Weekly Report – October 27, 2023

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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

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TRAINING AND EDUCATION

CISESS Lightning Team Outreach Event at the 8th Spooky Science Expo

The CISESS lightning team Guangyang Fang, Joseph Patton, Daile Zhang, and two students Damian Joseph Figueroa, and Ashmita Pyne went to celebrate the 8th Spooky Science Expo in Alexandria, VA. This Is the first time CISESS/ESSIC scientists participate in this event. The team showed Leon the Lion Lightning Safety game. Kids who played the game and learned the lightning safety rules could get candy and stickers including the special Leon the Lion sticker. In addition, the team also exhibited the virtual reality application of lightning safety that the students developed.

Figure - Top: The lightning Team at the Spooky Science Expo. Left to right: Damian Joseph Figueroa, Guangyang Fang, Ashmita Pyne, Daile Zhang, and Joseph Patton; bottom left: the very popular virtual reality landscape with lightning; bottom middle: high resolution videos of lightning; and bottom right: playing the lightning safety game. (Daile Zhang, CISESS, dlzhang@umd.edu, Funding: GOES-R AWG, GOES-R PGRR, NOAA ROSES and CISESS Seed Grant.)

Assessment of Lightning Tools and Training Needs at NWS Weather Prediction Center

On Monday, October 23rd, CISESS Scientist Joseph Patton visited the Weather Prediction Center (WPC) office of the National Weather Service (NWS) to better understand their operations and what products and techniques are involved in composing their forecasts. Of particular interest was their incorporation of both satellite- and ground-based lightning detection networks in their workstations. Patton shadowed forecaster Peter Mullinax, who was working on the winter weather forecasting desk that day. They walked through the routine WPC operations for several products that they issue, from the probabilistic Winter Weather Severity Index to the low pressure center tracks. With a mid-week winter storm approaching, it was very informative to witness an active day from the perspective of their forecasters. Key messages concerning this winter storm were issued by Peter to the public via social media and the NWS website. While shadowing this winter weather shift, Peter and I discussed the access that WPC has in general to lightning data in their workstations. Their NAWIPS workstations have the ability to display the Geostationary Lightning Mapper (GLM) flash points, but that software does not take advantage of the unique capabilities of the GLM instruments to display the full spatial extent of lightning flashes through gridded products. The forecasters at WPC would sometimes use external websites to view real-time and recent GLM gridded products, such as the College of DuPage website (weather.cod.edu). While lightning does not usually play a primary role in the forecasting and collaboration on the winter weather desk, it likely could have more a pronounced impact on other operations at WPC, such as with the Excessive Rainfall Outlook and Met Watch desks. Peter agreed that having improved access to satellite- and ground-based lightning products in their AWIPS stations could be very beneficial to their operations. Patton will discuss the possibility of expanding their access to these lightning products with the Total Operational Weather Readiness – Satellite (TOWR-S) team within the NWS. *(Joseph Patton, CISESS, jpatton4@umd.edu; Funding: GOES-R AWG & GOES-R PGRR)*

Peter Mullinax, NWS/WPC

PUBLICATIONS

New User Manual for SAWC - Software to Compare Winds from Multiple Platforms

Citation**: Lukens, Katherine E**.; Kevin Garrett, **Kayo Ide**, David Santek, Brett Hoover, David Huber, **Ross N. Hoffman** and **Hui Liu**, 2023: *System for Analysis of Wind Collocations (SAWC): A Novel Archive and Collocation Software Application for the Intercomparison of Winds from Multiple Observing Platforms–User Manual, Version 1.2.0*. STAR, 59 pp., https://www.star.nesdis.noaa.gov/data/sawc/User_Manual/SAWC_User_Manual_v1.2.0.pdf.

Summary: This User Manual provides important information for wind observation users. It gives an overview of the System for Analysis of Wind Collocations (SAWC), including the wind

observation archive, its datasets, and variables available. It also provides step-by-step instructions on the installation and operation of the collocation application developed for use in conjunction with the archived wind datasets.

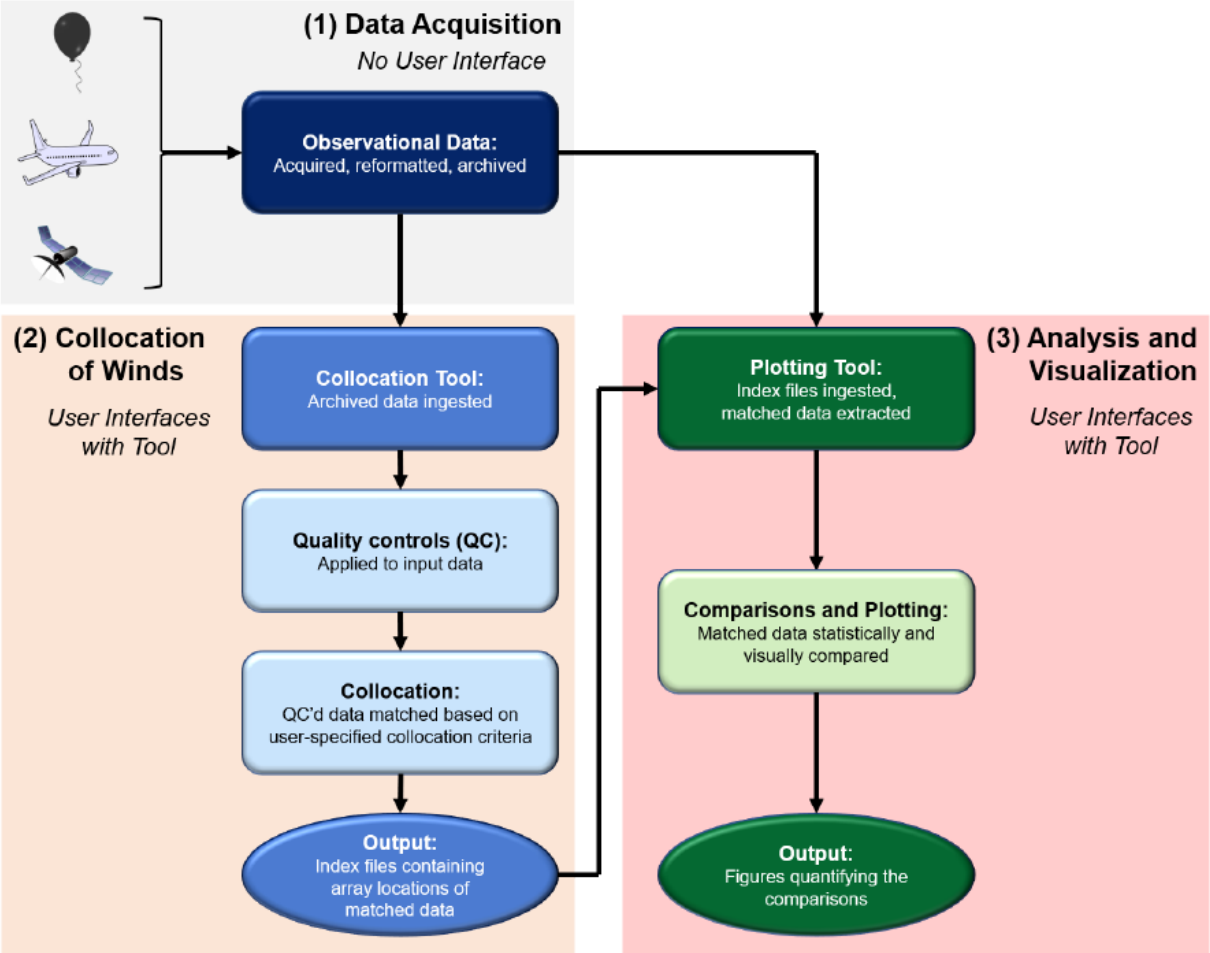

***Figure**: Flow chart illustrating SAWC's end-to-end process.*
(Katherine Lukens, CISESS, katherine.lukens@noaa.gov; Funding: SAE [formerly OSAAP] & EMC)

EFSO Applied to CFSv2 shows Forecast Improvements for SST, Salinity & T2 Forecasts
Citation**: Chu-Chun Chang,** Tse-Chun Chen**, Eugenia Kalnay, Cheng Da,** and Safa Mote, 2023: Estimating ocean observation impacts on coupled atmosphere-ocean models using Ensemble Forecast Sensitivity to Observation (EFSO). *Geophys. Res. Lett.*, **50**(20), e2023GL103154, https://doi.org/10.1029/2023GL103154.
Summary: CISESS Scientist Eugenia Kalnay and Tse-Chun Chen (formerly CISESS) developed the Ensemble Forecast Sensitivity to Observation (EFSO), a technique that can efficiently identify the beneficial/detrimental impacts of every observation in ensemble-based data assimilation.

With the help of two CISESS Scientists Chu-Chun Chang and Cheng Da, Kalnay applied EFSO for the first time to a coupled atmosphere-ocean model, the NCEP Climate Forecast System, version 2 (CFSv2), which was modified to use local ensemble transform Kalman filter (LETKF) data assimilation by co-author Safa Mote. The 24-hr CFSv2 forecasts of sea temperature, salinity, and 2-m air temperature were improved by 1.5%, 0.8%, and 0.4%, respectively, after removing detrimental ocean observations detected by EFSO. The improvements in the CFSv2 forecast can last for at least 5 days for the ocean and 3 days for the low-level atmosphere (see figure below).

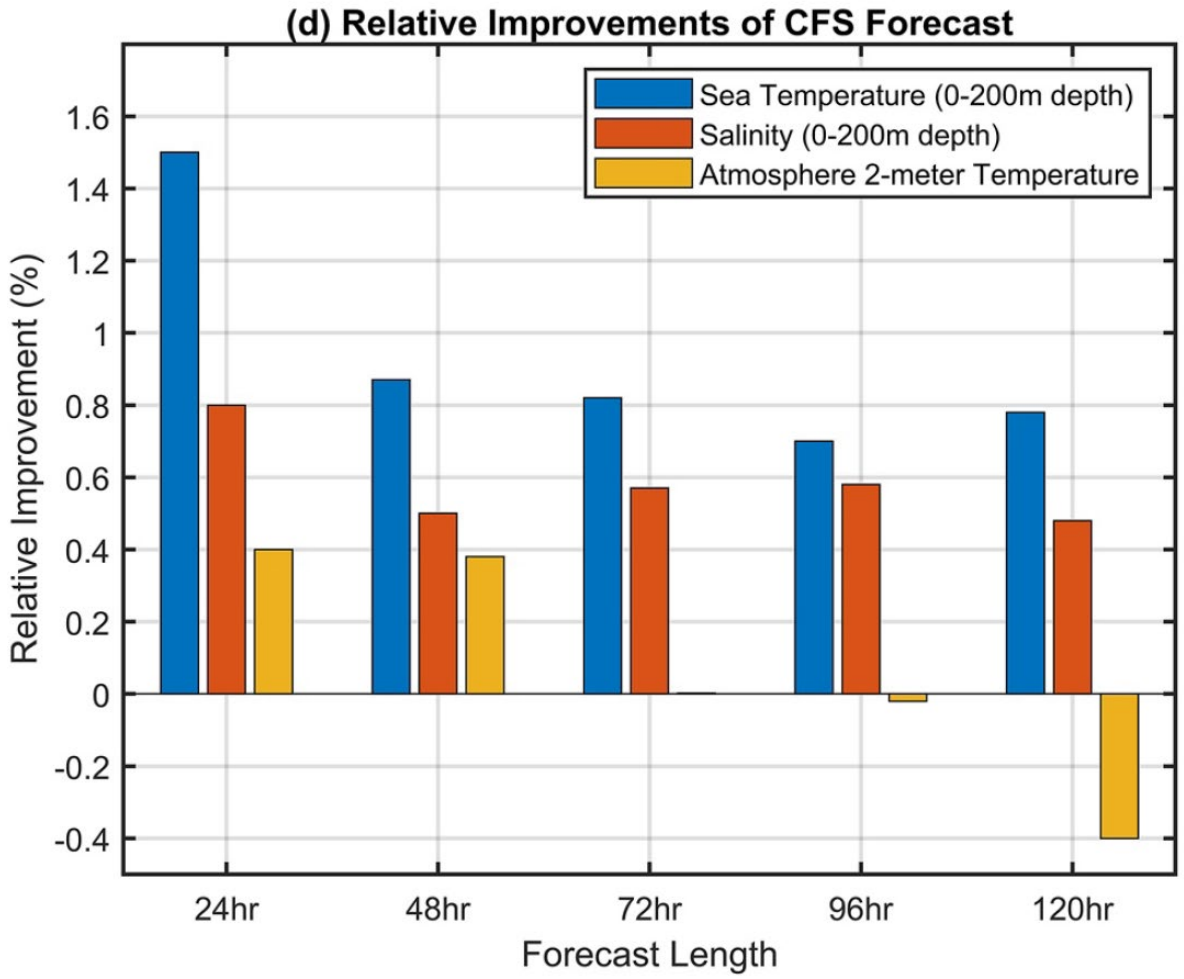

***Figure**: The monthly-mean relative forecast improvement (%) of the ocean temperature (blue), salinity (red) in the mixed layer, and the atmosphere temperature at 2m (yellow) forecasts. (Cheng Da, CISESS, cda@umd.edu, Funding; JPSS PGRR)*