Weekly Report – April 8, 2022

Satellite Climate Studies Branch (SCSB)/CISESS

NOAA/NESDIS/STAR

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HIGHLIGHTS FOR NESDIS LEADERSHIP

Use-Inspired Science

NOAA/NCEI Blended Sea Surface Winds Product for Resolving Hurricane Winds: CISESS Scientist Korak Saha and collaborator Huai-min Zhang (NESDIS/NCEI/OGSSD/OSB/Surface) have been improving the NOAA/NCEI Blended Seawinds (NBS) product. NBS blends several satellite estimates of surface wind providing more accurate and gap-free observational data for model calibration and quality control. NOAA has been producing a global gridded 0.25-degree and 6-hourly sea surface winds product that has wide applications in marine transportation, marine ecosystem and fisheries, offshore winds, weather and ocean forecasts, among others. The new version of NBS v2.0 contains a long-term sea surface wind product from 1987 to present that can easily delineate high storm winds starting 2012 and with a one-day latency. An examination for multiple cases of tropical cyclones and Hurricanes (see examples in figures below) has been carried out. And,comparisons with the IBTrACS data shows that NBS v2.0 performs better than the other existing globally gridded gap-free blended and reanalysis products. The NBS product is generated by blending observations from multiple sources (satellites), including scatterometers and microwave radiometers/imagers. However, these sensors do not provide accurate observations of extreme hurricane winds as their signals saturate (level off) in very high winds or degrade in the presence of rain. Recent advancement in satellite wind retrievals revealed that a new L-band (1.42 GHz) instrument on Soil Moisture Active Passive (SMAP) satellite, which started in 2012, can provide accurate hurricane winds up to 65 m/s (145 MPH) without being affected by rain. Similarly, the AMSR2 All-Weather channel (~6.9 GHz), provides rich with information about wind speeds in and around storms. Inclusion of both SMAP and AMSR2 inputs dramatically improve NBS v2.0 providing a long-term ocean surface wind product that can easily delineate high winds especially in and around hurricanes and other extreme oceanic storms.

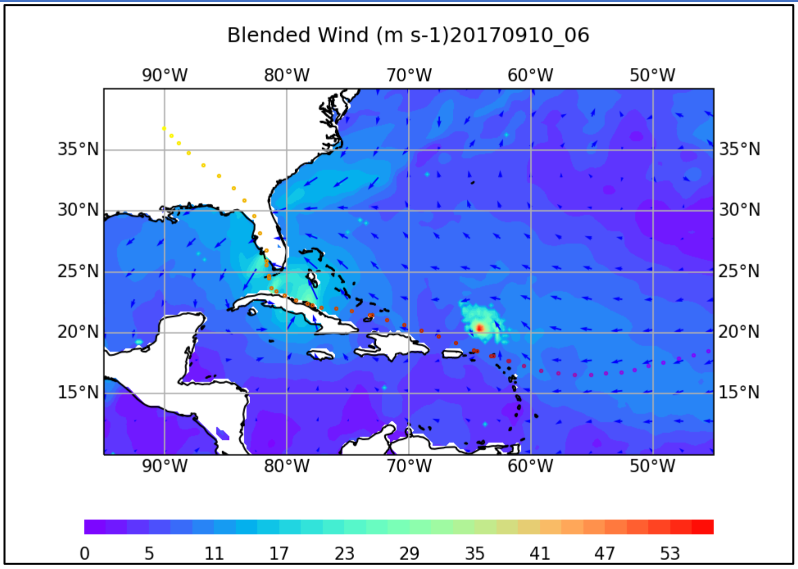

Figure: Image showing Hurricane Irma (near landfall in SW Florida), which was followed by Hurricane Jose, of the Gulf of Mexico in 2017. The track for Hurricane Irma only is shown here.

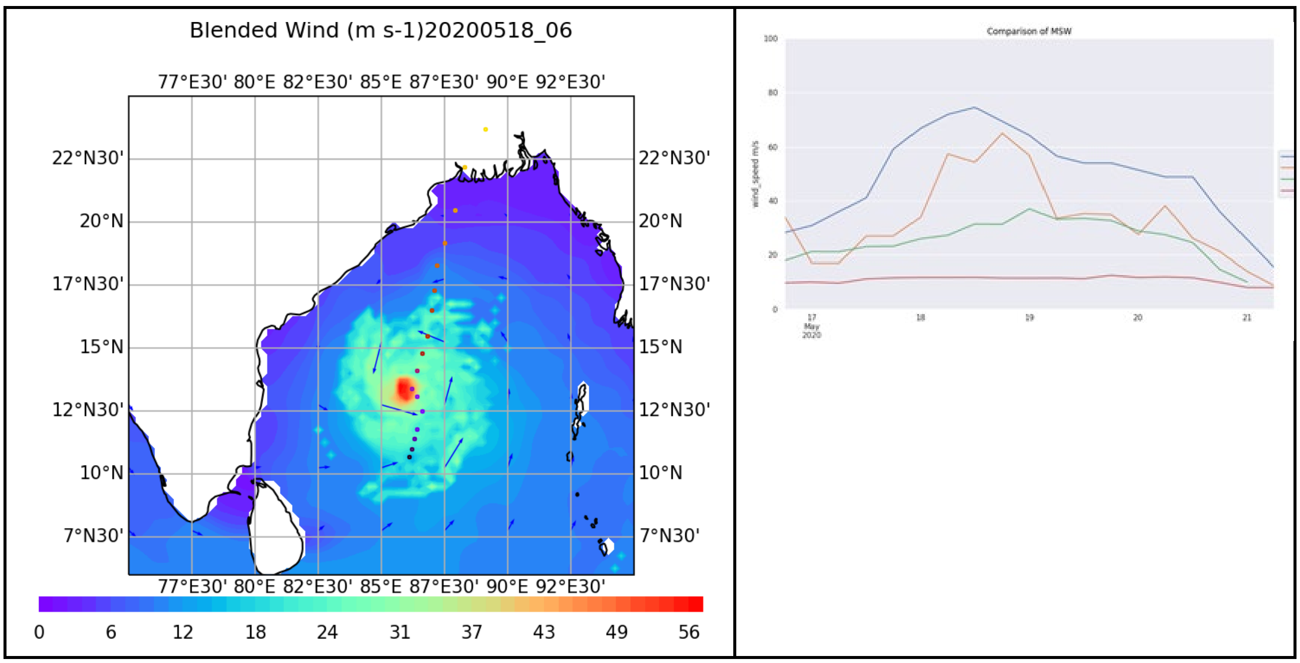

Figure: High winds associated with Super Cyclone Amphan are resolved very well in the NBS v2.0 in comparison to the other blended and reanalysis products.

Saha, K., and H-M. Zhang, 2022: Hurricane and Typhoon Storm Wind Resolving NOAA/NCEI Blended Sea Surface Wind (NBS) Product (in review).

(Korak Saha, korak.saha@noaa.gov, Funding: NCEI Oceans)

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People

Innovation Impact Case Award: The University of Minnesota Office of the Vice President for Research has recognized CISESS Scientist Melissa Kenney with an Honorable Mention in the inaugural Innovation Impact Case Award for her project "New Visualizations Improve the Understandability of Climate Outlooks Used by Millions of People." The purpose of the Innovation Impact Case Award is to recognize research that has led to significant impact outside of academia and has made a meaningful difference in our communities. The work will be highlighted online at https://research.umn.edu/funding-awards/innovation-impact-case-award) the week of April 18th as an example of the kind of research that solves problems and challenges and that has potential for great impact going forward.

(Melissa Kenney, makenney@umn.edu, Funding: CPC)

Summary Items

Date and Name of Meeting/Event/Significant Publications *Details Below **

- 08/08-12 AMS 25th Conf. on Sat. Meteor., Oceanog. and Climat. (Madison, WI), Tom Ford ***N***
- 10/24-28 GEO Blue Planet Symposium (Ghana), Emily Smail ***P***

**** N: New, U: Updated, P: In previous weekly report***

Detailed Article

Newly Submitted

CISESS Scientists Tom Smith (NESDIS/STAR/CoRP/SCSB), James Carton, Ligang Chen, and Garrett Graham (NC-CISESS) and coauthors submitted an abstract this week to the 25th American Meteorological Society (AMS) Satellite Meteorology, Oceanography and Climatology (SatMOC) Conference on 8–12 August 2022 at Madison, Wisconsin. The abstract is titled "Improvements in operational daily long-record satellite-based global SST analysis". The presentation is intended to discuss some recent improvements in the operational long-record global Sea Surface Temperature (SST) analysis.

Smith, T.; B. Huang, J. Carton, M. Steele, G. Graham, L. Chen, H.-M. Zhang, and X. Yin, 2022: Improvements in operational daily long-record satellite-based global SST analysis, AMS SatMOC, August 8-12, 2022, Madison, WI (submitted).

(Tom Smith, tom.smith@noaa.gov, Funding:STAR)

Previously Submitted

CISESS Scientist Emily Smail, who works with STAR/SOCD, is the Executive Director of the Group on Earth Observations (GEO) Blue Planet Initiative. They are planning their 5th Symposium for the end of October. It will be held in Accra, Ghana, and will also allow virtual participation. For information, see https://symposium.geoblueplanet.org/.

(Emily Smail, CISESS & STAR/SOCD, emily.smail@noaa.gov , Funding: Ocean Remote Sensing)

PUBLICATIONS

Bulletin of the American Meteorological Society

Predicting Flood Property Insurance Claims over CONUS, Fusing Big Earth Observation Data

Citation**:**
Yang, Qing; Xinyi Shen, Feifei Yang, Emmanouil N. Anagnostou, Kang He, Chongxun Mo, Hojjat Seyyedi, Albert J. Kettner, and **Qingyuan Zhang**, Predicting Flood Property Insurance Claims over CONUS, Fusing Big Earth Observation Data, *Bulletin of the American Meteorological Society,* **103**(3), E791 – E809, https://doi.org/10.1175/BAMS-D-21-0082.1. **Summary:** As climate change threatens to increase flood frequency and severity, predicting flood insurance claims are critical information needed to ensure flood resilience in our communities. To address flood resiliency, CISESS Scientist Qingyuan Zhang and coauthors published a paper on an innovative method to predict the number of property insurance claims. The work makes use of the flood property Insurance Claims model (iClaim) which fuses together data from the National Flood Insurance Program and data from multiple sources of hydrometeorological variables. Validation tests of the iClaim model show that it yields acceptable results in assessing flood impact and thus improving public resiliency.

Summary:

Abstract: Each year throughout the contiguous United States (CONUS), flood hazards cause damage amounting to billions of dollars in homeowner insurance claims. As climate change threatens to raise the frequency and severity of flooding in vulnerable areas, the ability to predict the number of property insurance claims resulting from flood events becomes increasingly important to flood resilience. Based on random forest, we develop a flood property Insurance Claims model (iClaim) by fusing records from the National Flood Insurance Program (NFIP), including building locations, topography, basin morphometry, and land cover, with data from multiple sources of hydrometeorological variables, including flood extent, precipitation, and operational river-stage and oceanic water-level measurements. The model utilizes two

steps—damage level classification and claim number regression—and subsampling strategies designed accordingly to reduce overfitting and underfitting caused by the flood claim samples, which are unevenly distributed and widely ranged. We evaluate the model using 446,446 grid samples identified from 589 flood events occurring from 2016 to 2019 over CONUS, overlapping 258,159 claims out of a total of 287,439 NFIP records of the same period. Our rigorous validation yields acceptable performance at the grid/event, county/event, and event accumulative level, with R^2 *over 0.5, 0.9, and 0.95, respectively. We conclude that the iClaim model can be used in many application scenarios, including assessing flood impact and improving flood resilience.*

As shown in the figure below, most claims are concentrated in coastal areas (a) and result from event during the time period from August to October (b).

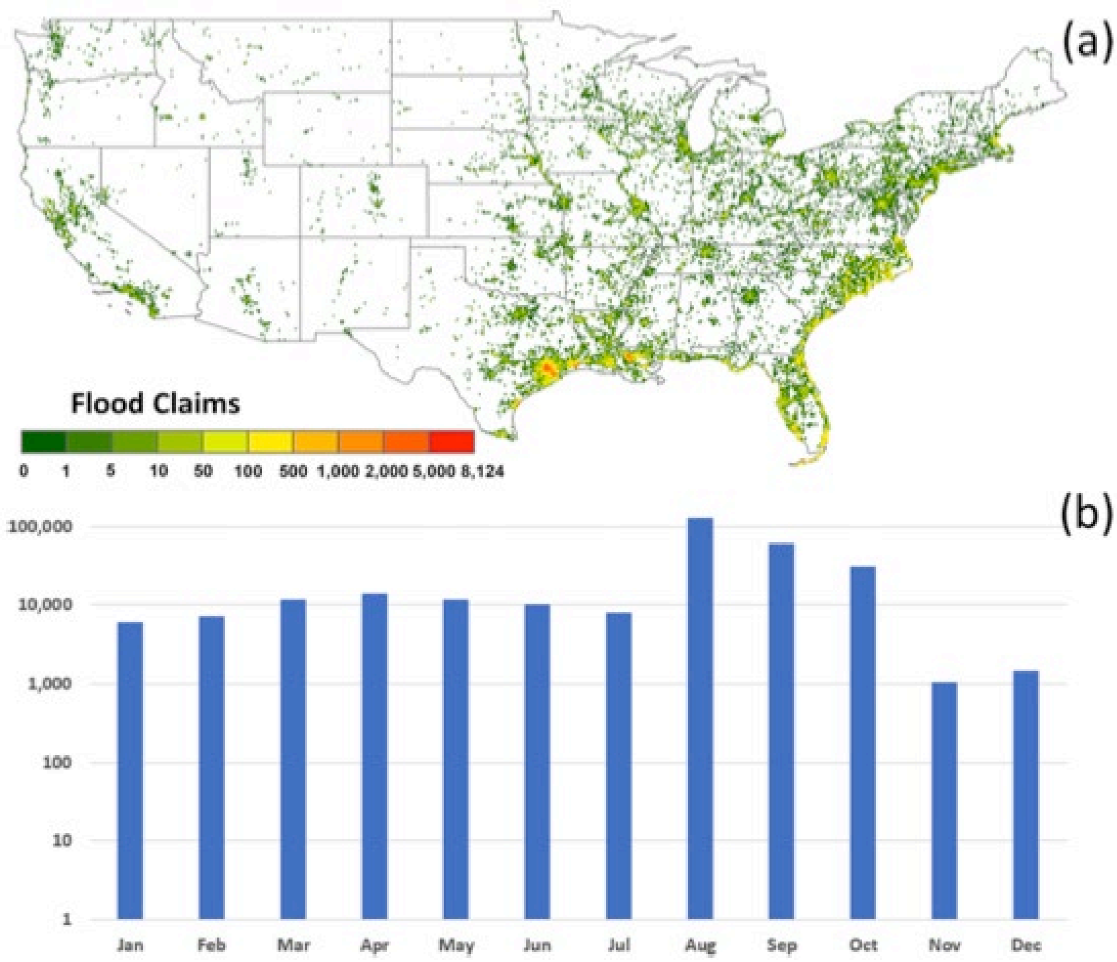

Figure: The (a) spatial and (b) temporal distribution of flood insurance claims from January 2016 to August 2019.

(Qingyuan Zhang, qyzhang@umd.edu, Funding: JSTAR)