**SUBCOMITTEE ON ENVIRONMENT
HEARING CHARTER**

"Winning in Weather: U.S. Competitiveness in Forecasting and Modeling"

**Wednesday, March 6, 2024
10:00 a.m.
2318 Rayburn House Office Building**

Purpose

The purpose of this hearing is to assess the United States' leadership in weather forecasting and modeling. The hearing will discuss the impacts of the Weather Act of 2017 and the Weather Act Reauthorization of 2023 in bolstering U.S. competitiveness in the global weather community. This hearing will also discuss the coordination and collaboration of government agencies, the private sector, and academia to implement programs that advance new technologies related to data assimilation and modeling.

Witnesses
- **The Honorable Dr. Neil Jacobs,** Acting NOAA Administrator, 2019-2021
- **Dr. Kevin Petty,** CEO, Aeris LLC
- **Dr. Scott Weaver,** CEO, CLIMET Consulting

Overarching Questions
- What is the current state of the U.S. weather enterprise on a global scale? How does our data assimilation and modeling match up with international counterparts?
- How can we effectively separate climate and weather modeling and data sets to best communicate short- and long-term predictions?
- Is current interagency collaboration producing results when it comes to weather modeling and transitioning new products from research to operations?
- How can weather data be better specialized to meet industry specific needs like forecasting products for the private industry, emergency managers, and the meteorological community?
- How can the U.S. maintain the security of weather enterprise infrastructure from hostile adversaries?

Background
This hearing will examine the sustainability and accuracy of federally-provided weather information as the committee looks at next steps after reauthorizing the Weather Research and Forecasting Innovation Act of 2017. This conversation will include insight on where U.S. capabilities stand compared to that of counterparts around the world; national security risks that may be encountered if U.S. capabilities are lacking; and how the National Oceanic and Atmospheric Administration (NOAA) collaborates with other agencies and the private sector.

International Competition
The United States' global weather model is officially known as the Global Forecast System (GFS). It is created and operated by the U.S. National Weather Service to run four times a day and can make predictions up to 16 days in the future. The computing power behind GFS grew tenfold from 2015 to 2020, with the model able to process eight quadrillion calculations per second. Yet, the European model is still more computationally powerful and generally considered the superior all-around model.[1]

The European model is officially known as the European Center for Medium-Range Weather Forecasts (ECMWF). It was created through a partnership between 34 different nations and makes predictions for up to 10 days out. ECMWF is widely considered more computationally powerful because of the math and physics underpinning it and the supercomputer power it runs on. ECMWF's superiority was headlined in 2012 when it accurately predicted Hurricane Sandy would make a hard turn into the northeast coast of the U.S. before the American model did.[2]

Recently, China has placed an emphasis on utilizing artificial intelligence to increase the accuracy and speed of their weather models. The FuXi-Subseasonal model was developed by scientists from the Shanghai Academy of Artificial Intelligence for Science, Fudan University, and China's National Climate Center. According to the development team, it has a thousand-fold increase in operational speed, higher forecasting accuracy, and longer forecasting period than existing international models.[3]

Weather Predictors, Networks, and Technologies
Within the federal research enterprise, there should be a distinct difference and separation between weather modeling and climate modeling. Meteorologists analyze current data from a variety of sources to prepare and issue forecasts of approaching weather patterns in the short-term.[4] Climatologists focus on long-term climate trends affecting a certain population's food production, energy usage, species conservation, and public health.[5] While the end products of

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[1] Matthew Cappucci and Jason Samenow, *So, what exactly are the European and American weather models?*, THE WASHINGTON POST (Nov. 22, 2019), https://www.washingtonpost.com/weather/2019/11/22/so-what-exactly-are-european-american-weather-models/.

[2] *Ibid*.

[3] Zhao Yusha, *China's AI weather forecasting model front-runner worldwide*, GLOBAL TIMES (Jan. 11, 2024), https://www.globaltimes.cn/page/202401/1305205.shtml.

[4] National Weather Service, *Careers in Meteorology,* https://www.weather.gov/careers/meteorology#:~:text=What%20is%20a%20Meteorologist%3F,studies%2C%20or%20forecasts%20the%20weather.

[5] Mizzell, Hope, *Climatologist,* South Carolina Department of Natural Resources, https://www.dnr.sc.gov/education/pdf/Climatologist.pdf

both research areas are meant to protect the public and property, the timescale related to data collection and packaging into a meaningful product requires distinct research expertise and focus areas.

One tool that the public uses for weather information is Weather Data Receivers. These are low-cost satellite receiving systems that get data and information directly from federal weather satellites like the NOAA Geostationary Operational Environment Satellite (GOES) and the European Space Agency's Meteosat satellites (EUMETSAT). Weather Data Receivers are frequently used by independent meteorologists, agribusiness firms, small airports or flying clubs, marine vessels, and small TV stations.[6] Farmers and ranchers also use these receivers to make planting and crop management decisions based on rainfall totals, storm predictions, wind speed, freeze predictions, and other risk factors that have the potential to affect crop yield outcomes.[7]

Another public tool is the National Mesonet Program (NMP), which serves as a "network of networks" to deliver critical information to improve weather predictions and warnings to ensure a weather-ready nation. The NMP is the central repository for real-time collection and dissemination of non-federal surface, boundary layer, and tropospheric atmospheric weather observations in the U.S. It is made up of diverse public-private partnerships and acts as a resource to state and local agencies, businesses, researchers, and policymakers. The NMP's 35,000 stations/platforms significantly improve weather prediction, severe weather warnings, and emergency response for all regions of the country.[8]

Of particular interest to the committee is the role of the Interagency Council for Advancing Meteorological Services (ICAMS), which was first established through the Weather Act of 2017. ICAMS is co-chaired by the Director of the Office of Science and Technology Policy (OSTP) and the Under Secretary of Commerce for Oceans and Atmosphere, the latter of whom is also the Federal Coordinator for Meteorology. ICAMS is the formal mechanism by which all relevant federal departments and agencies coordinate implementation of policy and practices to ensure U.S. global leadership in the meteorological services enterprise.

The Interagency Meteorological Coordination Office provides administrative and logistical support to and operates under guidance from ICAMS. The work of ICAMS is organized under four primary committees:

- Services
- Observational Systems
- Cyber Facilities and Infrastructure
- Research and Innovation[9]

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[6] NASA Spinoff, *Weather Data Receiver (1982),* https://spinoff.nasa.gov/node/9204

[7] Hannan, Joe, *Personal Weather Station for Specialty Crop Management,* Iowa State University Extension and Outreach (2020), https://www.extension.iastate.edu/smallfarms/personal-weather-station-specialty-crop-management

[8] National Mesonet, *The National Mesonet Program,* https://nationalmesonet.us/

[9] *ICAMS*. ICAMS Organization. (n.d.). https://www.icams-portal.gov/organization.html

<u>*Legislative History*</u>
The Weather Research and Forecasting Innovation Act of 2017 (Public Law 115-25), known simply as the Weather Act, was signed into law in April 2017, capping a bipartisan, bicameral legislative effort that began in 2013 in the House Science Committee.[10] It was widely viewed as the first comprehensive weather authorization since the National Oceanic and Atmospheric Administration Authorization Act of 1992.[11]

The main goals of the Weather Act were to improve NOAA's weather research through investments in observational, computing, and modeling capabilities; to support improvement in weather forecasting and prediction of high impact weather events; and to expand commercial opportunities for the provision of weather data. Many sections of the bill were inspired by recommendations from reports authored by experts in the U.S. weather enterprise, including a National Academy of Sciences report published in 2012 titled, *Weather Services for the Nation: Becoming Second to None*[12] and a National Academy of Public Administration report published in 2013 titled, *Forecast for the Future: Assuring the Capacity of the National Weather Service*.[13]

Recognizing the immediate and impactful advances in the accuracy and timeliness of weather forecasting that the Weather Act prompted, the National Integrated Drought Information System (NIDIS) Reauthorization Act of 2018 (Public Law 115-423) was signed into law just two years later in January 2019.[14] The bipartisan NIDIS Reauthorization Act extended authorizations and improved several key programs from the Weather Act. Some of the programs, such as the agriculture weather provisions and NOAA's Office of Oceanic and Atmospheric Research, were extended with gradual increases in authorization of appropriations until FY2023. Other provisions, like NOAA Computing Resources, were simply updated with a revised focus based on stakeholder and community feedback since the signing of the Weather Act.

Reauthorizing the Weather Act is an opportunity to modernize U.S. weather policy and better serve American communities. At a hearing on March 23, 2023, titled "Reauthorizing the Weather Act: Data and Innovation for Predictions," the committee heard from private companies in the U.S. weather industry that can provide observations and data to NOAA and other federal agencies. This hearing aims to hear the perspectives of people and groups who use that data.

On November 8th, 2023, the Weather Act Reauthorization (H.R. 6093) passed the committee unanimously. The committee expects the bill to be considered on the Floor by the end of March 2024.

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[10] P.L. 115-25
[11] P.L. 102-567
[12] National Research Council, *Weather Services for the Nation: Becoming Second to None*, THE NATIONAL ACADEMIES PRESS (2012), https://doi.org/10.17226/13429.
[13] National Academy of Public Administration, *Forecast for the Future: Assuring the Capacity of the National Weather Service*, NAPA (2013), https://www.weather.gov/media/ooe/ForecastfortheFuture-AssuringtheCapacityoftheNationalWeatherService.pdf.
[14] P.L. 115-423