## Weekly Report – February 23, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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**PUBLICATIONS**

**A Decade of Slowing Thermohaline Circulation in the North Atlantic Ocean**

Citation**: Mishonov**, **Alexey;** Dan Seidov, and James Reagan, 2024b: Revisiting the Multidecadal Variability of North Atlantic Ocean Circulation and Climate. *Front. Mar. Sci.*, **11**, 1345426, https://dx.doi.org/10.3389/fmars.2024.1345426.

Summary: In an article published yesterday (22 February 2024), CISESS Scientist Alexey Mishonov and two other NCEI Scientists, Dan Seidov and James Reagan, document for the first time a significant slowing of the thermohaline circulation in the North Atlantic Ocean. The Atlantic Meridional Overturning Circulation (AMOC), which includes the Gulf Stream, potentially slowing or stopping was considered a potential "tipping point" for climate change in the early IPCC Reports but more recent IPCC Reports have not highlighted this issue. Mishonov and his colleagues, using data from the most recent update to the NOAA World Ocean Atlas, found that the AMOC remained robust from 1955 to 1994. However, they found a slowdown of the thermohaline geostrophic circulation everywhere in the North Atlantic during the most recent decade. This slowdown was linked to changes in the geometry and strength of the Gulf Stream system. They do not know if this trend will persist, accelerate or diminish in the next decade but scenarios involving the slowdown or collapse of AMOC cannot be completely dismissed.

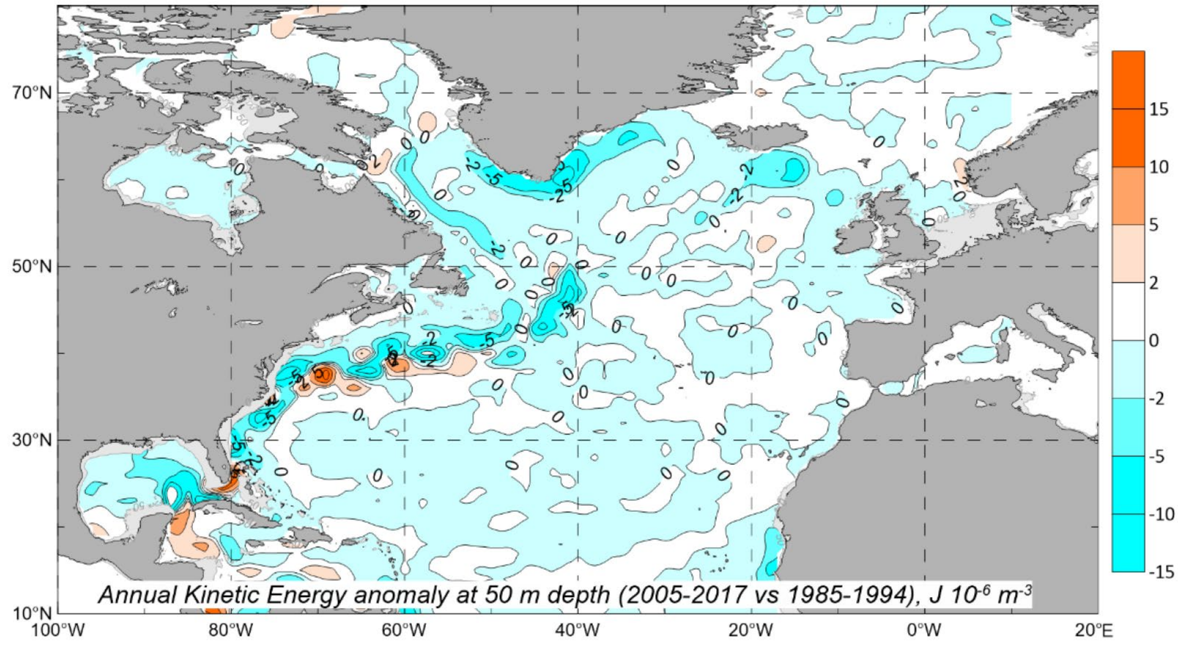
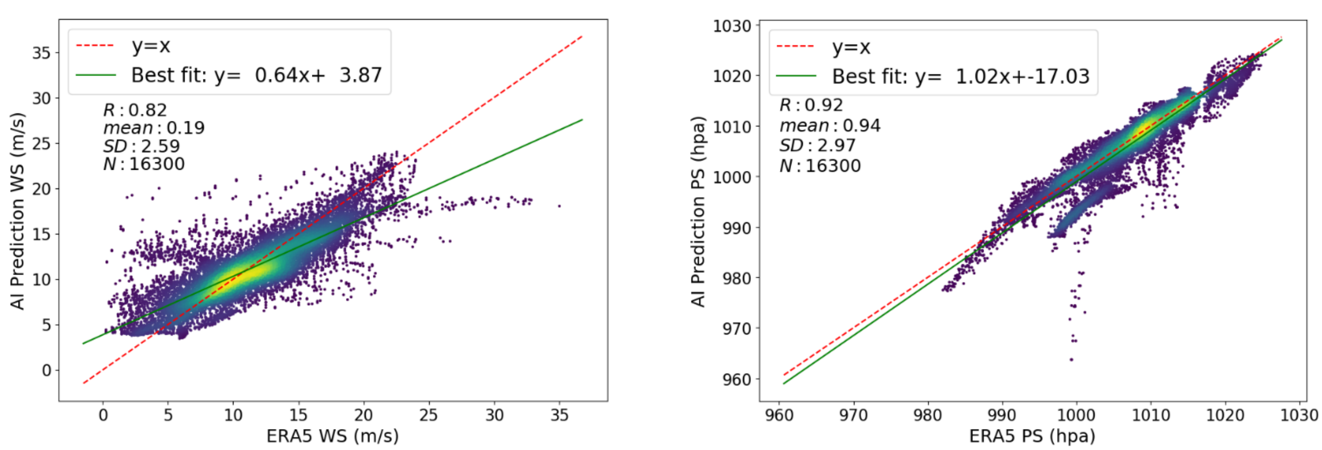


*Figure*: *Differences of annual specific kinetic energy for the North Atlantic Ocean at 50 m depth between 2005-2017 and 1985-1994. Blue colors indicate slowing and orange indicates accelerating flows. (Alexey Mishonov, CISESS, alexey.mishonov@noaa.gov, Funding: NCEI)*

**ATMS Tropical Cyclone Intensity Estimation using Machine Learning**

Citation**: Liang, Zichao**; **Yong-Keun Lee**, **Christopher Grassotti**, Lin Lin and Quanhua Liu, 2024: Machine Learning-based estimation of tropical cyclone intensity from Advanced Technology Microwave Sounder using a U-Net algorithm. *Remote Sens.*, **16**(1), 77, https://doi.org/10.3390/rs16010077 [in special issue on *Advances in Remote Sensing and Atmospheric Optics*].

Summary: The latest *Remote Sensing* published a CISESS study about tropical cyclone intensity estimation using a U-Net algorithm. The first author is the undergraduate student who did the CISESS summer internship with NOAA Microwave Integrated Retrieval System (MiRS) team in 2023. Two of the authors are CISESS scientists and two are NOAA scientists. A U-Net algorithm was used to retrieve surface pressure and wind speed over the ocean within tropical cyclones (TCs) and their neighboring areas using NOAA-20 Advanced Technology Microwave Sounder (ATMS) reprocessed Sensor Data Record (SDR) brightness temperatures (TBs) and geolocation information. For TC locations, International Best Track Archive for Climate Stewardship (IBTrACS) data have been used over the North Atlantic Ocean and West Pacific Ocean between 2018 and 2021. The European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalysis v5 (ERA5) surface pressure and wind speed were employed as reference labels. Preliminary results demonstrated that the visualizations for wind speed and pressure matched the prediction and ERA5 location. The residual biases and standard deviations between the predicted and reference labels were about 0.15 m/s and 1.95 m/s, respectively, for wind speed and 0.48 hPa and 2.67 hPa, respectively, for surface pressure, after applying cloud screening for each ATMS pixel. This indicates that the U-Net model is effective for surface wind speed and surface pressure estimates over general ocean conditions.




(**a**) (**b**)

*Figure: Scatterplots of U-Net prediction vs. ERA5 for (a) surface wind speed (m/s) and (b) surface pressure (hPa) across all 27 test samples. The pixels included in this analysis were selected from within a 350 km radius circle centered on the TC. The data distribution changes from dense to sparse as the color shifts from yellow to blue. (R: Pearson correlation coefficients; SD: standard deviation; N: number of selected pixels). (Yong-Keun Lee, CISESS, yong-keun.lee@noaa.gov, Funding: JSTAR, JPSS PGRR, DACS, METOP-SG)*