

## Molecular Test Shared for Quick Detection of Microbes

A tutorial that provides instructions on how to perform a DNA hybridization assay (in microtiter format, the “microplate assay”) was shared with participants at the recent Florida Marine Biotechnology Summit V in Gainesville, Florida. As part of a technology transfer effort, Dr. Kelly Goodwin of AOML’s Environmental Microbiology Laboratory presented a poster and distributed DVDs that demonstrate the technique and how it can quickly detect a variety of microbial contaminants.

Water quality managers often depend on assays for determining the public health and safety of beaches and shell fisheries. The new assay allows for sensitive, species-specific molecular analysis of contaminants in a convenient, adaptable, and relatively inexpensive form. Molecular probes can be easily added or modified to the assay for environmental monitoring or as circumstances warrant.

A web portal to facilitate technology transfer of the assay has been established at [http://ciceet.unh.edu/project\\_extras/microplate\\_assay](http://ciceet.unh.edu/project_extras/microplate_assay). The site provides written, pictorial, and step-by-step video instructions on how to perform the molecular method.

Goodwin and others at AOML, along with researchers at the University of Miami, adapted the microplate assay for coastal water quality applications. The development and transfer of the assay was funded by the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), a partnership between NOAA and the University of New Hampshire.

**HAPPY HOLIDAYS!**

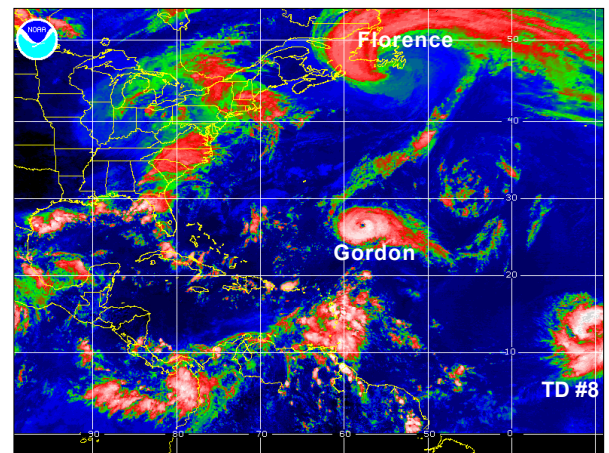
## Florida Breezes Through the 2006 Hurricane Season

After being pummeled by eight landfalling hurricanes in the meager span of two years, Floridians were finally given a reprieve: the mild 2006 Atlantic hurricane season ended quietly on November 30th without a single hurricane having come ashore in the United States. In a year originally forecast to produce between 13 and 16 named storms, only nine materialized. Of these nine storms, five became hurricanes and two (Gordon and Helene) reached “major” status with winds above 110 mph.

The slightly below average season is attributed to changes in oceanic and atmospheric weather patterns that tend to suppress hurricane activity. An El Niño that began developing in August across the tropical Pacific generated crosswinds in the upper atmosphere of the Atlantic that made it more difficult for storms to strengthen. Additionally, large quantities of dry, mineral-laden dust from the Saharan Desert drifting in the Atlantic basin robbed the atmosphere of the moisture that fuels hurricane formation. A strong ridge of high pressure that perches over the Atlantic every summer and fall and acts as one of the main steering currents for storms, the Bermuda High, also assisted by deflecting storms to the northeast, away from the United States. Four of the season’s nine storms—Hurricanes Florence, Gordon, Helene, and Isaac—encountered the Bermuda High and remained at sea, a threat to shipping interests only.

Three tropical storms—Alberto, Beryl, and Ernesto—did impact the U.S. but caused only minor damage. Since 1995, when the Atlantic entered a multi-decadal cycle that favors heightened hurricane activity, an average of 15 named storms have developed annually. The 2006 season becomes the second year since 1995 to generate fewer than 12 named storms. The 1997 hurricane season, also an El Niño year, produced only seven named storms.

While the 2006 hurricane season presented coastal residents a welcome respite from the devastation and destruction that occurred in 2004 and 2005, the decades-long cycle of enhanced hurricane activity is expected to continue. Floridians enjoyed the lull, even if only for a season.



GOES satellite infrared image of the central Atlantic on September 13, 2006. Visible are the remains of Hurricane Florence off the Canadian coast, Hurricane Gordon at its peak intensity with 120 mph winds, and Tropical Depression 8 (which became Hurricane Florence). All three storms were deflected to the northeast and remained at sea courtesy of the Bermuda High, one of the main regional steering currents for storms.

## Bob Molinari Retires

Dr. Robert Molinari, a NOAA Senior Scientist with AOML's Physical Oceanography Division, retired on December 9th after 36 years of federal service. Molinari began his career with NOAA in 1970 when he joined the staff of the Physical Oceanography Division as a National Research Council post-doctoral research associate.



He became a federal employee in 1972 and continued working with the Division, first as a research oceanographer and then as a supervisory oceanographer. Molinari served as the Director of the Division beginning in 1993 but stepped down four years later to assume a leadership role as the Director of NOAA's newly formed Global Ocean Observing System (GOOS) Center housed within the Physical Oceanography Division. In 1998, he was made a NOAA Senior Scientist.

During Dr. Molinari's tenure with the Physical Oceanography Division, he was the recipient of many honors including NOAA's Silver Medal for his work on subtropical Atlantic climate studies. His research has focused primarily on the hydrography and large-scale circulation of the North Atlantic Ocean with an emphasis on western boundary currents, as well as decadal variability of the upper ocean temperature structure of the North Atlantic and its effect on climate.

Molinari will continue working with the Division after retirement as an affiliate of the University of Miami's Cooperative Institute for Marine and Atmospheric Studies. Congratulations to Bob on the successful conclusion of a distinguished federal career.

## Combined Federal Campaign

November 24 - December 11, 2006

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## Powerful Isabel Yields New Insights of Storm Physics

Hurricane Isabel wreaked havoc along the U.S. east coast from South Carolina to New York in September 2003, but it also afforded AOML scientists and their university research partners an unprecedented opportunity to study an intense storm. Their findings, which present new scientific challenges to the current understanding of hurricanes, were outlined in a two-part article that appeared in the October 2006 issue of the *Bulletin of the American Meteorological Society* (BAMS).

Montgomery, M.T., M.M. Bell, S.D. Aberson, and M.L. Black, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms, Part I: Mean vortex structure and maximum intensity estimates. *Bulletin of the American Meteorological Society*, 87(10):1335-1347.

Aberson, S.D., M.T. Montgomery, M.M. Bell, and M.L. Black, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms, Part II: Extreme localized wind. *Bulletin of the American Meteorological Society*, 87(10):1349-1354.



"This research is a great investment," said Michael Montgomery, lead author on part one of the article. "It will repay many times over in improving our understanding of the physics of intense storms that ultimately will lead to better forecasts and warnings. More research of this sort needs to be carried out using NOAA's unique resources."

As discussed in part one, global positioning system (GPS) dropwindsondes and in-situ data from NOAA's P-3 hurricane hunter aircraft were used to create a composite of Isabel's inner-core structure. The authors observed a reservoir of high-entropy air, a measure of the heat energy available to the hurricane, inside the low-level eye, along with a large amount of inflowing near-surface air from outside of the eye. Their analysis suggests the low-level air that penetrated the eye was enhanced thermodynamically by acquiring additional entropy through its interaction with the ocean. This enhanced air replaced air that was mixed out of the eye. The results support the hypothesis that high-entropy air in the eye "turbo-boosted" the hurricane engine upon its injection into the eyewall clouds, enabling Isabel to become super intense.

Part two of the article focused on a unique set of observations of an extraordinary small-scale cyclonic feature (a mesocyclone) inside the inner edge of Isabel's eyewall. A dropwindsonde released into this feature measured the strongest known horizontal wind recorded in a tropical cyclone—208 knots or 240 mph. The authors suggest that this type of feature and similar "little whirls" may have been responsible for the catastrophic wind damage that occurred during Hurricane Andrew's south Florida landfall in 1992 and in other lesser-known cases.

Understanding the meteorological conditions that favor these intense vertical substructures will enable scientists to better assess high resolution forecast models that are currently being developed to improve intensity forecasts. "Hurricane Isabel shared some of its secrets with us," said Sim Aberson, a meteorologist with the Hurricane Research Division and lead author on part two of the article. "We were able to see some of the unusual aspects of its structure to gain an understanding of how they contributed to the hurricane's extreme intensity."

In addition to lead authors Montgomery and Aberson, the article was also co-authored by Michael Bell of Colorado State University and the National Center for Atmospheric Research and Michael Black, a meteorologist with AOML's Hurricane Research Division. Michael Montgomery is currently a professor at the Naval Postgraduate School's Department of Meteorology in Monterey, California and is also a research scientist with AOML's Hurricane Research Division.

## Recent Publications\*

ABERSON, S.D., M.T. Montgomery, M.M. Bell, and M.L. BLACK, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms, Part II: Extreme localized wind. *Bulletin of the American Meteorological Society*, 87(10):1349-1354.

Casal, T.G.D., L.M. Beal, and R. LUMPKIN, 2006: A North Atlantic deep-water eddy in the Agulhas Current system. *Deep-Sea Research, Part I*, 53(10):1718-1728.

Corbosiero, K.L., J. Molinari, A.R. Aiyyer, and M.L. BLACK, 2006: The structure and evolution of Hurricane Elena (1985), Part II: Convective asymmetries and evidence for vortex Rossby waves. *Monthly Weather Review*, 134(11):3073-3091.

Houze, R.A., S.S. Chen, W.-C. Lee, R.F. ROGERS, J.A. Moore, G.J. Stosmeister, M.M. Bell, J. Cetrone, W. Zhao, and S.R. Brozdik, 2006: The Hurricane Rainband and Intensity Change Experiment: Observations and modeling of Hurricanes Katrina, Ophelia, and Rita. *Bulletin of the American Meteorological Society*, 87(11): 1503-1521.

Lee, K., L.-T. Tong, F.J. Millero, C.L. Sabine, A.G. Dickson, C. Goyet, G.-H. Park, R. WANNINKHOF, R.A. Feely, and R.M. Key, 2006: Global relationships of total alkalinity with salinity and temperature in surface waters of the world's oceans. *Geophysical Research Letters*, 33(19):L19605, doi:10.1029/2006GL027207.

Montgomery, M.T., M.M. Bell, S.D. ABERSON, and M.L. BLACK, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms, Part I: Mean vortex structure and maximum intensity estimates. *Bulletin of the American Meteorological Society*, 87(10):1335-1347.

Moores, C.N.K., H.-S. KANG, I. Bang, and D.P. SNOWDEN, 2006: Some lessons learned from comparisons of numerical simulations and observations of the JES circulation. *Oceanography*, 19(3):86-95.

ROGERS, R., S. ABERSON, M. BLACK, P. BLACK, J. CIONE, P. DODGE, J. DUNION, J. GAMACHE, J. KAPLAN, M. POWELL, N. Shay, N. Surgi, and E. UHLHORN, 2006: The Intensity Forecasting Experiment: A NOAA multiyear field program for improving tropical cyclone intensity forecasts. *Bulletin of the American Meteorological Society*, 87(10):1523-1537.

Tracey, K.L., D.R. Watts, C.S. MEINEN, and D.S. Luther, 2006: Synoptic maps of temperature and velocity within the Subantarctic Front south of Australia. *Journal of Geophysical Research*, 111(C10):C10016, doi:10.1029/2005JC002905.

\*Names of AOML authors appear in capital letters.

## Recent Meetings and Workshop Summaries

Claudia Schmid of AOML's Physical Oceanography Division participated in two international Argo meetings: the Argo Trajectory Workshop in Seoul, South Korea on October 27-28, 2006 and the Argo Data Management Meeting in Tianjin, China on October 31-November 3, 2006. The Argo Trajectory Workshop convened to discuss details on how to generate data files in a standardized manner that facilitates joint analysis of trajectory data from various float types. The Data Management Meeting convened to discuss the status of the Argo program, address topics related to real-time data and delayed-mode data processing, and product development. Argo is an international program that calls for the deployment of 3,000 free drifting profiling floats, distributed over the global oceans, to measure the temperature and salinity in the upper 1,000-2,000 m of the ocean.

The 12th annual PIRATA (Pilot Research Moored Array in the Tropical Atlantic) meeting was jointly held at AOML and the University of Miami's Rosenstiel School on November 1-3, 2006. The goal of the meeting was to evaluate the current status of the PIRATA program, determine its future, and discuss the results of a recent review presented by the CLIVAR and Ocean Observations Panel for Climate (OOPC) communities. The PIRATA program is a collaboration between Brazil, France, and the United States. PIRATA aims to successfully maintain an array of ATLAS (Autonomous Temperature Line Acquisition System) moorings in the tropical Atlantic Ocean for use in weather and climate forecasting and climate research. The ATLAS array is also used to study ocean-atmosphere interactions in the tropical Atlantic that are relevant to regional climate variability on seasonal, interannual, and longer time scales.

Lewis Gramer and Derek Manzello of AOML's Ocean Chemistry Division participated in the 59th annual meeting of the Gulf and Caribbean Fisheries Institute in Belize City, Belize on November 6-11th. Gramer made presentations that highlighted the recent data integration efforts of the Integrated Coral Observing Network (ICON) program, implementation of web-compatible expert system software, and the use of ecological forecasting by marine protected area managers. Gramer also unveiled the newly designed ICON website, which allows users easy access to environmental data in near real-time. Manzello demonstrated the scientific capabilities of integrated data by presenting his research on environmental variables coincident with three widespread coral bleaching events from multiple reef sites in the Florida Keys since 1990.

Michael Black of the Hurricane Research Division attended a global positioning system (GPS) dropsonde redesign meeting at Keesler Air Force Base in Mississippi on November 28th. Current dropsondes are using ten-year old technology. The meeting convened to review and consider design criteria for an updated, next-generation dropsonde which is expected to cost less to produce, provide twice the wind resolution, and retain the same high performance in obtaining pressure, temperature, and humidity measurements. The final design should be completed by the end of 2007 and ready for production in 2008.



Invited participants at the November 7-8th Workshop on Hurricane and Climate Change Modeling in Boulder, Colorado gather for a group photo. The meeting brought together tropical cyclone and climate experts to discuss the impacts of greenhouse warming on tropical cyclones, the role of tropical cyclones in general climate, and how to improve understanding and predictive capability using regional climate models. AOML Director, Dr. Robert Atlas (first row, third from right), attended and made a presentation entitled "Modeling of hurricanes using the finite volume/general circulation model."

View Keynotes online: <http://www.aoml.noaa.gov/keynotes>

## Welcome Aboard

Carmen Alex joined the staff of AOML's Physical Oceanography Division in October to work as a research assistant for the Division. Alex will aid Division scientists investigate long-term signals in temperature fields and work with data from high density XBT transects obtained from the Atlantic Ocean. She holds a M.S. degree in earth sciences from the University of California.

Dr. Natchanon Amornthammarong joined the staff of AOML's Ocean Chemistry Division in November as a National Research Council post-doctoral research associate. Amornthammarong will work with Dr. Jia-Zhong Zhang to develop shipboard instrumentation for nutrient analysis in coastal and open ocean waters. He holds a doctoral degree in analytical chemistry from Mahidol University in Thailand.

Dr. Francis Bringas joined the staff of AOML's Physical Oceanography Division in October as a CIMAS research associate. Bringas will work with Dr. Gustavo Goni to create new oceanographic products for the Gulf of Mexico that are derived from hydrographic and satellite observations. He will also work to develop web pages for access to these new products. Originally from Cuba, Bringas received a doctoral degree at the University of Sao Paulo in Sao Paulo, Brazil.

Guilherme Castelao joined the staff of the Physical Oceanography Division in October to work with Dr. Gustavo Goni on processing and distributing real-time thermosalinograph data. Originally from Brazil, Castelao is a graduate student at the University of Miami's Rosenstiel School in the Division of Meteorology and Physical Oceanography. He is currently working towards completion of his doctoral dissertation.

Linda Pikula, Branch Chief of Public Services and Outreach for NOAA's Central and Regional Libraries, returned to AOML in December for family reasons to work out of the NOAA Miami Regional Library at AOML. Pikula served as a librarian at the Miami Regional Library for 17 years prior to her promotion to Branch Chief and subsequent move to Silver Spring, Maryland in April 2005.

## Farewell

Dr. HeeSook Kang, A CIMAS post-doctoral associate, completed a three-year appointment in December with AOML's Physical Oceanography Division. During her years with the Division, Kang worked on improving how data are assimilated into the HYbrid Coordinate Ocean Model (HYCOM), a project funded by the National Oceanographic Partnership Program. Kang has accepted a position with the University of Miami's Rosenstiel School where she will continue working on the HYCOM project.

## Congratulations

Five employees with AOML's Ocean Chemistry Division were honored on November 8th for winning Department of Commerce Gold and Silver Medals at the 58th Honor Awards Ceremony in Washington, D.C. The Gold Medal recipients included members of AOML's ocean carbon group (Rik Wanninkhof, Tsung-Hung Peng, Robert Castle, Betty Huss, and Esa Peltola), along with the ocean carbon group of NOAA's Pacific Marine Environmental Laboratory (PMEL) (Richard Feely, Christopher Sabine, Marilyn Roberts, Dana Greeley, and Catherine Cosca). These two groups were recognized for their 15 years of joint research and observations that have shown the oceans are becoming more acidic as a result of the uptake and storage of anthropogenic carbon dioxide. Ocean acidification adversely affects corals and a variety of marine life forms, which could have significant impacts on fisheries, tourism, and other ocean-related economies.

Shailer Cummings was part of a multi-line office team (Office of Oceanic and Atmospheric Research and the National Marine Fisheries Service) that received a Silver Medal for its crucial post-Hurricane Katrina field efforts to address NOAA's concerns regarding seafood safety in the Gulf of Mexico. The team was assembled and onsite shortly after the disaster. Using their combined expertise in oceanography, toxicology, and microbiology, hundreds of samples for analysis were collected around the clock and in the face of unknown contamination hazards. Their efforts helped ensure seafood was safe for public consumption, saving millions in potential fishery losses.

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A team of scientists with AOML's Hurricane Research Division were recently honored at the 2006 NOAA Awards ceremony in Washington, D.C., on October 13th. Dr. John Gamache, Peter Dodge, Joseph Griffin, Nancy Griffin, and Paul Leighton received an Administrator's Award for their efforts to develop algorithms and software to enable real-time analysis and transmission of wind fields and airborne Doppler radar data. These data, collected in the hurricane environment, will improve the initialization of a new generation of hurricane forecast models currently being developed.



NOAA's ocean carbon groups at AOML and PMEL received a Department of Commerce Gold Medal for their joint research at the 58th Honor Awards Ceremony. Pictured from left to right are: Dr. Rik Wanninkhof, Robert Castle, Dr. Tsung-Hung Peng, Esa Peltola (all with AOML), Dr. Richard Feely, Marilyn Roberts, Catherine Cosca, and Dr. Christopher Sabine (all with PMEL).



A Hurricane Research Division (HRD) team received an Administrator's Award for developing algorithms and software that will make it possible to collect real-time data in hurricanes. Pictured at the 2006 NOAA Awards ceremony are (left to right): NOAA Administrator VADM Conrad Lautenbacher, Peter Dodge, Dr. John Gamache, Paul Leighton (all three with HRD), and Dr. Richard Spinrad, Assistant Administrator for the Office of Oceanic and Atmospheric Research.

## Travel

Rick Lumpkin and Mayra Pazos attended a Data Buoy Cooperation Panel meeting in San Diego, California on October 16-20, 2006.

Reyna Sabina and Claudia Schmid attended the 7th Argo Data Management Team Meeting in Tianjin, China on October 31- November 3, 2006.

Robert Rogers attended the 6th GPM (Global Precipitation Measurement) International Workshop in Annapolis, Maryland on November 6-8, 2006.

Pamela Fletcher, Lewis Gramer, and Derek Manzello attended and made presentations at the 59th Gulf and Caribbean Fisheries Institute Conference in Belize City, Belize on November 6-11, 2006.

Robert Atlas was an invited participant at the Workshop on Hurricane and Climate Change Modeling in Boulder, Colorado on November 7-8, 2006.

Kelly Goodwin attended the Florida Marine Biotechnology Summit V in Gainesville, Florida on November 14-15, 2006.

David Enfield was an invited participant and presenter at the Multidecadal to Centennial Climate Variability Workshop in Honolulu, Hawaii on November 15-17, 2006.

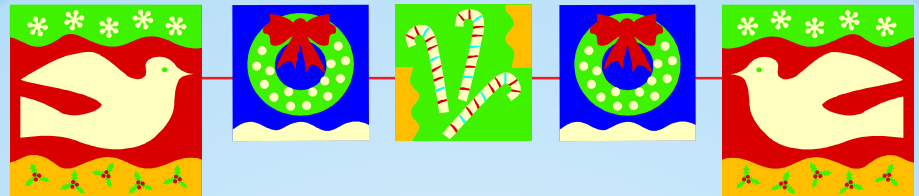
Sim Aberson and Peter Black attended the Sixth International Workshop on Tropical Cyclones in San Jose, Costa Rica on November 21-30, 2006.

Judith Gray and Claudia Schmid attended an Argo capacity building meeting and training session in Accra, Ghana on December 5-7, 2006.

Rik Wanninkhof attended the Second Annual Carbo-Ocean meeting in Las Palmas, Canary Islands on December 4-8, 2006.

Robert Kohler attended a review meeting of NOAA's Office of High Performance Computing and Communications in Silver Spring, Maryland on December 4-8, 2006.

Chunzai Wang attended the Fall Meeting of the American Geophysical Union in San Francisco, California on December 11-15, 2006.



# AOML Holiday Party

December 8, 2006

Lobby — 12:00 Noon

*Bring a covered dish or dessert  
to share with others*

*Price: \$9.00 per person  
(includes turkey, ham, chicken,  
mashed potatoes, side dishes, and more...)*

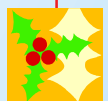
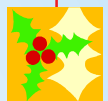
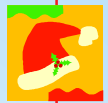
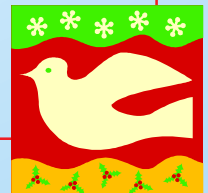
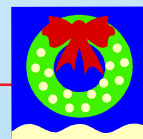
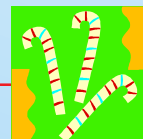
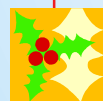
*Raffle drawing with prizes*

*To register or for more info contact:*

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