Weekly Report – September 16, 2022

Satellite Climate Studies Branch (SCSB)/CISESS
NOAA/NESDIS/STAR
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HIGHLIGHTS FOR NESDIS LEADERSHIP

Unique & Significant Reports

Revisiting the Three Lightning Fatalities Event near the D.C. White House on August 4th: CISESS Scientist Daile Zhang and her team of student interns analyzed the lightning event that recently caused three local deaths. On August 4, 2022, there was a severe storm with very active lightning flashes sweeping over the greater D.C. area, causing three lightning fatalities and one person in critical conditions after lightning struck near the D.C. White House. According to Washington Post: "Four people — two men and two women — were critically hurt in the strike just before 7 p.m. in the center of the park, in a grove of trees about 100 feet southeast of the statue of Andrew Jackson …. Three people, including a Wisconsin couple celebrating their 56th wedding anniversary, have died after a lightning strike Thursday evening in Lafayette Square, just north of the White House, D.C. police said Friday." About 100 total lightning discharges were reported by the National Lightning Detection Network (NLDN) within ~3 km of the statue during the 10 minutes before the deadly strike (see Figure). The deadly flash was a cloud-to-ground flash with six strokes. The strongest was the second stroke which had an estimated peak current of -25.5 kiloamps. Both Geostationary Lightning Mapper (GLM) and Mid-Atlantic Lightning Mapping Array (MALMA) detected the flash. MALMA detected five strokes but missed the 1st stroke, which was reported having a peak current of -16.9 kiloamps. The GLM detected three strokes.

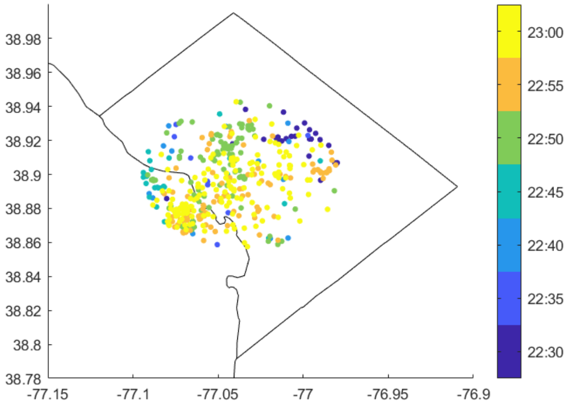


Figure: Total lightning within 3 km from the White House Statue reported by NLDN in the greater D.C. area during 22:30 – 23:00 LT

There are also two videos of satellite data for this event from GLM and ABI, created by CISESS Scientist Joseph Patton:

- https://youtu.be/namOlUgaQrU .
- https://youtu.be/FRhpl2lzUH8 .

This tragedy emphasizes the importance of NWS early warnings and the need for personal lightning safety education. *(Daile Zhang, CISESS, dlzhang@umd.edu; Funding: GOES-R AWG, GOES-R PGRR, NOAA ROSES and CISESS Seed Grant.)*

TRAVEL AND MEETING REPORTS

2022 GLM Science Meeting: A hybrid GLM Science Meeting was held in Huntsville, AL on September 13-15. Roughly 70 online participants joined 40 in person attendees to make this our most successful meeting yet. Over 3 days, 54 presenters described their recent work on GLM calibration and validation, operational use, and science and applications.

(Scott Rudlosky, SCSB, scott.rudlosky@noaa.gov; Funding: PDRA)

PUBLICATIONS

Wild on Stratospheric Ozone in *State of the Climate 2021*

Citation**:** Weber, M.; W. Steinbrecht, C. Arosio, R. van der A, S. M. Frith, J. Anderson, L. M. Ciasto, M. Coldewey-Egbers, S. Davis, D. Degenstein, V. E. Fioletov, L. Froidevaux, D. Hubert, D. Loyola, C. Roth, A. Rozanov, V. Sofieva, K. Tourpali, R. Wang, and **J. D. Wild**, 2022: Stratoshperic Ozone [in "State of the Climate in 2021"]. *Bull. Amer. Meteor. Soc.*, **103** (8), S90–S92, https://doi.org/10.1175/BAMS-D-22-0092.1. In 2021, total ozone shows above-average total ozone levels in the outer tropical/subtropical region. However, Southern Hemisphere extratropical lower stratospheric ozone was close to the lowest values seen in the last decade but higher than in 2020. The lower values are related to the above-average sizes of the Antarctic ozone holes in 2020 and 2021.

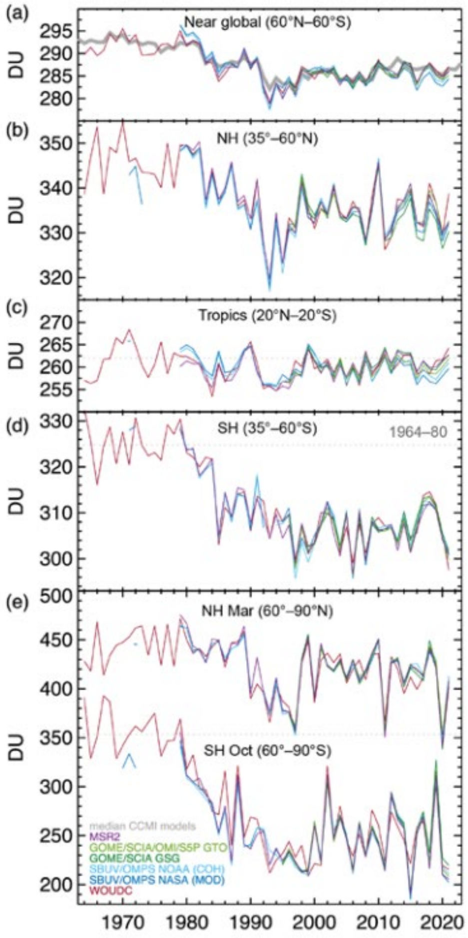


Figure: Time series of annual mean total column ozone (DU) for (a) global, (b) Northern Hemisphere (NH), (c) the Tropics, (d) Southern Hemisphere (SH), and (e) NH and SH in the month that polar ozone losses are usually the largest.
(Jeannette Wild, CISESS, jeannette.wild@noaa.gov; Funding: JSTAR)

Farrel on Sea Ice in *State of the Climate 2021*

Citation**:** Meier, W. N., D. Perovich, **S. Farrell,** C. Haas, S. Hendricks, A. Petty, M. Webster, D. Divine, S. Gerland, L. Kaleschke, R. Ricker, A. Steer, X. Tian-Kunze, M. Tschudi, and K. Wood, 2022: Sea ice [in "State of the Climate in 2021"]. *Bull. Amer. Meteor. Soc.*, **103** (8), S270–S273, https://doi.org/10.1175/BAMS-D-22-0082.1. Overall, 2021 continued to demonstrate the profound changes underway in the Arctic sea *i*ce system.. Arctic-wide, the September 2021 total sea ice extent was 4.92 × 106 km^2, which was 1.49 × 106 km^2 (23.2%) lower than the 1981–2010 average and the 12th-lowest September extent on record. The September trend from 1979 through 2021 is −12.7% decade^{-1} and like all other months, is statistically significant. The 15 lowest September extents in the satellite record have all occurred in the last 15 years (2007–21). Using sea ice thickness as a proxy for ice age, the amount of multiyear ice remaining in the Arctic was the second lowest on record (above only 2012). In the 37 years since ice-age records began in 1985, the Arctic has changed from a region dominated by multiyear sea ice to one where first-year sea ice prevails.

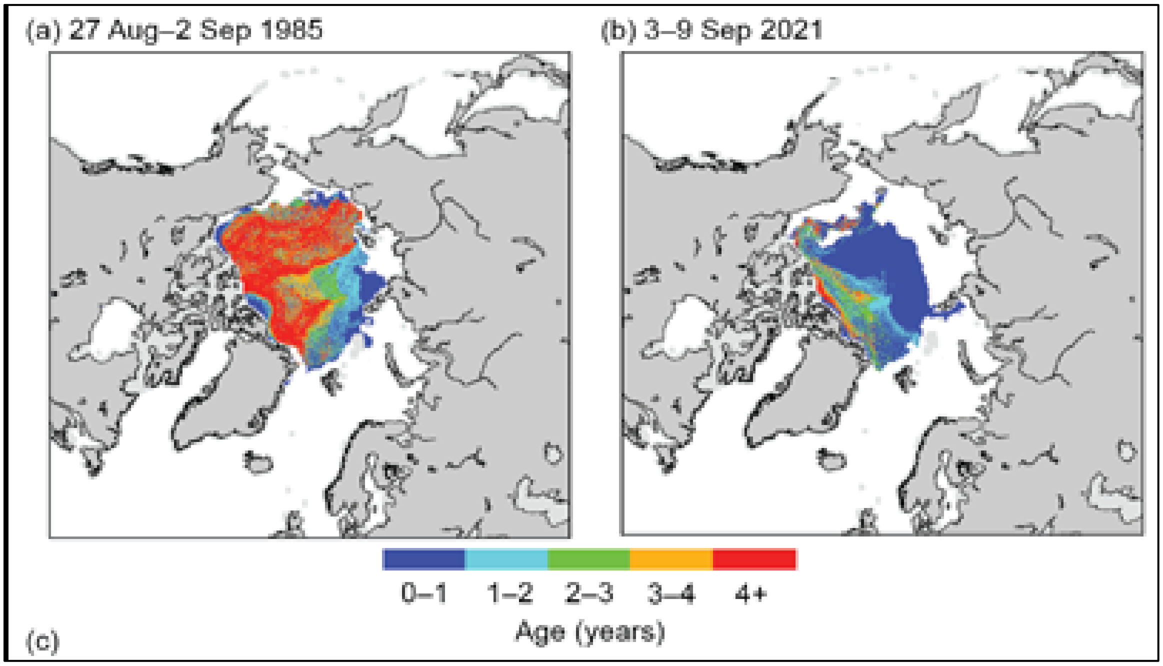
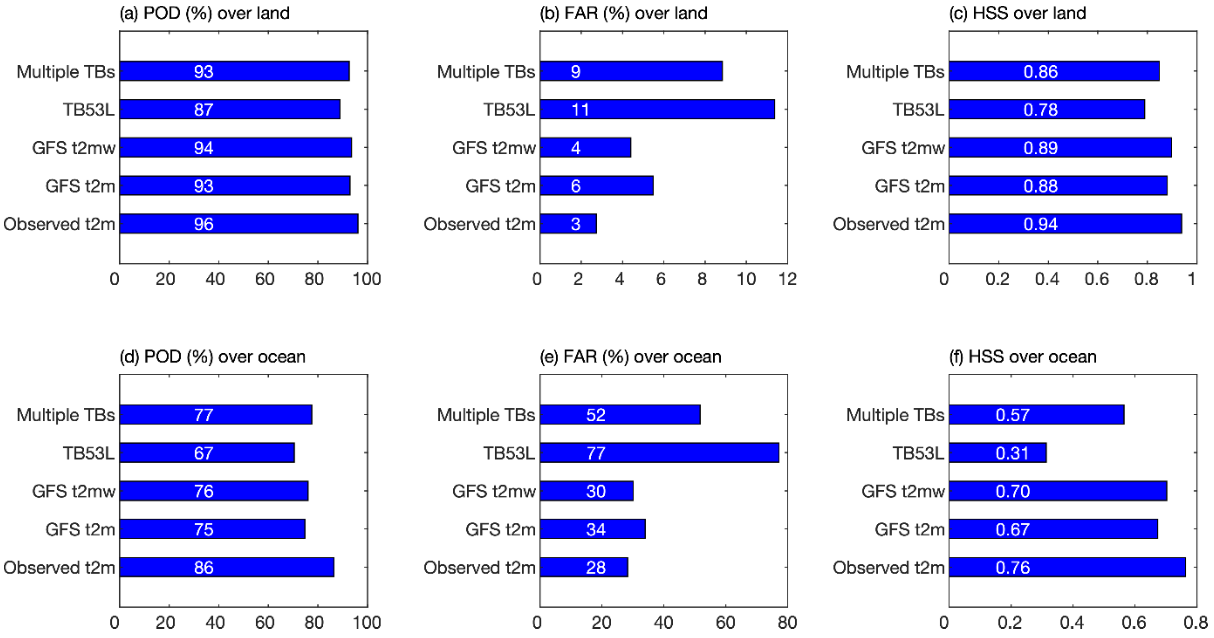


Figure: Sea ice age coverage map for the week before minimum total extent (when age values are incremented to one year older) in (a) 1985 and (b) 2021.
(Sinéad Farrell, CISESS, sinead.farrell@noaa.gov, Funding: Ocean Remote Sensing)

Precipitation Phase Determination Using ATMS Brightness Temperatures:
Citation: **You, Yalei**, **Huan Meng, Jun Dong, John Xun Yang**, Sarah Ringerud and **Yongzhen Fan**, 2022: Precipitation phase determination by brightness temperatures from ATMS. *IEEE Geosci. Remote Sens. Lett.*, **19,** 1006005, https://dx.doi.org/10.1109/LGRS.2022.3196386. Modeled temperature parameters are often utilized to determine precipitation phase (liquid, solid, or mixed) in satellite precipitation algorithms. This study demonstrates that it is possible to determine phase solely relying on satellite observations. Logistic regression models were trained using brightness temperatures (TBs) from Advanced Technology Microwave Sounder (ATMS) aboard S-NPP and ground observations. Evaluation study shows that the TB-based phase discrimination has comparable performance as model-based results over land. However, the satellite algorithm has a strong dependence on scan angle over ocean. While its skill score is slightly higher than model-based result at nadir, its performance deteriorates rapidly towards the edge of scan.



First row: Probability of Detection (POD), False Alarm Ratio (FAR), and Heidke Skill Score (HSS) from five types of predictor variables over land, including observed 2-m temperature (observed t2m), 2-m temperature from GFS (GFS t2m), 2-m wet bulb temperature from GFS (GFS t2mw), limb-corrected TB at 53.6 GHz (TB53L), and multiple TB channels (Multiple TBs); Second row: same as the first row except over ocean.
(Huan Meng, SCSB, huan.meng@noaa.gov, Funding: PDRA)