

Weekly Report – May 22, 2026
Cooperative Institute for Satellite Earth System Studies (CISESS)
NOAA/NESDIS/STAR

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Date of Submission: 22 May 2026

HIGHLIGHTS FOR NESDIS LEADERSHIP

People

The Heat is On

The summer of 2023 had record-breaking ocean temperatures, leading to marine heat waves, Canadian forest fires, and droughts. The paper "[Record High Sea Surface Temperatures in 2023](#)", led by NOAA/NCEI-NC author Boyin Huang and including CISESS coauthors James Carton and Ligang Chen, is among the top downloaded papers published in the journal *Geophysical Research Letters* in 2024. This paper and the related "[Remarkable 2023 North Atlantic Ocean Warming](#)" published in the same journal by Carton explains the roles of El Niño in contributing to the record-breaking ocean temperatures. Another El Niño is expected this summer, and ocean temperatures are already at record levels.



(James Carton, CISESS, carton@umd.edu, Funding: Jason; Ligang Chen, CISESS, lchen2@umd.edu; Funding: Jason)

PUBLICATIONS

Making the National Air Quality Forecast Capability More Capable

Citation: Farzad, Kiarash, Yang Zhang, **Daniel Tong**, Siqi Ma, Youhua Tang, Jianping Huang, **Patrick C. Campbell**, Havala O. T. Pye, Benjamin Murphy, Fanglin Yang, Barry Baker, Daiwen Kang, Bill Hutzell, and Golam Sarwar, 2026: Application and evaluation of a NOAA GFS-driven air quality model using CMAQv5.4 and high-resolution emissions: FIREX-AQ 2019. *J. Geophys. Res. Atmos.*, **131**, e2025JD045668, <https://doi.org/10.1029/2025JD045668>.

Summary: The National Air Quality Forecast Capability (NAQFC) is a joint initiative by the National Weather Service and the Environmental Protection Agency (EPA) that offers operational air quality forecast guidance for the continental United States (CONUS). These include forecasts for ozone, fine particulate matter (PM_{2.5}), smoke, and dust. These forecasts generated by NAQFC are only as good as how well its models and emissions data represent the real world. Updating the Community Multiscale Air Quality (CMAQ) modeling system, i.e., the chemistry core, within NAQFC from version 5.3.1 to 5.4 and using the Neighborhood Emission Mapping Operation, a high-resolution 1-km anthropogenic emission dataset, CISESS Scientists

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Daniel Tong and Patrick Campbell and coauthors assess changes in NAQFC’s prediction skills in their paper published in the *Journal of Geophysical Research: Atmospheres*. They use EPA’s Air Quality System (AQS) ground observations and NOAA/NASA Fire Influence on Regional to Global Environments and Air Quality aircraft observations for evaluating the updated-model performance on the CONUS scale and during significant fire events. Many simulations later with different model configurations, the authors conclude that overall, current NAQFC predictions can be improved by using high-resolution anthropogenic emissions, adjustments to wildfire emissions, and newer versions of CMAQ. They also point out limitations of their study that will be addressed in future work, such as uncertainties of emission inputs and wildfire emissions, and the propagation uncertainties of the meteorological model to the chemical model.

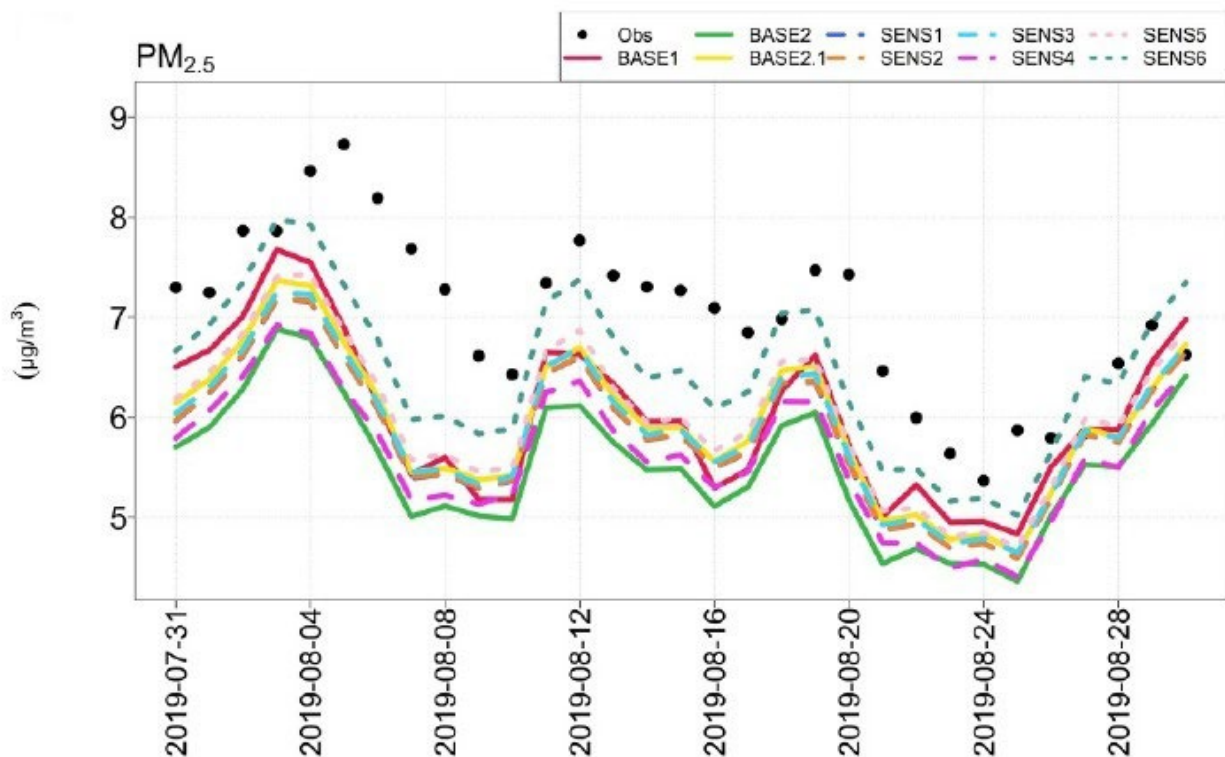


Figure: Time series (August 2019) of daily average observed and model-predicted concentrations over the CONUS for total PM_{2.5}. Different colored lines represent simulations with different model configurations, and black dots show AQS observations. This is an example of one of the experiments conducted to assess model performance, showing that in this case, PM_{2.5} was always underestimated due to underestimations in each PM_{2.5} component considered depending on the model configuration (not shown here; see Fig. 2 in the paper).

(Daniel Tong, CISESS, daniel.tong@noaa.gov, Funding: ARL; Patrick Campbell, CISESS, patrick.c.campbell@noaa.gov, Funding: ARL)

Examining the North Atlantic Circulation

Citation: Seidov, Dan, **Alexey Mishonov**, and James Reagan, 2026: Resilience of the North Atlantic circulation on decadal timescales. *Climate*, **14**(5), 99, <https://doi.org/10.3390/cli14050099>.

Summary: Many modeling studies have suggested that the Atlantic Meridional Overturning Circulation (AMOC), a crucial ocean current system with a strong influence on climate, will slow down or even collapse in the near future, with catastrophic implications for humankind. But some observational studies are not so doom and gloom. The Subpolar North Atlantic (SPNA) is an important region associated with the AMOC, with a cold subpolar front as its main feature. The location and orientation of this front, represented by the 10 °C isotherm at the 50-m depth, is linked to the strength of the AMOC. In their paper published in the journal *Climate*, CISESS Scientist Alexey Mishonov and NOAA colleagues analyze how the temperature and salinity fields over the past 60+ years have changed in the SPNA as well as if there are any changes in the region’s upper-ocean currents. The authors find that the thermohaline, i.e., temperature and salinity, patterns of the upper ocean layers in the SPNA have remained resilient for over 70 years and especially over the past three decades. Although they find that there is a deceleration of the AMOC, it is not dramatic, with average velocities in the upper layers decreasing by less than 10–15% over 30 years. Also, the subpolar front migration over 70 years reached a maximum of only 3° of latitude. Although they cannot offer a definitive picture of the future of the AMOC, their general conclusion is that even though there is some slowing down of the AMOC, the entire North Atlantic circulation appears stable, holding up to the ongoing sea surface changes in this region.

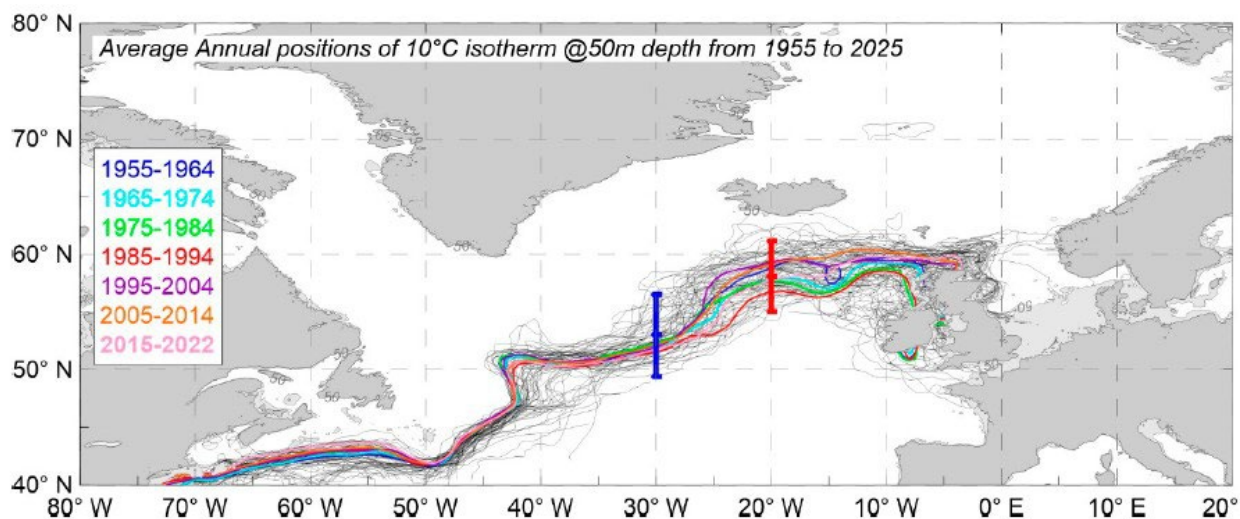


Figure: Annual positions of 10 °C isotherms at the 50-m depth from 1955 to 2025, based on observational data from the World Ocean Database. The decadal-averaged positions of these isotherms for the seven decades from 1955 to 2022 are shown as bold-colored lines. The two

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sections across the 10 °C spaghetti at 30°W (blue) and 20°W (red) show the locations where the standard deviation of the individual annual 10 °C isotherm positions was calculated.

(Alexey Mishonov, CISESS, alexey.mishonov@noaa.gov, Funding: NCEI)

(Maureen Cribb, CISESS, mcribb@umd.edu, Funding: CISESS Task I)