



AOML Keynotes

ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY

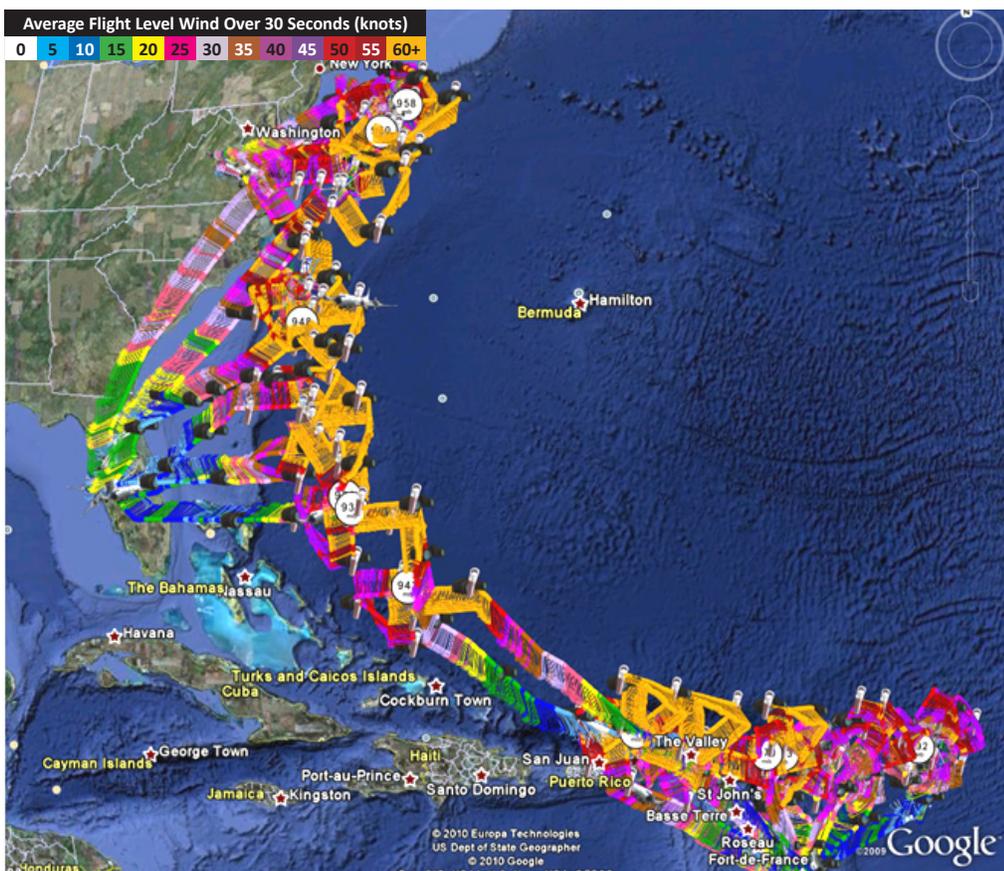
AOML is an environmental laboratory of NOAA's Office of Oceanic and Atmospheric Research on Virginia Key in Miami, Florida

Agreement Reached for Indian Ocean Tropical Cyclone Research

An implementation agreement aimed at improving tropical cyclone forecasts over the Indian Ocean region was signed under an existing NOAA-Indian Ministry of Earth Sciences Memorandum of Understanding on October 6th.

The agreement outlines a strategy by which researchers with AOML's Hurricane Research Division (HRD), the Indian Meteorological Department (IMD), Indian Institute of Technology (IIT), and Purdue University will collaborate to improve the Indian regional tropical cyclone modeling system (based on the Hurricane Weather Research and Forecasting [HWRF] model). The strategy also calls for the use of new and existing observations to improve forecast guidance of tropical cyclones affecting India and the surrounding countries.

HRD's efforts will be coordinated through NOAA's Hurricane Forecast Improvement Project in close collaboration with university partners and researchers with the Environmental Modeling Center (EMC) of the National Centers for Environmental Prediction. As with NOAA's National Hurricane Center, the Indian Meteorological Department is one of six World Meteorological Organization (WMO) Regional Specialized Meteorological Centers. It provides tropical cyclone analyses and forecasts for the countries surrounding the Bay of Bengal and the Arabian Sea. Hence, any improvements through this collaboration will provide benefits not only to the people of India, but also to the people living in adjacent regions.



NOAA's research flights into Hurricane Earl can be traced by the flight level winds encountered (denoted by various colors). Earl impacted the Leeward Islands, Puerto Rico, and the Bahamas before skirting up the eastern seaboard of the United States. The tenacious system finally came ashore in Nova Scotia as a tropical storm on September 4th.

Unprecedented Data Capture Rapid Intensification of Earl

Hurricane Earl has become the best sampled tropical cyclone undergoing rapid intensification of all time. Over the seven-day period from August 28th-September 3rd, researchers with NOAA and the National Aeronautics and Space Administration (NASA) gathered data from the inner core and surrounding environment of Earl to better understand how hurricanes intensify. Investigators with AOML's Hurricane Research Division (HRD) participated in 18 hurricane hunter research flights aboard NOAA aircraft. The nearly continuous data they gathered documented Earl's evolution from a tropical storm to a robust, category 4 hurricane over a 36-hour time frame, as well as Earl's weakening and early stages of extratropical transition several days later. Capturing the rapid intensification of Earl fulfilled a major goal of HRD's 2010 field program through its Intensity Forecast

Experiment (IFEX). IFEX seeks to improve the understanding and prediction of hurricane intensity change. NASA sampled Earl from aboard three aircraft as part of the Genesis and Rapid Intensification Processes (GRIP) experiment. HRD and NASA researchers also collaborated to gather data and images of Earl using NASA's Global Hawk unmanned aerial vehicle (UAV) flying at an altitude of 60,000 feet. The Global Hawk's successful mission marked the first flight of a UAV above a fully-developed tropical cyclone. The unprecedented quality and quantity of new observations obtained in Earl represents the most comprehensive dataset gathered to date of a tropical cyclone. These observations will, no doubt, aid researchers in understanding the processes that contribute to hurricane intensification, ultimately leading to better forecasts.

Deepwater Horizon Sampling Continues in Gulf of Mexico

Michael Shoemaker, an electronics technician with AOML's Ocean Chemistry Division, served as a volunteer Deepwater Horizon NOAA Trustee aboard the RV *Gyre* in September. The *Gyre* is one of several research vessels participating in sampling operations as part of the federal government's Unified Command response to the Deepwater Horizon oil spill in the Gulf of Mexico.

In preparation for his time aboard the *Gyre*, Shoemaker attended a day of orientation and training at the NOAA/Coast Guard Headquarters office in New Orleans, Louisiana. Besides learning of the duties and responsibilities incumbent to being a NOAA Trustee, Shoemaker was also briefed on the sampling equipment aboard the *Gyre* and the sampling procedures that would be used.

The *Gyre* was mainly tasked with gathering sediment samples at various distances from the Deepwater Horizon well head using a 12-tube multi corer. In addition to collecting and analyzing sediment cores, however, researchers aboard the *Gyre* also deployed a weighted ROBIO (Robust Biodiversity)



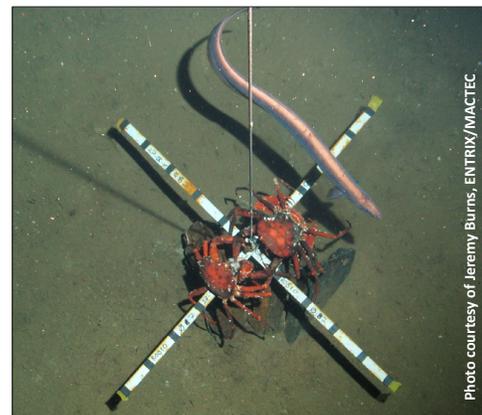
A 12-tube multi-corer instrument was deployed from the RV *Gyre* to gather sediment samples at various distances from the Deepwater Horizon well head in the Gulf of Mexico.

underwater camera that sat on the ocean floor for periods of up to 16 hours to document marine life in the deep-sea environment. An abundance of crustaceans, fish, and other marine forms were observed (see photo at right).

As a Deepwater Horizon NOAA Trustee, Shoemaker was responsible for providing a daily summary of the *Gyre*'s sampling and science activities to the NOAA/Coast Guard Headquarters office. Shoemaker subsequently participated in all three legs of the *Gyre* sampling cruise, spending almost three weeks aboard ship. At the end of the cruise, a final report was prepared that included Shoemaker's overall summary and assessment of the *Gyre*'s sampling activities.

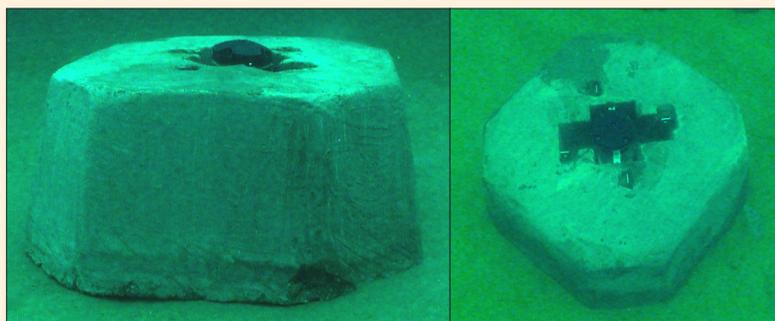


Sediment cores gathered in the Gulf of Mexico near the Deepwater Horizon well head were analyzed for the presence of oil and other contaminants to assess their toxicity.



Crabs and an eel are observed on and near the weighted measuring device below an underwater camera deployed to photograph marine life forms in the deep-sea environment.

On October 14th, two Teledyne RD acoustic Doppler current profiler (ADCP) instruments were installed in the waters off of Broward County, Florida in support of AOML's Florida Area Coastal Environment (FACE) program. The instruments, both 600 kHz Workhorse Sentinel models, were deployed at a depth of 8 meters by Industrial Divers Corporation under contract with AOML. The instruments were placed on a sandy bottom inshore of the Hollywood and Broward wastewater treatment plant outfall sites. These instruments, in conjunction with other current measuring devices deployed at greater depths near the outfalls, will enable AOML researchers to estimate the transport of material emanating from their wastewater streams. To assure that the deployment of these instruments did not impact sensitive marine habitat, a pre-deployment inspection of the area was conducted by AOML divers on July 27, 2010. Permits for the deployment of these instruments were subsequently issued by the Florida Department of Environmental Protection, the Broward County Environmental Protection and Growth Management Department, and the United States Army Corps of Engineers.



Acoustic Doppler current profile (ADCP) instruments were inserted into concrete mounts and placed on the ocean floor near the Broward (left) and Hollywood (right) wastewater treatment outfall sites in October to estimate the transport of material from their wastewater streams.

NOAA/AOML Recognizes Ocean-Observing Efforts of Hapag-Lloyd

In September, Gustavo Goni, Director of AOML's Physical Oceanography Division, met with representatives from Hapag-Lloyd in Hamburg, Germany to personally thank them for the company's participation in NOAA's Ship of Opportunity Program. Hapag-Lloyd, one of the largest container shipping lines worldwide, has collaborated with NOAA since 2004 by permitting its ships to be outfitted with ocean-observing instruments that gather data globally. These data are critical for climate and weather studies conducted by NOAA and the international science community.



Captain Richard von Berlespsch, Senior Director of Ship Management for Hapag-Lloyd (left), accepts a plaque presented by Dr. Gustavo Goni, Director of AOML's Physical Oceanography Division (right), in appreciation of Hapag-Lloyd's six-year participation in NOAA's Ship of Opportunity Program.

NOAA is the leading U.S. agency tasked with the design and implementation of the ocean observing system for climate and weather studies. This observing system is an international effort that requires the global participation and cooperation of government laboratories, universities, and private industry organizations.

The Ship of Opportunity Program (SOOP) enlists the support and cooperation of merchant, cargo, and research vessels worldwide to aid in gathering ocean data. The SOOP network of participating vessels routinely gathers high-quality data of the upper ocean's thermal structure that are used for operational analysis and initialization of climate forecast models.

Long time series of the in situ "ocean weather" type being obtained from the NOAA/Hapag-Lloyd collaboration are needed for better understanding of extreme weather events and for long term climate-change assessments.

Data Pod System Successfully Deployed and Tested

In October, engineers with the Instrumentation Group of AOML's Physical Oceanography Division (PhOD), along with the support of staff from AOML's Ocean Chemistry Division and the Office of the Director, conducted three data pod test cruises aboard the RV *Cable* and RV *Virginia Key*. The purpose of these cruises was to test the deployment technique of the Adaptable Bottom Instrument Shuttle System (ABISS), a technology developed by PhOD engineers.

Once fully operational, ABISS will enable scientific instruments anchored on the ocean floor to send their data to the surface via expendable data pods. The data pods are released on a programmable schedule that float to the surface and transmit their data via satellite. ABISS has the potential to save significant amounts of financial and personnel resources by reducing the amount of ship time needed to support and maintain ocean time series measurement sites.

On these cruises, a RDI acoustic Doppler current profiler (ADCP) was used as the main scientific test instrument (initial prototype tests conducted in September 2009 used a URI pressure-inverted echo sounder). These tests were successful in parachuting ABISS to the ocean bottom (see photo at right), verifying the communication between the test ADCP and the pods, releasing the pods to the surface, and transmitting the information to AOML via an Iridium satellite network.

To gauge the future performance of the system, the Instrumentation Group will be monitoring ABISS over the next six to eight weeks. Thereafter, any adjustments/corrections needed to deploy the system in deeper water (~800–1000 meters) will be made.

AOML staff who participated in the test ABISS cruises included Ulises Rivero, Grant Rawson, Pedro Pena, Kyle Seaton, and Andrew Stefanick, all with PhOD, Joseph Bishop and LT Rachel Kotkowski of the Ocean Chemistry Division and LCDR Hector Casanova with AOML's Office of the Director.



AOML researchers tested the deployment of the Adaptable Bottom Instrument Shuttle System (ABISS) in October. ABISS was lowered to the ocean floor (pictured above) where it successfully released its data pods to the surface upon command and transmitted its data via satellite to AOML.

Dominican Republic's ANAMAR Leadership Visits AOML

Representatives from the Dominican Republic's National Authority of Maritime Affairs (ANAMAR) visited AOML in October to explore the possibility of developing a partnership with AOML investigators for gathering ocean observations. ANAMAR is a newly formed agency dedicated to managing and conserving the Dominican Republic's ocean resources.

Pascual Proto Henríquez, the President of ANAMAR, along with Mario Delgado Malangón, Technical Director of ANAMAR, met with AOML leaders to learn more about NOAA's efforts to monitor the ocean through the global deployment of Argo and drifting buoys and the Ship of Opportunity program.

In the coming months, ANAMAR scientists will participate in AOML's bimonthly monitoring cruises of south Florida waters aboard the RV *Walton Smith*. These cruises will provide hands-on training to develop ANAMAR's skill and expertise in gathering ocean observations.



Representatives from the Dominican Republic's National Authority of Maritime Affairs met with AOML investigators in October. Pictured above from left to right are Nelson Melo (AOML), Pascual Proto Henríquez and Mario Delgado Malangón (of ANAMAR), and Claudia Schmid (AOML).

All in a Day's Work...at AOML



Linda Joy, a public affairs specialist with NOAA's Office of Public and Constituent Affairs, visited AOML for a few days in September. While at the Laboratory, Linda met with staff of the Office of the Director, as well as the Hurricane Research, Ocean Chemistry, and Physical Oceanography Divisions, and photographed them as they went about their workday. A representative sampling of Linda's photos appears above. The complete set of Linda's photos can be accessed at <ftp://dossier.ogp.noaa.gov/COMM/AOMLpix/>.

Farewell

Jon Molina, a CIMAS research associate with AOML's Physical Oceanography Division, resigned from AOML in October. Molina has accepted an oceanographer position in Houston, Texas with Fugro-GEOS (Global Environmental and Ocean Sciences). During the year he worked at AOML, Molina supported the Physical Oceanography Division's global oceanographic data collection efforts through the Ship of Opportunity Program.



Congratulations

LT Hector Casanova, a NOAA Corps officer and AOML's current Associate Director, has been promoted to the rank of Lieutenant Commander. As Associate Director, Casanova oversees safety issues and facility maintenance operations at AOML, coordinates ship time aboard NOAA research vessels, and assists with diving missions. He has served with the NOAA Corps for 8 years.



Jason Dunion, a CIMAS research associate working with AOML's Hurricane Research Division, is the recipient of a 2009 Editors' Citation for Excellence in Refereeing Award. Dunion was recognized by the American Geophysical Union (AGU) for his conscientious review of submitted papers to the journal *Geophysical Research Letters* that have been invaluable to AGU for maintaining the journal's high standards of quality.



Alan Leonardi, AOML's Deputy Director, is the recipient of a 2010 U.S. Department of Commerce Silver Medal. Leonardi received the Silver Medal in recognition of his leadership in building a first-of-its-kind partnership with Google to disseminate NOAA ocean data and information through Google Earth. Due to Leonardi's efforts, direct dissemination of NOAA's ocean information is available worldwide through Google Ocean.



Welcome Aboard

Leticia Barbero joined the Ocean Chemistry Division's Ocean Carbon Group in September as a CIMAS post-doctoral scholar. Barbero obtained her Ph.D. from the University of Las Palmas in Gran Canaria, Spain by researching the variability of carbon fluxes in the northeast Atlantic under Professor Melchor Gonzalez. She subsequently worked with Drs. Jacqueline Boutin and Liliane Merlivat at the University Pierre et Marie Curie on the CARBOOCEAN project, synthesizing physical information from buoys and floats and surface CO₂ data from drifters and ships to obtain high fidelity CO₂ flux maps. At AOML, she will work to establish an ocean acidification monitoring network for the northern Gulf of Mexico and coastal ocean along the eastern seaboard of the United States.



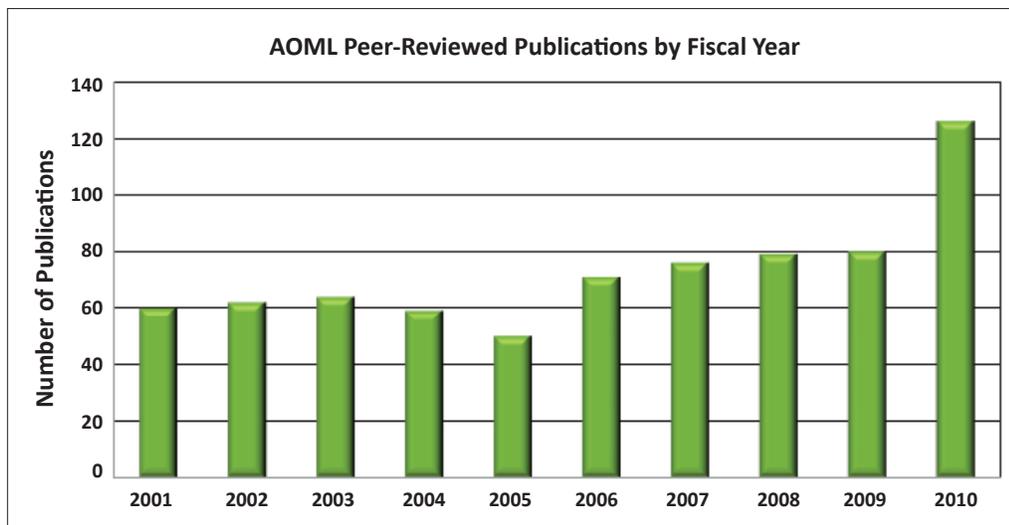
Gregory Foltz joined the staff of AOML's Physical Oceanography Division in October as an oceanographer to perform research on the role of the tropical Atlantic in weather and climate using data from the PIRATA (Prediction and Research Moored Array in the Atlantic) array and from other components of the ocean observing system. Foltz earned his Ph.D. in meteorology from the University of Maryland in 2003. He then served as a National Research Council post-doctoral scholar at NOAA's Pacific Marine Environmental Laboratory in Seattle, Washington before becoming a research scientist with the University of Washington's Joint Institute for the Study of the Atmosphere and Ocean.



Marlos Goes joined the staff of AOML's Physical Oceanography Division in September as a CIMAS assistant scientist. Goes obtained his Ph.D. in physical oceanography from the University of Sao Paulo in Brazil in 2006. He subsequently held a post-doctoral position with the Geosciences Department at Pennsylvania State University's College of Earth and Mineral Sciences during 2007-2009. At AOML, Goes will conduct research on the upper ocean's variability using a wide range of observations obtained from expendable bathythermograph instruments, surface drifting buoys, and satellite altimetry.



Verena Hormann joined the staff of AOML's Physical Oceanography Division on November 1st as a CIMAS post-doctoral scholar. Hormann received her Ph.D. in December 2008 from the University of Kiel in Germany where she blended model output and observations to gain a greater understanding of the equatorial Atlantic's circulation and climate variations. She subsequently completed a post-doctoral position with Dr. Peter Brandt at IFM-GEOMAR in 2009-2010 in which she studied the tropical Atlantic's variability and participated in numerous research cruises. At AOML, Hormann will continue studying the circulation and variability of the tropical Atlantic using observations gathered in the region by AOML researchers and others.



Fiscal year (FY) 2010, which spanned the time frame from October 1, 2009 to September 30, 2010, was a productive period at AOML. As illustrated by the bar graph above, AOML researchers published more papers in FY 2010 than in any of the previous nine years, racking up a total of 126 peer-reviewed articles (a new AOML record). This total for peer-reviewed articles represents a 36.5% increase over FY 2009, when AOML researchers published a total of 80 peer-reviewed papers.

**COMBINED
FEDERAL CAMPAIGN
November 1st-26th**

Travel

Gustavo Goni was a keynote speaker at the 2010 Storm Surges Congress in Hamburg, Germany on September 13-17, 2010. He also attended the NOAA Climate Monitoring Summit in College Park, Maryland on October 19-20, 2010.

Shaun Dolk, Rick Lumpkin, Mayra Pazos, Claudia Schmid, and Erik Valdes attended the 26th Session of the Data Buoy Cooperation Panel, as well as meetings of the International Buoy Program of the Indian Ocean and the Task Team of Data Management, in Oban, Scotland on September 27-30, 2010.

Michelle Wood and Gustavo Goni were both invited panel speakers at a Deepwater Horizon Principle Investigators Conference in St. Petersburg, Florida on October 4-7, 2010.

Frank Marks attended the signing of a Memorandum of Understanding Implementation agreement between AOML's Hurricane Research Division and the Indian Ministry of Earth Sciences in Washington, D.C. on October 6th.

Rik Wanninkhof attended the First Regional Carbon Cycle Assessment and Processes (RECAPP) Workshop in Viterbo, Italy on October 6-8, 2010.

Alan Leonardi and Alejandra Lorenzo attended the Leadership Effectiveness and Advancement Program (LEAP) Conference in Silver Spring, Maryland on October 12-15, 2010.

Maribeth Gidley, Christopher Sinigalliano, and David Wanless attended the Gulf of Mexico Alliance (GOMA) Coastal Pathogens Risk Assessment Workshop in Sarasota, Florida on October 13-15, 2010.

Eduardo Ramos attended an Argo Data Management Team meeting in Hamburg, Germany on October 18-22, 2010.

Mark Powell was an invited participant and panel speaker at the Hurricane Science and Education Symposium at Tulane University in New Orleans, Louisiana on October 25, 2010.

Molly Baringer, Gregory Foltz, Silvia Garzoli, Marlos Goes, Gustavo Goni, George Halliwell, Rick Lumpkin, Christopher Meinen, Renellys Perez, Claudia Schmid, and Rik Wanninkhof attended the annual systems review meeting of NOAA's Climate Program Office in Washington, D.C. on October 26-29, 2010.

Recent Publications*

ABERSON, S.D., 2010: Ten years of hurricane synoptic surveillance (1997-2006). *Monthly Weather Review*, 138(5):1536-1549.

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CONZEMIUS, R.J., and M.T. MONTGOMERY, 2010: Mesoscale convective vortices in multiscale, idealized simulations: Dependence on background state, interdependency with moist baroclinic cyclones, and comparison with BAMEX observations. *Monthly Weather Review*, 138(4):1119-1139.

DONG, S., S.T. GILLE, J. SPRINTALL, and E.J. FETZER, 2010: Assessing the potential of the Atmospheric Infrared Sounder (AIRS) surface temperature and specific humidity in turbulent heat flux estimates in the Southern Ocean. *Journal of Geophysical Research*, 115(C5):C05013, doi:10.1029/2009JC005542.

HAMID, S., B.M. GOLAM KIBRIA, S. GULATI, M. POWELL, B. ANNANE, S. COCKE, J.-P. PINELLI, K. GURLEY, and S.-C. CHEN, 2010: Predicting losses of residential structures in the state of Florida by the public hurricane loss evaluation model. *Statistical Methodology*, 7(5):552-573.

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PENG, T.-H., and R. WANNINKHOF, 2010: Increase of anthropogenic CO₂ in the Atlantic Ocean in the last two decades. *Deep-Sea Research, Part I*, 57(6):755-770.

RIEMER, M., M.T. MONTGOMERY, and M.E. NICHOLLS, 2010: A new paradigm for intensity modification of tropical cyclones: Thermodynamic impact of vertical wind shear on the inflow layer. *Atmospheric Chemistry and Physics*, 10(7):3163-3188.

ROGERS, R.F., F.D. MARKS, and T. MARCHOK, 2009: Tropical cyclone rainfall. In *Encyclopedia of Hydrological Sciences*, M.G. Anderson (ed.). John Wiley and Sons, Chichester, UK, doi:10.1002/0470848944.hsa030.

SINIGALLIANO, C.D., J.M. FLEISHER, M.L. GIDLEY, H.M. SOLO-GABRIELE, T. SHIBATA, L.R.W. PLANO, S.M. ELMIR, D. WANLESS, J. BARTKOWIAK, R. BOITEAU, K. WITHUM, A.M. ABDELZAHER, G. HE, C. ORTEGA, X. ZHU, M.E. WRIGHT, J. KISH, J. HOLLENBECK, T. SCOTT, L.C. BACKER, and L.E. FLEMING, 2010: Traditional and molecular analyses for fecal indicator bacteria in non-point source subtropical recreational marine waters. *Water Research*, 44(13):3763-3772.

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ZHANG, J.A., 2010: Spectral characteristics of turbulence in the hurricane boundary layer over the ocean between the outer rainbands. *Quarterly Journal of the Royal Meteorological Society*, 136(649):918-926.

*AOML authors are denoted by capital letters.

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AOML seeks to provide improved ocean and weather services for the nation by conducting research to understand the physical, chemical, and biological characteristics and processes of the ocean and the atmosphere, both separately and as a coupled system. The principal focus of these investigations is to advance knowledge that leads to more accurate forecasting of severe storms, better utilization and management of marine resources, and better understanding of the factors affecting both climate and environmental quality.