



Atlantic Oceanographic and Meteorological Laboratory

AOML Research Review: Wrap-Up

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Director, AOML



AOML Research Review
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Atlantic Oceanographic and Meteorological Laboratory

Our Mission

The Atlantic Oceanographic and Meteorological Laboratory conducts a basic and applied research program that seeks to understand the physical, chemical, and biological characteristics and processes of the ocean and atmosphere, both separately and as a coupled system.

The principle focus of these investigations is to provide knowledge that will ultimately lead to:

- Improved understanding and forecasting of severe storms
- Better utilization and management of marine resources
- Better understanding of the factors affecting both climate and environmental quality, and
- Improved ocean and weather services for the Nation



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AOML Research – Guiding Documents

Major Drivers:

NOAA Strategic Plan

NOAA Research Plan

National Programs

U.S. Legislation

Interagency Agreements

International Agreements

Climate Goal (climate, forcing)

Weather and Water Goal
(hurricanes)

Ecosystem Goal
(ecosystem research, oceans
and human health, corals)



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Physical Oceanography – Key Points

AOML's Physical Oceanography Division conducts an end-to-end enterprise

- Develop and design new instruments
- Develop and design experiments
- Collect observations
- Process, quality control, and transmit data
- Analyze, interpret and publish the results



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Hurricane Research Division - Key Points

- HRD is NOAA's focus for hurricane research for over 50 years
- HRD's strength is acquisition and analysis of observations within storm circulation and its immediate environment.
- HRD's future strategy is to guide and advance numerical model under NOAA Hurricane Forecast Improvement Project (HFIP) to significantly improve forecast guidance for track, intensity, and structure change, with sufficient fidelity **to predict rapid intensity changes with minimal uncertainty.**
- HRD works closely within NOAA and federal, academic, and private sector communities to broaden base of expertise in tropical cyclone research community.



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Ocean Chemistry Division - *Key Points*

- OCD is a scientific center for the improvement of the understanding of the inter-linked chemical, biological and physical processes regulating the composition of the coastal and global ocean and the health and sustainability of the ecosystems therein.
- OCD carries out state-of-the-art multi-disciplinary research through the development of methods and technologies and through the gathering and dissemination of high quality, reliable, unbiased data.
- OCD participates in the Global Carbon Program, the South Florida Ecosystem Research Program, and the Coral Reef Ecosystem Forecasting program.
- OCD contains first quality Nutrient Dynamics Research program and Microbiology Research Programs.
- In conjunction with the Physical Oceanography Division and with the Hurricane Division of AOML, OCD carries out ecosystem connectivity and impact of hurricanes studies.



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Key Questions Driving Research

Major Foci:

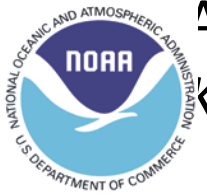
Oceans and Climate

Coastal Ecosystems

Hurricanes

Key Questions:

- How do oceans control and modify climate?
- How is the Meridional Overturning Circulation changing?
- To what extent does interior mixing alter the overturning circulation?
- How do variations in the Atlantic Warm Pool influence US rainfall?
- What is the relationship between climate change and hurricane formation, track and intensity?
- What are the effects of global warming on CO₂ uptake?
- How can models best extract information about climate from observations?



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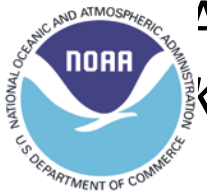
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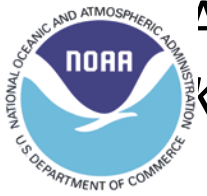
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Key Questions:

- What is the impact of ocean acidification on marine ecosystems?
- What are the long-term trends of meteorological and oceanographic parameters at key U.S. coral reef areas?
- Can data from various sources be integrated in real time to provide for ecological forecasts at coral reef and coastal ecosystems areas?
- Can molecular analysis be used to quickly and reliably identify human pathogens and indicators of human fecal contamination in coastal waters?
- How are ecosystems connected regionally and what is the effect of this connection on the individual ecosystems, e.g., fisheries.
- What are the impacts of hurricanes on coastal ecosystems?
- How can we measure low nutrient concentrations with high precision and accuracy?
- What are the sources of nutrients, pathogens, and fecal indicators in coastal waters?



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Key Questions Driving Research

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Key Questions:

- How do the multi-scale interactions affect the predictability of hurricane formation, track, and intensity?
- What is the best mix of model ensembles to bound the uncertainty and test predictability of intensity and structure?
- What is the optimal observing strategy for initializing models for track, intensity and structure forecasts?
- How can we take advantage of information gleaned from field experiments (IFEX, RAINEX, CAMEX, TCSP, CBLAST) to improve analytical and numerical models of tropical cyclones?
- What emerging observing technologies will provide the key observations to improve track, intensity, and structure forecasts?



Atlantic Oceanographic and Meteorological Laboratory *New Research Thrusts Discussed*

Observing System Simulation/Strategy Experiments
(OSSEs)

Modeling



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Our Metrics

- Partners
- Transitioned Projects (tab 12)
- Use of Data and Products by the External Community
- Highly Viewed Articles
- Publications
- Scientific Leadership
- Awards



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Our Service to Society

AOML science and accomplishments are of benefit not only the broader scientific community, but a myriad of customers ranging from our local community to the Nation and beyond.

- Our hurricane research directly impacts forecasters' abilities to warn the public about hurricanes and their impacts
- We conduct solid climate studies that help our nation to mitigate the impacts of a growing society
- We help Florida's local and state water resource managers make decisions based on the best available science
- Advances in detecting harmful contaminants keep beachgoers healthy