Navy researchers seek to improve weather prediction for global operations

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ONR-developed weather models and tools aid Navy forecasters and meteorologists around the world

ARLINGTON, Va.—With the Atlantic hurricane season officially beginning this month, the Office of Naval Research (ONR) is pursuing a number of projects to help Navy forecasters and meteorologists around the world predict storms better.

"Weather is one of the most significant factors affecting naval operations at sea," said Chief of Naval Research Rear Adm. Matthew Klunder. "ONR-funded research in weather prediction is improving the Navy's forecasting capability and accuracy for any location around the world where our Sailors and Marines are conducting missions."

ONR's efforts in funding ocean research are yielding enhanced weather and ocean prediction models—highlighted in a new video [1]—that help Navy leaders understand how to route ships around the globe to avoid storms, reduce fuel consumption, avoid Arctic ice flows and promote safety at sea.

At the Fleet Weather Center in Norfolk, Va., Navy meteorologists depend on ONR-developed weather models and tools to provide timely, comprehensive and tactically-relevant products and services to support Fleet training and operations. "We use real-time sensing data, observations from ships and combine that with modeling outputs to try and get as far ahead of the bad weather as possible," said Commander Adam Newton, Operations Officer. "This information improves safety at sea and can give the Fleet a real warfighting advantage."

While the Navy forecasters focus on supporting Fleet operations around the world, ONR often partners with the National Oceanic and Atmospheric Administration (NOAA) because the same data and weather models that Navy forecasters use also help NOAA to provide accurate weather prediction and storm warnings across the country.

"There is a concerted effort to link various atmospheric and oceanic models together to attain more accurate weather forecasts," said Dan Eleuterio, an ONR program officer. Eleuterio is working on a new computer model called the Tropical Cyclone Coupled Ocean/Atmospheric Mesoscale Prediction System, or TC-COAMPS, which allows scientists to forecast storms' track and strength in real time at high resolution. It was the first dynamic model to demonstrate better skill than statistical approaches at NOAA's National Hurricane Center, and is one of several Navy and NOAA models being evaluated by the National Weather Service's Hurricane Forecast Improvement Program.

"Up until now, predicting the intensity of storms was done with statistical-dynamical models," said Eleuterio. "What that means is that forecasters would look at several decades of observed data and they would simply say that if a storm is in this place this season, it is most likely going to get stronger or weaker or change. It wasn't an actual prediction, and TC-COAMPS will change that as a next-generation weather prediction model."

ONR researchers work with underwater autonomous vehicles, ocean gliders and other sensors to collect information about how much the ocean environment drives global weather patterns. That data helps scientists improve mathematical equations for computer models that predict weather, ocean, sea, and even Arctic ice conditions.

The Navy has a long history of conducting missions in the Arctic for research and military purposes, and in 2009 published the Navy Arctic Roadmap to help ensure naval readiness and capability and promote maritime security in the Arctic region. Developed by the Navy's Task Force Climate Change, the plan includes increasing operational experience, promoting cooperative partnerships and improving environmental understanding.

"The Arctic ice flows are retreating, and that has strategic implications for our country and naval operations in that region of the world as sea lanes open for shipping," said Rear Adm. David Titley, director of the Navy's Task Force Climate Change. "ONR research is helping us understand the Arctic environment, which helps us predict conditions and design future Navy ships better suited for that tough mission."

Tracking the sea ice cover is the responsibility of the National Ice Center (NIC), a multi-agency organization operated by the Navy, NOAA and the United States Coast Guard in Suitland, Md. "Weather modeling is really key to better understanding and forecasting of changing ice conditions in the Arctic," said Pablo Clemente-Colón, NIC's chief scientist.

In the future, ONR researchers hope to combine multiple weather prediction models to create a comprehensive coupled global model that will greatly extend prediction capability, accuracy and our understanding of the world's environment.

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