to Protect Coral Reefs". There was special appreciation for educational resources that were available in English and Spanish. A few examples of visitors who benefited from this outreach effort include a

fourth grade teacher who picked up one of each booklet to share with her students and a girl scout leader preparing her troop for an event in Florida who was thrilled to have coral reef resources to share at an upcoming girl scout meeting.

Figure: (Left) CISESS scientist Christopher Buchhaupt and other volunteers answered visitors' earth system science questions and distributed various giveaways from the UMD Earth System Science Interdisciplinary Center at Maryland Day on Saturday, April 30, 2022. (Right) Educational coral reef materials were available including reports, booklets, and leaflets in addition to fun freebies, such as thermometer key chains, bookmarks, and stickers.

(Jacqueline De La Cour, jacqueline.shapo@noaa.gov, National Ocean Service; Sarah O'Connor, sarah.oconnor@noaa.gov, NCEI Oceans)

CISESS Lightning Group Exhibited Virtual Reality Program at 2022 Maryland Day:
The CISESS lightning group including Guangyang Fang, Joseph Patton, Terrence Pierce, and Daile Zhang volunteered at the UMD Maryland Day from 10:00am to 5:00pm on Apr. 30th, 2022. The group exhibited and demonstrated the NOAA satellite data virtual reality (VR) program, which

was developed by the research team led by NOAA scientist Scott Rudlosky. This VR program is an interactive and immersive "fly-through" of real weather data that allows users to visualize events like hurricane Dorian and an atmospheric river in a 3-D environment. The group also promoted lightning safety to the community. They distributed stickers and temporary tattoos with lightning safety slogans as well as answered questions about lightning safety that the community had. Maryland Day gathered thousands of kids and adults, making it one of the best showcase events in the city of College Park. The VR program was of great interest to kids.

Figure: The lightning group standing in front of the VR set, wearing the lightning safety hat with the NOAA lightning safety slogan "When thunder roars, go indoors" on it to promote lightning safety. Left to right: Terrence Pierce, Joseph Patton, Guangyang Fang, and Daile Zhang.

(Daile Zhang, dlzhang@umd.edu, GOES-R AWG, GOES-R PGRR, NOAA-NASA ROSES)

Figure: A booth featuring the NOAA satellite data VR Program was extremely popular at Maryland Day on April 30, 2022. This project aims to explore creative ways of using VR to analyze and visualize 3-D weather datasets from NOAA in an immersive environment. At this VR booth, the audience could wear the VR headsets to explore different weather datasets such as GDAS wind vector, GOES ABI radiance, and cloud top height in a 3-D environment. Most of the kids in the audience used VR for the first time in their lives, and they enjoyed themselves. Stickers about knowledge on severe weather such as lightning strikes and fliers about on-site summer internships were handed out. The VR headsets and controllers were cleaned with disinfecting wipes after each use and the disposable sanitary VR masks were also used for each person to fight against COVID.

(Guangyang Fang, STAR/CRPD/SCSB, gfang@umd.edu, GOES-R AWG & GOES-R PGRR)

People

Outstanding Employee Award:
CISESS Financial Director Heather Mattern was the recipient of the University of Maryland's College of Computer, Mathematical, and Natural Sciences (CMNS) 2022 Dean's Outstanding Employee Award, which was presented at the CMNS Academic Awards Festival on April 22nd. Heather was recognized for her outstanding work leading the pre- and post-award activities of the CISESS Business Office.

Figure: CISESS Financial Director Heather Mattern received the CMNS Dean's Outstanding Employee Award on April 22, 2022 (Photo credit: Debra Baker).

PUBLICATIONS

Innovative Algorithm to Characterize Striping of Microwave Humidity Sounder
Citation: *Yang, John X.; Yalei You, William Blackwell, Sidharth Misra and Rachael A. Kroodsma, 2022: Quantifying and characterizing striping of microwave humidity sounder with observation and simulation, IEEE Transactions on Geoscience and Remote Sensing,* ***60****, pp. 1-13, Art no. 5302413, doi: 10.1109/TGRS.2021.3132560*. **Important Conclusions and Impacts:** The research presented provides insights into quantifying striping of Microwave Humidity Sounder and understanding its characterization and cause. The algorithm can be applied to other radiometers. The methodology allows for quantifying in terms of the absolute magnitude and comparing striping among different radiometers in terms of relative ratio. In addition, the simulation model can be applied to investigations of error propagation in data assimilation, Numerical Weather Prediction modeling, and science products.

Summary: CISESS scientists John Xun Yang and Yalei You co-authored a publication in *IEEE Transactions of Geoscience and Remote Sensing* on the striping that has been observed in the MetOp-A Microwave Humidity Sounder (MHS). Striping (also referred to as stripes or striping

noise) is a distinctive radiometric feature found in many microwave radiometers characterized by sharp, non-periodic stripe patterns with large fluctuation both radiance data and high-level science products. This study addressed the challenges associated with accurate striping quantification and characterization and developed a set of novel algorithms for striping quantification, decomposition, characterization, and simulation. Their algorithm extracts striping from the warm-load and cold-space scenes that are relatively stable. The researchers broke down the striping into two parts of thermal and 1/ f noises, and quantified their absolute magnitude and relative ratio. 1/f noise is low frequency noise whose power is inversely proportional to the frequency. Major findings included a significant increase in striping at 157 GHz, which has more than quadrupled by October 2019 relative to its normal level. Regardless of the degradation, the ratio of thermal and 1/ f noises remained the same. A simulation reproduced all the characteristics of striping against observation. The results showed that 1/ f noise generates sharp, non-periodic stripes, while thermal noise also generates stripes but with smoother band features. The latter is due to the periodic calibration that has a chopping effect. The striping percentage, defined as the ratio of 1/ f to total noise, shows no dependence on the scene temperature. Striping is pronounced not only in 157 GHz but also in 89 and 190 GHz with the striping percentage over 50% while lower in 183 GHz of 20%. The results provided insights for quantifying and understanding striping. The new algorithm can be applied to other radiometers and can be used to simulate striping for evaluating its impact on data assimilation and science products.

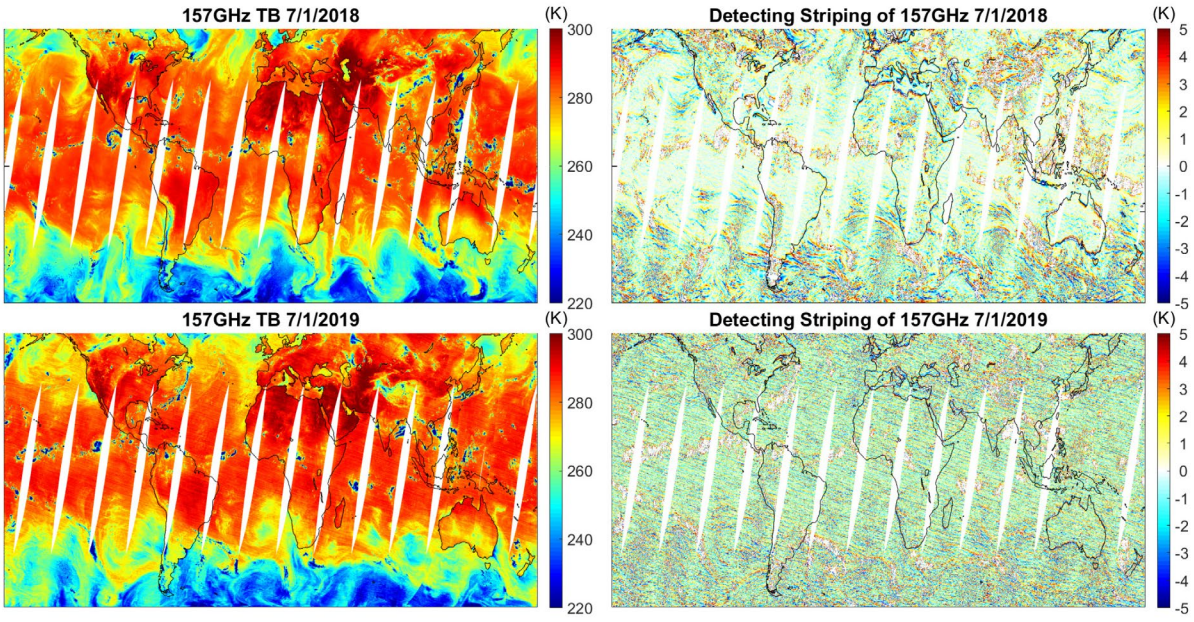

Figure: Striping at 157 GHz of MetOp-A MHS. Striping became remarkable on July 1, 2019 in comparison to one year earlier (lower right). Obvious stripes show up in a 10 K color bar range

with high-pass filter that removes the background variations (lower left). Striping is so significant that it can be perceived in the Earth scene map that has a T_B range of 80 K.