

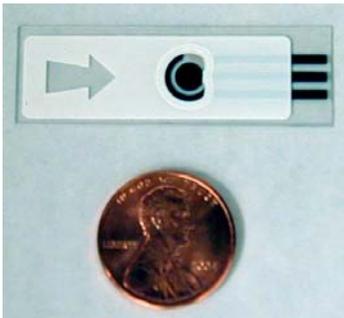


# Atlantic Oceanographic and Meteorological Laboratory

*Specializing in hurricanes and open and coastal ocean research*



Coral Reef Early Warning System (CREWS) coral monitoring station in the US Virgin Islands



DNA sensor that detects microbial contaminants in coastal waters



NOAA's Gulfstream 4 jet used in AOML synoptic surveillance research missions

## What does the Atlantic Oceanographic and Meteorological Laboratory do for the nation?

With an estimated 40 million Americans living in coastal regions of the eastern United States, it is essential that we understand how humans impact the oceans and the role the ocean plays in our lives.

For example:

- Human-related discharges ranging from wastewater to increased levels of freshwater run-off can significantly affect economically important coastal marine ecosystems.
- The gradual north and south oscillation of warm waters in the Atlantic is strongly linked to increased or decreased hurricane activity.

Scientists at the Atlantic Oceanographic and Meteorological Laboratory (AOML) study the relationship between the ocean and atmosphere by conducting research in both nearshore and open ocean environments. They cooperate with other Federal, state, and local authorities to maximize research expertise for use in economically and environmentally important projects. AOML also provides and interprets oceanographic data collected via ships, satellites, drifting buoys and floats, and conducts research relevant to annual-to-decadal climate change and coastal ecosystems. This research includes the dynamics of the ocean, its interaction with the atmosphere, and its role in climate change. AOML's research improves the understanding and prediction of hurricane track and intensity change, and the impacts from wind, storm surge, waves, and rain. Key to this work is the annual hurricane field program supported by the NOAA Aircraft Operations Center research/reconnaissance aircraft.

## Recent Accomplishments:

- AOML addresses the problem of rapid hurricane intensification through analysis of detailed airborne observations of the atmospheric boundary layer and upper ocean. Through a partnership with NOAA/NESDIS, AOML created the only operational statistical-dynamical intensity model, known as SHIPS, which recently incorporated a new understanding of ocean heat content. **Payoffs: The forecast system currently has limited skill in predicting rapid intensification, a process that can transform tropical storms into engines of devastation overnight. Timely warning of a storm's rapid intensification immediately prior to landfall is crucial to mitigating inevitable large-scale property damage and to preventing extensive mortality.**
- AOML is a leader in the development of marine biotechnology to improve water quality monitoring and to promote public health and the economic value of coastal resources. In collaboration with its industrial and academic partners, AOML is developing portable and on site electrochemical biosensors to detect the genetic signatures of fecal indicators, harmful algae, and human pathogens in coastal waters. **Payoffs: These biotechnology advancements will benefit the public and economy by better enabling rapid, informed decisions on beach closures and human health risks. Development of autonomous biosensors coupled with traditional oceanographic data will enhance efforts to understand, model, predict, and help mitigate water-borne biological threats.**

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- Through time-series observations, AOML characterized properties of the Meridional Overturning Circulation in the Atlantic. This circulation is responsible for the transport of water and heat from the southern hemisphere to the northern hemisphere. **Payoffs: The data are a critical component of the climate forecast activities and are used in models that have been shown to be of great economic benefit to the national and international communities.**
- AOML is a principal player in the NOAA Carbon Cycle Science Program and, with the help of its NOAA Pacific Marine Environmental Laboratory and university research partners, determined the first observation-based inventory of anthropogenic carbon dioxide in the ocean. **Payoffs: The findings are critical for national and international assessments of the long-term fate of anthropogenic carbon dioxide, such as the Intergovernmental Panel on Climate Change report. The monetary value of the ocean's annual sequestration of 2 trillion kg carbon equates to a \$4 billion "service."**
- AOML continues to publish new understandings of hurricane dynamics and structure through the laboratory's innovative use of instruments and data collected in the hurricane field program. **Payoffs: These findings lead to improved model resolution, which directly improves the quality and accuracy of forecasts for the National Weather Service.**

### What's next for AOML?

AOML will conduct increasingly interdisciplinary research with stronger links between the three major laboratory themes of oceans and climate, regional and coastal ecosystems, and tropical meteorology. Additionally, AOML is further strengthening its links to the other NOAA line organizations (e.g., a joint emphasis with the National Marine Fisheries Service on fisheries oceanography). AOML also has a firmly established role as a leader of research in all three themes, particularly for research focused on the Atlantic Ocean, including the Intra-Americas Sea (Caribbean and Gulf of Mexico) and Florida coastal areas. AOML is the custodian of major oceanographic and hurricane data sets and is a center for their dissemination. In addition to continuing work, emerging avenues include:

- Technology development coupled with coastal observations for assisting state and regional coastal infrastructure authorities in meeting societal needs regarding water resources and marine transportation;
- Explicit integration with our regional line organization partners in responding to South Florida Ecosystem Restoration implementation;
- Expanded use of advanced technologies and innovative cost-effective sampling platforms;
- Integration of the laboratory's observing systems into regional, national, and international observing systems; and
- More sophisticated representations of the ocean in coupled ocean-atmosphere models to meet goals for improved hurricane intensity forecasts.

### Research Partnerships:

AOML has long-standing research partnerships with all components of NOAA; many universities, especially the University of Miami; numerous other Federal agencies including EPA, Army Corps of Engineers, NASA, and the Office of Naval Research; regional agencies such as the South Florida Water Management District; and several foreign research organizations (e.g., IFREMER, the French Oceanographic Research Institute).

### Budget and Staff

The fiscal year 2006 enacted budget for AOML totaled \$14.1M, including hurricane supplemental funding. The fiscal year 2007 President's budget request for AOML is \$13.3M. AOML has 78 permanent Federal employees.



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