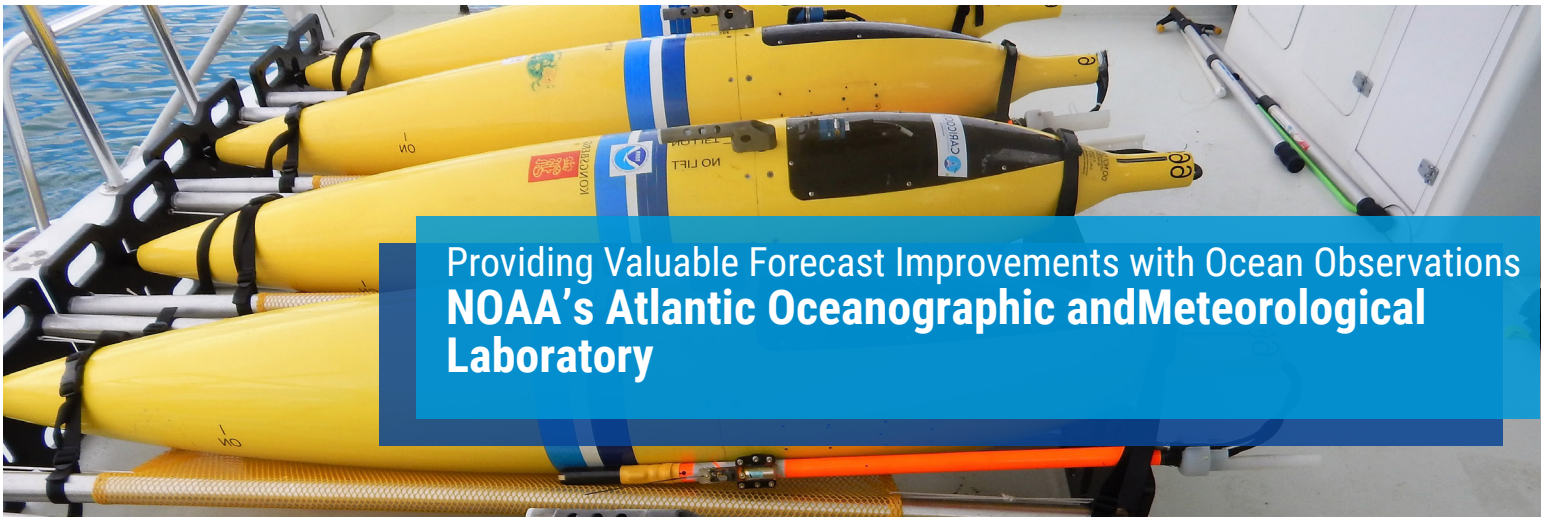

Providing Valuable Forecast Improvements with Ocean Observations

NOAA's Atlantic Oceanographic andMeteorological Laboratory

Underwater gliders are recovered in the waters of Puerto Rico, October 2020. Image Credit: NOAA/CIMAS/CARICOOS.

NOAA Research Improves Models and Forecasts

NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) scientists have annually deployed underwater gliders to monitor ocean conditions every hurricane season since 2014, surveying conditions in over 20 Atlantic hurricanes. Researchers at AOML have worked with many partners to launch these autonomous vehicles. These partners include the US Navy, US IOOS Regional Associations in the Caribbean Sea (CARICOOS), Southeast US (SECOORA), and Gulf of Mexico (GCOOS), the National Maritime Affairs Authority (ANAMAR) of the Dominican Republic, Rutgers University, the University of Miami, the University of Puerto Rico-Mayaguez, the University of the Virgin Islands, and Cape Eleuthera Institute (Bahamas).

The observations obtained from underwater gliders allow ocean conditions to be more accurately represented in ocean models. Because of the strong interaction between the ocean and atmosphere during the passage of a hurricane, improved representation of the ocean in hurricane forecast models leads to more accurate hurricane intensity forecasts. Studies led by AOML, together with academic institutions, have shown the benefits of underwater glider data in improving model forecasts. These gliders provide high-volume, high-resolution data in areas where hurricanes frequently travel and intensify or weaken, but where there may traditionally be a scarcity of ocean observations. Improved forecasts of hurricane intensity are important because emergency managers make evacuation decisions based in part on the predicted strength of an approaching hurricane.

GLIDERS IMPROVE INTENSITY FORECASTS

20+
Hurricanes Surveyed by Underwater Gliders

100,000+
Temperature, Salinty, and Dissolved Oxygen Profiles Collected

20-80%
Per Storm Improvement by Adding Glider Data into Models

Underwater Robots Explore the Ocean Depths to Improve Hurricane Forecasts

NOAA's Atlantic Oceanographic and Meteorological Laboratory deploys underwater gliders that gather data to increase the accuracy of hurricane forecast models. These autonomous, uncrewed vehicles are equipped with sensors to measure salinity, temperature, and other physical, chemical, and environmental parameters as they move through the ocean.

For the 2020 hurricane season, AOML scientists and their partners launched several gliders from ships off the coasts of Puerto Rico, the US Virgin Islands, and the Southeast US, with more gliders launched by partners in the Mid-Atlantic Bight and Gulf of Mexico regions.

These battery-powered, remotely-piloted gliders are deployed for up to six months and then recovered. They can operate and transmit data under hurricane wind conditions. Upon reaching the ocean surface, the data are transmitted via satellite for immediate use in hurricane forecast models.

NOAA's Atlantic Oceanographic and Meteorological Laboratory
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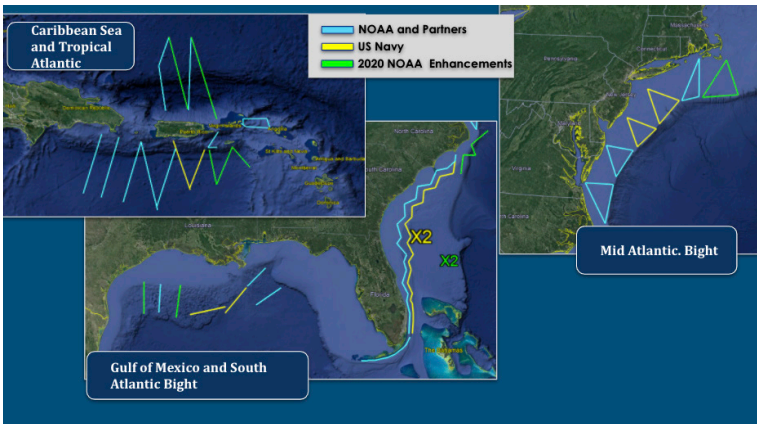
www.aoml.noaa.gov

Glider Deployments Occur in Areas Where Hurricanes are Frequent

The maps below show the locations where glider operations in 2020 were carried out by NOAA and its partners to record temperature and salinity data at the sea surface down to a half mile depth. Once launched, the gliders make regular dives along set courses, surfacing several times a day to send their data via satellite to be used in hurricane forecast models.

The locations surveyed by the gliders are characterized by the presence of ocean features, such as warm rings and eddies, warm currents, warm surface waters of riverine origin, and subsurface cold waters, all of which have been linked to changes in hurricane intensity.



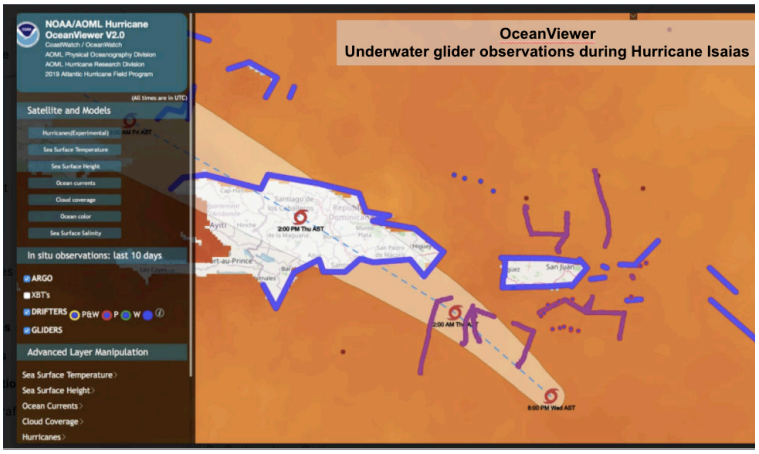
The 2020 Observational Plan for the Underwater Gliders Image Credit: NOAA/AOML

Sea surface temperature and salinity provide important information about the intensity of a hurricane. As a hurricane passes by, warmer water is mixed with cooler water below the surface, reducing the energy available to fuel the passing storm. However, if there is a layer of fresher, warmer water at the surface, it can serve as a cap that prevents mixing of ocean waters and keeps heat energy at the oceans surface, continuing to fuel the passing storm and causing the hurricane to gain strength. Knowing if a storm will pass over predominantly warm water or areas where cold water may be stirred up from below helps scientists and forecasters better predict whether a storm will intensify or weaken as it travels. The observations obtained from gliders allow these features to be better identified and represented more accurately in the ocean component of hurricane forecast models.

AOML deployed 11 NOAA gliders and 4 US Navy gliders in 2020 to transmit ocean profile data in real-time for assimilation into ocean and ocean-atmosphere forecast models. The autonomous characteristics of these vehicles and the strong collaborations in place with regional, academic, and governmental partners have been key to the success of the project. In addition, AOML is partnering with the National Weather Service to assess the impact of underwater glider and other ocean data on NOAA's new generation hurricane models.

OceanViewer Displays Recent Ocean Conditions

AOML recently supported the release of a new version of NOAA's Hurricane OceanViewer interface for tropical cyclone research and operations. The interactive maps enable NOAA to plan its field operations by providing a user friendly interface with easy access to global and regional ocean-atmospheric observations and products. AOML researchers use the maps to assess ocean and atmospheric conditions prior to, during, and after the passage of a tropical cyclone. The large set of targeted ocean observations featured in this product, including ocean gliders and floats, enabled AOMl to better monitor ocean conditions in support of hurricane forecasts during 2020. As glider deployments were made throughout hurricane season, the data became available for viewing on this site.



For a view of ocean conditions that can inform hurricane forecasts, visit: https://cwcgom.aoml.noaa.gov/cgom/OceanViewer/index_hrd.html

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