

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

Hurricane Field Program Nets Goldmine of Data

The busy 2010 Atlantic hurricane season provided ample opportunity for tropical systems to be studied and observed. Researchers with AOML's Hurricane Research Division (HRD) logged close to 420 hours aboard NOAA aircraft this past summer, gathering data from nine tropical systems and three Gulf ocean survey missions as part of their annual field program. The most noteworthy datasets included sampling efforts into Hurricanes Earl and Karl.

Hurricane Earl became the most intensively sampled life cycle for a tropical cyclone of all time. HRD researchers gathered nearly continuous inner-core and environmental observations of Earl over an eight-day period, including Earl's 36-hour mushrooming from tropical storm to category 4 hurricane. Capturing Earl's rapid intensification fulfilled a major goal of HRD's Intensity Forecast Experiment, aimed at improving the understanding and prediction of hurricane intensity change.

Data gathered in Hurricane Karl included Global Positioning System (GPS) dropsonde measurements collected several days prior to the National Hurricane Center declaring Karl a tropical cyclone. Aircraft from partnering experiments, the National Aeronautics and Space Administration's GRIP (Genesis and Rapid Intensification Processes) and National Science Foundation's PREDICT (PRE-Depression Investigation of Cloud systems in the Tropics) campaigns, also flew missions into Karl for several days prior to its development, providing the best dropsonde coverage to date of a tropical cyclogenesis case.

Additional data were gathered in Earl and Karl from the NASA Global Hawk unmanned aerial aircraft. Flying at an altitude of 60,000 feet, the Global Hawk successfully overflew the inner core and surrounding environment of both hurricanes, demonstrating the capability for long-duration, high-altitude measurements.

2010 Hurricane Season Ends with Minimal Impact to U.S.

November 30th marked the official end of the six-month long Atlantic hurricane season, likely to be remembered as one of the most active but mildest seasons on record for the United States. A total of 19 named storms developed, of which 12 strengthened into hurricanes with five becoming major hurricanes (winds above 110 mph—Danielle, Earl, Igor, Julia, and Karl).

NOAA accurately predicted that 2010 would be a hectic year for tropical cyclone activity due to several environmental factors. The La Niña weather pattern in the tropical Pacific brought reduced wind shear to the Atlantic basin, while record warm sea surface temperatures across the tropical Atlantic Ocean and Caribbean Sea provided the fuel for storms to generate and intensify. The ongoing active phase of the multi-decadal signal, which is believed to have contributed to enhanced storm activity in the Atlantic since 1995, was also a factor in NOAA's May and August seasonal outlooks.

Despite the large number of storms that formed in 2010, now ranked amongst the top five busiest years on record, only two weak systems impacted the U.S. Tropical Storm Bonnie brought a day of inclement weather

2010 Atlantic Named Storms			
Activity Type	2010 Season	NOAA Outlook	Average Season
Tropical storms	19	14-20	11
Hurricanes	12	8-12	6
Major hurricanes	5	4-6	2

to south Florida in late July, while Tropical Storm Hermine soaked portions of Texas in early September after the system made landfall along the U.S.-Mexican border.

Remarkably, the U.S. was spared from landfalling hurricanes, although Hurricane Earl brought flooding and blustery weather to eastern seaboard communities on its trek towards Nova Scotia. Since records began in 1851 there has never been a season with so many hurricanes and not a single U.S. landfall.

The combination of an eastward displacement of the Bermuda High (a large area of high pressure over the Atlantic) and a series of low pressure systems that moved off the eastern U.S. throughout the summer deflected many of the season's storms away from the U.S. mainland. Most of these storms dissipated at sea, a threat only to shipping interests.



Hurricanes Karl, Igor, and Julia, all of which achieved major hurricane status during their life cycle (winds above 110 mph on the Saffir-Simpson scale), are shown churning in the Atlantic on September 16th. Karl crossed the Yucatan Peninsula as a tropical storm, regained strength, and then made landfall in Belize as a powerful category 3 hurricane. Igor, which became one of the largest hurricanes on record, sideswiped Bermuda before causing widespread damage and flooding in southeast Newfoundland as a category 1 hurricane. Julia underwent rapid intensification on September 15th, with top winds reaching 135 mph, but remained at sea and harmlessly dissipated several days later.

AOML Hosts Workshop Aimed at Improving Hurricane Forecasts

AOML hosted a workshop for the Joint Center for Satellite Data Assimilation-Hurricane Forecast Improvement Program (JCSDA-HFIP) on December 2-3, 2010. More than 50 participants from the satellite data, numerical weather prediction, and hurricane forecast communities, including members of AOML's Hurricane Modeling and Data Assimilation Groups, attended to review the current status of satellite data assimilation as applied to hurricane prediction. AOML Director Dr. Bob Atlas, one of five workshop organizers, welcomed them to the Laboratory and chaired the session on future directions.

The Joint Center for Satellite Data Assimilation is tasked with increasing and improving the use of satellite data and related research in operational environmental assimilation and prediction applications. NOAA's Hurricane Forecast Improvement Program seeks to improve the accuracy and reliability of hurricane forecasts and to extend the lead time for hurricane forecasts with increased certainty.

Workshop sessions were structured along three general topics:

- Current models and data assimilation systems currently used for hurricane prediction;
- Satellite data currently used for hurricane prediction; and
- Identification of shortfalls and strategies/directions for closing them.



Attendees of the Joint Center for Satellite Data Assimilation-Hurricane Forecast Improvement Program Workshop gathered in the AOML lobby for a group photo on December 3rd.

Each session featured several invited presentations followed by a discussion period. After the sessions concluded, working group discussions developed recommendations for future satellite data assimilation activities in support of hurricane forecasting. Among the key recommendations were:

- The 3D VAR (three-dimensional variational) data assimilation system is no longer adequate.
- Synthetic vortex versus assimilation: both should be consistent with all available satellite (and other) data.
- More effective use of satellite imagery and atmospheric motion winds are needed, as well as quantitative data from polar-orbiting satellites.

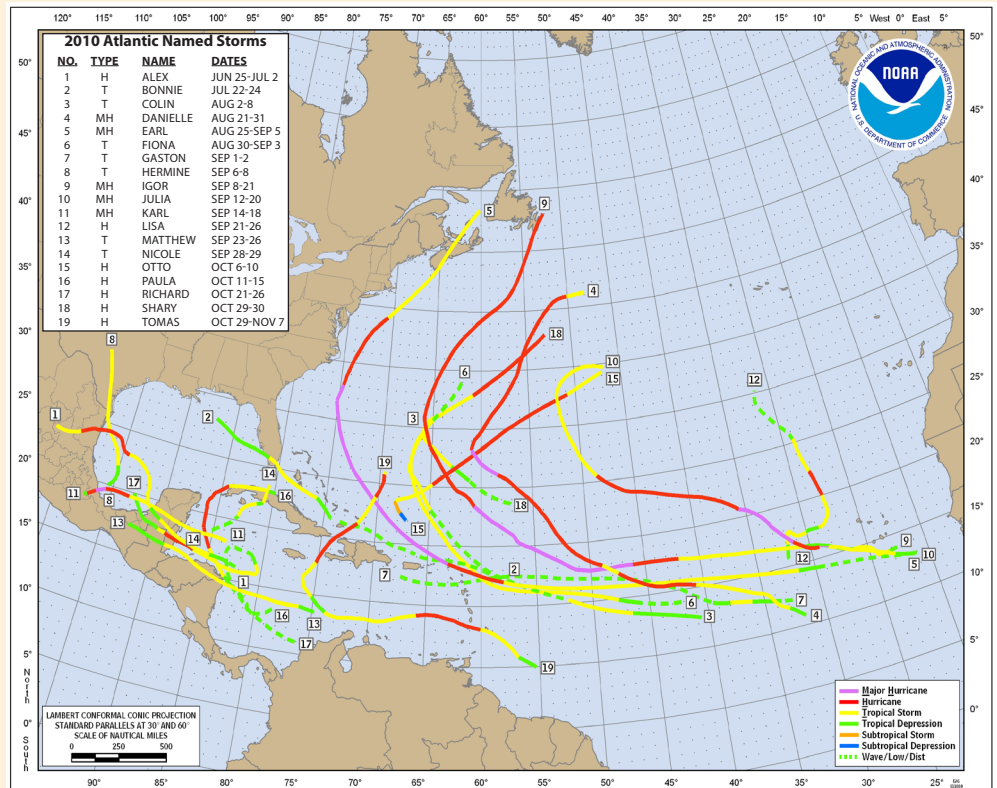
- Perturbations to model initial conditions should reflect uncertainties where little or no data are available to define the initial representation of the vortex.
- Model initial conditions should be displayed as imagery.
- Wind profile observations represent the most significant need for future observations.
- Assimilation of data retrievals from AIRS and other hyper or ultra-spectral sounder instruments should be tested.
- ASCAT data should be assimilated and the use of backscatter field should be considered.

These recommendations will be included in the Final Report compiled by the workshop's organizing committee.

The 2010 Atlantic hurricane season lived up to NOAA's expectations of being an active year. Unprecedented sea surface temperatures and the La Niña weather pattern both conspired to making conditions favorable for storm development. With 19 named storms to its credit, 2010 will make it into the recordbooks as one of the top five busiest seasons ever observed.

In spite of having been an active year, however, no landfalling hurricanes impacted the U.S. Acting as a shield were the Bermuda High (a large area of high pressure located over the eastern Atlantic) and a succession of low pressure systems that moved off the east coast throughout the summer.

Thanks to these protective barriers, many of the season's hurricanes—Danielle, Earl, Igor, Julia, Lisa, Otto, and Shary—were deflected away from the U.S., making 2010 the most active season on record without a U.S. hurricane landfall. The U.S. has thus evaded landfalling hurricanes for two consecutive years, a trend not likely to last.



Heat Stress to Caribbean Corals in 2005 Worst on Record

Coral reefs suffered record losses as a consequence of high ocean temperatures in the tropical Atlantic and Caribbean in 2005 according to the most comprehensive documentation of basin-scale bleaching to date. Collaborators from 22 countries, including coral researcher Jim Hendee of AOML's Ocean Chemistry Division, reported that greater than 80% of the corals surveyed had undergone bleaching and that over 40% of the total surveyed corals died, making this the most severe bleaching event ever recorded in the basin. The study appears in *PLoS ONE*, an international, peer-reviewed, open-access online publication.

Satellite-based tools from NOAA's Coral Reef Watch Program guided site selection for field observations conducted across the greater Caribbean region from June to October 2005. Field surveys of bleaching and mortality in this study surpass prior efforts in both detail and extent.

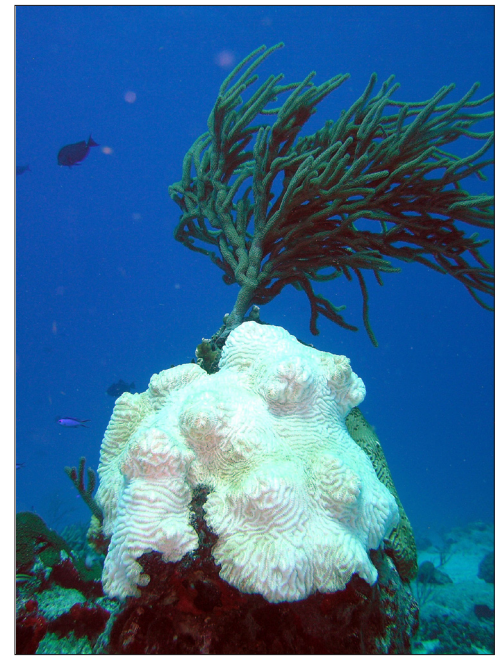
This study also substantially raised the standards for documenting the effects of bleaching and for testing satellite and forecast products. Coral bleaching occurs when stress causes corals to expel their symbiotic algae, or zooxanthellae. If prolonged or particularly severe, it may result in coral death.

"Heat stress during the 2005 event exceeded any observed in the Caribbean in the prior 20 years, and regionally-averaged temperatures were the warmest in at least 150 years," said C. Mark Eakin, Ph.D., coordinator of NOAA's Coral Reef Watch Program. "This severe, widespread bleaching and mortality will undoubtedly have long-term consequences for reef ecosystems, and events like this are likely to become more common as the climate warms."

Through this survey, several species and localities reported bleaching for the first time, including the first known bleaching of any kind in Saba, the first documented mass bleaching at the Flower Garden Banks National Marine Sanctuary, and the first reported mass bleaching in the Virgin Islands National Park of *Acropora palmata*, a species listed as threatened under the U.S. Endangered Species Act in 2006.

The Caribbean is suffering severe bleaching again this year and, in some locations, this bleaching event is worse than the event in 2005. Not only are temperatures causing further damage to reefs hit hard during the 2005 event, but new locations have also been impacted.

The decline and loss of coral reefs have significant social, cultural, economic, and ecological impacts on people and communities throughout the world. As the "rainforests of the sea," coral reefs provide economic services—jobs, food, and tourism—estimated



A bleached coral reef colony in the Paradise Reef of Cozumel, Mexico (October 2006).

to be worth as much as \$375 billion each year.

This research was supported by the NOAA Coral Reef Conservation Program. Its research and monitoring program covers all shallow-water and deep-water coral reef ecosystems under the jurisdiction of the United States and is intended to inform resource managers, scientists, policymakers, and the public.

Adapted from a November 15, 2010 NOAA press release.

Researchers Chris Sinigalliano and Maribeth Gidley of AOML's Environmental Microbiology Program, along with student intern Lisa Johns, participated in a two-week Oceans and Human Health (OHH) cruise aboard the R/V *F.G. Walton-Smith* in December. Dr. Larry Brand of the University of Miami's Rosenstiel School served as the Chief Scientist.

Similar to past OHH research cruises, this cruise investigated the discharge of land-based sources of pollutants (including microbial contaminants) to the coastal zone of the southwest Florida Shelf, studied environmental factors influencing harmful algal blooms, and investigated the bioaccumulation of cyanobacterial BMAA (beta-methylamino-L-alanine) neurotoxins in marine invertebrates, crustaceans, and fish.

Despite rough weather, heavy seas, and a bitter cold snap with gusting gale force winds that broke the anchor chain, a variety of important data were gathered both with offshore CTD (conductivity-temperature-depth) transects and with numerous small boat sampling excursions up various rivers and estuaries, including the Myakka River, Peace River, Pine Island Sound and Matlache Pass, the Cape Coral residential canals, Charlotte Harbor, Estero Bay, Faka Union Canal, and the Shark River.

Upper image: Researchers bundled in multiple layers of clothing and foul-weather gear board the small boat *Tatiana* in rough weather for a two-mile ride to shore to collect water samples from the Faka Union River and Faka Union Canal for analysis of microbial pollutants, pathogens, harmful algae, and nutrient loading. Guest researchers from the Defenders of Wildlife organization also conducted census observations of native waterfowl and other bird species.

Bottom image: Troy Fulford, third mate aboard the R/V *F.G. Walton-Smith*, catches a Spanish mackerel during a transect just offshore of Key West, Florida, to be tested for bioaccumulation of the cyanobacterial toxin BMAA. This potent neurotoxin, produced by a wide variety of cyanobacteria, can magnify up the food chain, reaching high concentrations in some predator fish, as well as achieving high concentrations in certain marine invertebrates, especially warm water crabs. OHH cruises like this one have found the presence of BMAA in an increasing variety of seafood. Ongoing research has implicated this toxin as potentially contributing to a variety of human neurological disorders.



Collaborative Research between PhOD and SEFSC Presented at Bluefin Tuna Workshop

A joint workshop hosted by NOAA and the National Aeronautics and Space Administration (NASA) for bluefin tuna research was held at the University of Miami on December 6-7th. Researchers with AOML's Physical Oceanography Division (PhOD) presented the results of their collaborative efforts with NOAA's Southeast Fisheries Science Center (SEFSC), which have focused on the link between the ocean and stock assessment species of relevant commercial importance.

Although the Atlantic bluefin tuna (*Thunnus thynnus*) is widely distributed, spawning in the western Atlantic has been recorded predominantly in the Gulf of Mexico from April to June. While bluefin tuna can better tolerate colder waters than other tropical tunas, they are adversely affected by warm water (>28°C) and avoid warm features in the Gulf of Mexico such as the Loop Current.

The IPCC-AR4 climate model simulations for the 20th century, mid 21st century, and late 21st century (graphic at right) indicate that the preferred spawning habitat of bluefin tuna may be profoundly reduced in area (yellow/orange) due to the impact of anthropogenic global warming (AGW). However, since the IPCC-AR4 models have a very coarse resolution, the simulated changes in the strength, position, and eddy-shedding characteristics of the Loop Current, which are important factors for the upper ocean temperature response to the changing climate, are not realistic. AOML scientists are collaborating with Barbara Muhling and John Lamkin of SEFSC to explore this issue.

Yanyun Liu and Sang-Ki Lee of PhOD presented a regionally-enhanced view of potential future changes in the Gulf of Mexico under the impact of AGW. The highlight of their results is that the Loop Current may be

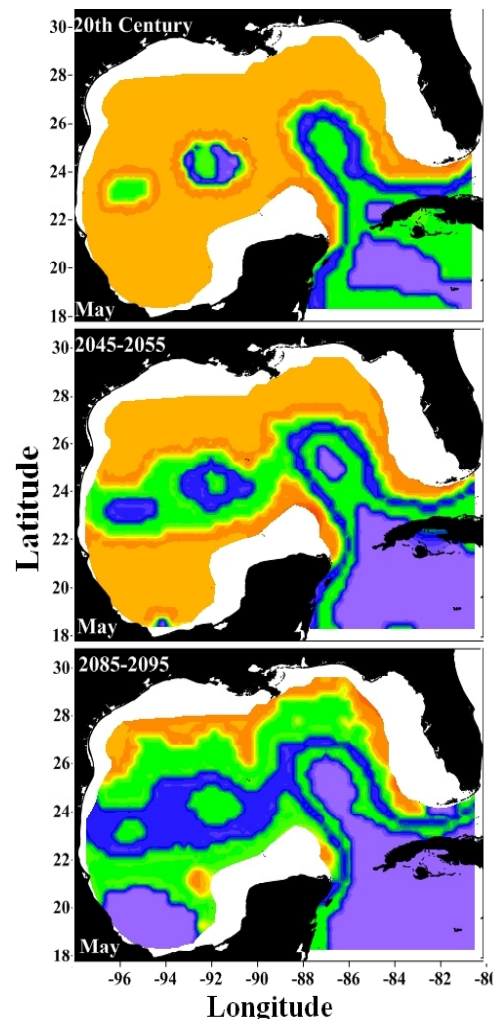
drastically reduced by as much as 20% by the late 21st century, resulting in a mitigation of AGW-induced surface warming, particularly in the northern Gulf of Mexico, a known spawning ground for Atlantic bluefin tuna. AOML researchers will continue their collaboration with SEFSC to further refine these projections using additional data and improved ocean modeling techniques.

David Lindo, Francis Bringas, and Gustavo Goni, all with PhOD, together with Barbara Muhling of SEFSC, also made a presentation to report new results on the application of altimeter satellite-derived observations to bluefin tuna research in the Gulf of Mexico. Given the strong link between temperature and salinity in habitats, the main mesoscale features are related to larvae distribution of six fish species, bluefin tuna among them.

Time series of the northernmost and westernmost locations of the Loop Current and a ring census were obtained from altimetry fields and related with spring larvae distributions from January 1993 to December 2008. Altimetry fields and fishery surveys indicate that when the Loop Current is farther to the south, larvae are more abundant in the eastern Gulf of Mexico than in the central and western portions of the basin.

Analysis made from 23 rings shed by the Loop Current during the study period indicate that warm-core rings shed by the Loop Current are generally less likely to contain larvae. Associations between the inner and outer regions of mesoscale features and larval catches show higher bluefin tuna abundances in the boundaries and frontal areas of anticyclonic and cyclonic regions.

Collaborative work will continue between AOML and SEFSC to analyze the link between ocean features and stock assessment.



IPCC projected changes of bluefin tuna's spawning habitat in the Gulf of Mexico due to anthropogenic global warming for three time frames: top (late 20th century), (middle) mid 21st century, and (bottom) late 21st century. The colors indicate preferred spawning habitat, with yellow/orange for favored locations and blue/purple for non-ideal regions. Liu and Lee's research indicates that the area of spawning habitat for the bluefin tuna may not be as drastically reduced as in the IPCC results shown in these figures.

CHAMP Page Gets an Update

Coral researchers with AOML's Ocean Chemistry Division premiered an updated web site for the Coral Health and Monitoring Program (CHAMP) in November. The new CHAMP site expands upon the previous version in that it provides information about coral research conducted at AOML in relationship to climate change, coastal pollution, fishing impacts, and physical oceanography. In the coming months, new content will continue to be added to the site, including video footage of an Integrated Coral Observing Network (ICON) station pylon being constructed and installed on the ocean floor.

The CHAMP web page bears the distinction of having been the first web site ever created at AOML. It was developed by AOML oceanographer Jim Hendee and information technology specialist Louis Florit. The CHAMP web site was also the first coral reef-related web site in the world and one of only about 3000 web sites accessible globally when it was originally launched in August 1994, a time when the Internet and World-Wide Web were emerging new technologies.

The new CHAMP web page can be visited at <http://www.coral.noaa.gov/>

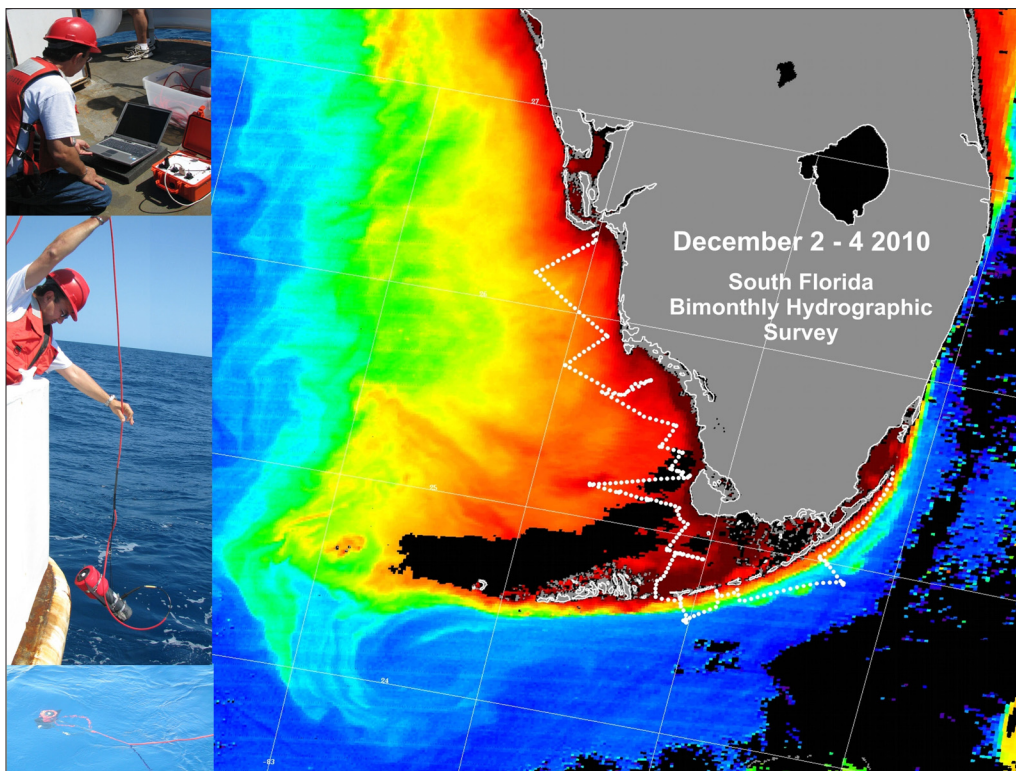
Bio-Optical Profiling Added to Suite of Data Gathered by South Florida Program

Bio-optical profiling was recently added to the regular shipboard measurements gathered by AOML's South Florida Program (SFP) as part of a new two-year project with the University of South Florida (USF). The project, *Early Warning 4-D Remote Sensing System to Assess Synoptic Threats to Coastal Ecosystems of Florida and of Adjacent States and Nations*, is a collaborative effort between USF lead principal investigator Dr. Frank Muller-Karger and co-principal investigator Dr. Libby Johns of AOML, among others.

Bio-optical profiles were collected by Nelson Melo of AOML's Physical Oceanography Division (PhOD) during a three-day cruise to the Florida Keys and southwest Florida shelf aboard the University of Miami's R/V *F.G. Walton Smith* on December 2-4, 2010. This cruise was part of an ongoing series of bimonthly cruises conducted by AOML's SFP since the mid 1990s.

Sea surface temperature, salinity, chlorophyll, and Chromophoric Dissolved Organic Matter (CDOM) fluorescence have been routinely measured along the ship track of these cruises using a continuous flow-through seawater system. The new bio-optical data are obtained using a Profiling Reflectance Radiometer to characterize the underwater light transmission at eight optical channels of downwelling irradiance and upwelling radiance, from ultraviolet to visible wavelengths, over water depths of up to 50 m. The bio-optical observations will be used to examine the factors that affect light penetration and its availability to the benthos.

PhOD researchers will share the in situ optical data with colleagues at USF for use in improving and fine-tuning algorithms for interpreting ocean color imagery in the shallow waters of the Florida Keys and southwest Florida shelf. The USF Remote



Left vertical column: bio-optical profile data collection efforts from aboard the R/V *F.G. Walton Smith*. Right satellite image: ocean color of south Florida's coastal waters. Red/orange tones denote areas of high chlorophyll, while blue/purple tones denote areas of low chlorophyll. The December 2010 cruise track is superimposed in white. Note that the shallow inshore areas are associated with the highest chlorophyll values.

Sensing Group will use the optical profiles to improve algorithms for interpretation of satellite ocean color in Florida's "Case II" waters, i.e., shallow, nearshore waters where ocean color can be difficult to interpret. With the improved algorithms they will be able to differentiate and quantify chlorophyll, CDOM, organic and inorganic particulates, and other water quality parameters from satellite observations of ocean color.

PhOD researchers will collaborate with USF regarding data collection protocols, data processing and analysis techniques, and the interpretation of observed variability as it relates to south Florida ecosystem health. Specifically, the bio-optical profiling and the other surface water quality parameters

will be measured to (1) quantify the three-dimensional light environment in south Florida coastal waters, (2) assess baseline and time-varying water quality attributes, and (3) validate satellite ocean color imagery for use as an interpretive and predictive tool for resource managers.

The combination of in situ observations and remote sensing will enhance our ability to detect and interpret environmental events such as algal blooms, coral bleaching, advection of water from remote sources, water clarity and turbidity changes, and/or the arrival of oil spills and other pollutants that can potentially harm coral reefs and other south Florida coastal ecosystems.

A group of science counselors and embassy staff from the European Union Delegation to the U.S. visited AOML on Friday, December 10th to discuss opportunities for collaboration. Representatives from Belgium, the Czech Republic, and Germany met with AOML leadership and scientists for round-table discussions and program overviews. The group's leader, Dr. Astrid-Christina Koch, represents the European Commission Directorate General for Research. Dr. Koch presented opportunities for NOAA researcher involvement in their program including an invitation to serve as reviewers and participation in an exchange program to facilitate international collaboration.



Alan Leonardi (AOML), AOML Director Bob Atlas, Astrid-Christina Koch (Science Counselor, European Union), Rik Wanninkhof (AOML), Christopher Kelble (AOML), Joseph Cione (AOML), Bart Deelen (Embassy of Belgium), and Martin Pizinger (Embassy of the Czech Republic) met at AOML on December 10th to discuss collaborative research opportunities.

PhOD and NWS Researchers Meet to Improve Meteorological and Physical Oceanography Observations

The Fourth Port Meteorological Officers (PMO) International Workshop was organized by the World Meteorological Organization and held in Orlando, Florida, on December 8-10th. Meteorologists and oceanographers from more than 15 countries participated. Researchers with AOML's Physical Oceanography Division (PhOD) also attended, including Gustavo Goni, Rick Lumpkin, Francis Bringas, Caridad Gonzalez, Shaun Dolk, Robert Roddy, and Diana Aranda. The major objective for this workshop was to enhance and promote synergies between the different ocean observing system components relying on ship logistics.

For the AOML participants, the meeting had two specific objectives, the first being to strengthen the National Weather Service-AOML partnership for enhancement of the Shipboard Environmental data Acquisition System (SEAS) software. The SEAS software, developed and maintained by AOML, gathers oceanographic and atmospheric data from a global network of research and merchant vessels participating in NOAA's Ship of Opportunity and Volunteer Observing Ship programs. It is also used by agencies such as the U.S. Coast Guard for search and rescue operations.

The second objective was to reinforce and discuss ongoing joint strategies for AOML, PMOs, and the international community to recruit volunteer ships. The successful recruitment of a volunteer ship provides increased meteorological and oceanographic observations.

The combination of these two objectives strengthened the availability of quality data



Participants of the Fourth Port Meteorological Officers International Workshop, including researchers with AOML's Physical Oceanography Division and a special guest from the Arctic, gathered for a group photo in Orlando, Florida.

for climate studies and for analysis and insertion into numerical models to generate marine weather forecasts.

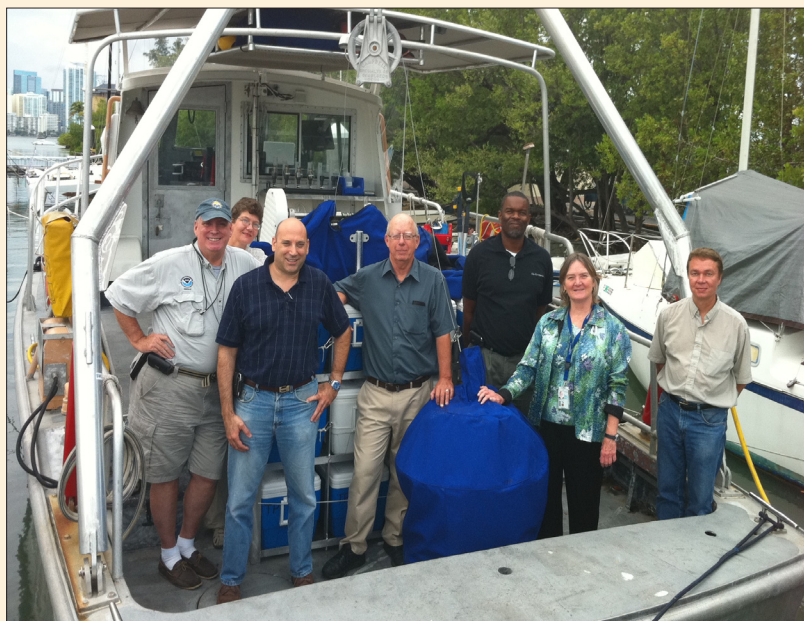
PhOD researchers made presentations about the Ship of Opportunity Program (Goni and Bringas), recent updates to the SEAS software (Gonzalez), the Global Drifter Program (Lumpkin and Dolk), and Argo float deployments (Roddy). PhOD presenters also addressed the need to improve volunteer ship recruiting strategies for the deployment of expendable bathythermographs, surface drifters, and profiling floats and to strengthen the interaction between the PMOs and AOML's recruiting efforts. The meeting was an invaluable aid in augmenting communica-

tion between the PMO community and PhOD to accomplish the goals and requirements of the global ocean observing system.

During the workshop, AOML personnel recognized many of the PMOs that work hard in support of NOAA's ocean observing efforts: Lori Evans (Baltimore, Maryland); Tim Kenefick (Charleston, South Carolina); Robert Niemeyer (Jacksonville, Florida); David Dellinger (Fort Lauderdale, Florida); Jim Luciani (New York, New York); Peter Gibino (Norfolk, Virginia); Fergus McKay (Durban, South Africa); Sydney Marais (Cape Town, South Africa); and Paula Rychtar (New Orleans, Louisiana).

Researchers in AOML's Ocean Chemistry Division (OCD) met with Steve Joseph of the City of Hollywood and Vin Morello of Broward County on November 1st to discuss the ongoing FACE (Florida Area Coastal Environment) project being funded by Hollywood and Broward County. Following the meeting, a tour was given of the R/V *Hildebrand*, a 41-foot vessel acquired by AOML in 2009 for use as a data-sampling platform for the FACE program and other coastal research projects. The FACE project is one of several research efforts within OCD's Coastal Ocean program designed to provide managers, policymakers, the public, the scientific community, and other stakeholders with information about human impacts affecting the quality and value of coastal ecosystems in south Florida and other tropical and subtropical areas.

Pictured aboard the R/V *Hildebrand* from left to right are Joe Bishop (AOML), Maribeth Gidley (AOML), Vin Morello (Broward County Division of Water and Wastewater Engineering), Tom Carsey (AOML), Steve Joseph (City of Hollywood Utilities Administration), Michelle Wood (AOML), and Esa Peltola (AOML).



Congratulations

Tsung-Hung Peng, a supervisory oceanographer with AOML's Ocean Chemistry Division (OCD), retired in December after 16 years of federal service. During his time at AOML, Peng conducted research on the global carbon cycle; in particular, the global distribution and inventory of anthropogenic carbon in the oceans.



Originally from Taiwan, Peng earned a Ph.D. in geochemistry from Columbia University in 1973. He subsequently became a research associate at the Lamont-Doherty Earth Observatory in Palisades, New York, working closely with climate science pioneer Wallace Broecker. Together with Broecker, Peng coauthored numerous articles and two books including *Tracers in the Sea*, widely regarded as one of the definitive textbooks written on chemical oceanography. Peng relocated to Oak Ridge, Tennessee in 1981 to become a researcher with the Environmental Sciences Division of the Oak Ridge National Laboratory.

In 1995, he joined the staff of AOML's Ocean Chemistry Division (OCD). Peng augmented his duties as a senior scientist in 2003 by becoming the OCD director, a position he held for three years. He received a U.S. Department of Commerce Gold Medal in 2006. Peng was a member of a research team recognized for its meticulous, long-term observations that showed the oceans were becoming more acidic due to the uptake and storage of anthropogenic carbon dioxide.

A new grandfather, Peng looks forward to spending time with Micah Jeffrey Yu-An and Hailee Grace Yu-Hui Peng, both born on December 3rd.

Alan Leonardi, AOML's Deputy Director, has been appointed to serve as an Adjunct Graduate Faculty member at James Madison University in Harrisonburg, Virginia. Leonardi will work primarily with the University's Department of Integrated Science and Technology. For the past 17 years, James Madison University has ranked as one of the nation's best public master's level universities in the south.



AOML Hurricane Research Director to Receive AMS Suomi Award

Frank Marks, Ph.D., director of AOML's Hurricane Research Division, will receive the prestigious Verner E. Suomi Award by the American Meteorological Society (AMS). Marks will receive the Suomi medallion at the AMS 91st Annual Meeting in Seattle, Washington on January 26, 2011.

The Suomi award is presented in recognition of highly significant technological achievement in the atmospheric or related oceanic and hydrologic sciences. The 14th recipient of the prestigious award, Marks is being honored for his creative use of airborne Doppler radar and other technologies to advance understanding of the dynamics of tropical cyclones.

"I am delighted and extremely proud that the AMS has recognized Dr. Marks for his landmark contributions to airborne Doppler radar observations," said AOML Director Dr. Robert Atlas. "His vision and passion to develop and apply Doppler radar technology for tropical meteorology field research has allowed for tremendous improvement in understanding hurricane structure and rainfall, benefiting the scientific community and the nation."

Marks began his career with NOAA after earning his master's and doctoral degrees in meteorology from the Massachusetts Institute of Technology in Cambridge, Massachusetts. He has worked as a research meteorologist in AOML's Hurricane Research Division since 1980 and as the division director since 2003.

Over the course of his career, Marks has flown more than 200 research missions in



tropical cyclones aboard NOAA's hurricane hunter aircraft, the flying laboratories that carry the radar he helped develop and establish as an integral hurricane observation tool. His research focus is in radar remote sensing—ground-based, airborne and spaceborne—of tropical cyclones and mesoscale convective systems to understand the storm kinematic and precipitation structure.

"I am deeply honored by this recognition and want to recognize all of my colleagues within NOAA who helped to make it possible, especially those who maintain and operate the research aircraft and whose dedication and skill made my accomplishments possible," Marks said.

In addition to the Suomi Award, Marks has received other awards during his tenure with NOAA, including many for his outstanding performance as a federal manager and leader in the scientific community.

AOML hosted a health fair for NOAA's Miami federal employees on November 12th. Representatives from various health care providers distributed materials and information and were available for private consultation to answer questions and/or address concerns. Free blood pressure readings were offered, along with complimentary 10-minute chair massages performed by students from the Miami-Dade College massage therapy program. Thanks to AOML's Howard Friedman, who organized the event to provide NOAA's Miami federal employees with a convenient venue to "shop" for health care information.



Massage therapy students from Miami-Dade College provided free chair massages to participants of the NOAA-Miami Health Fair hosted at AOML on November 12th. AOML Director Dr. Bob Atlas (above center) took advantage of the opportunity by taking a few minutes out of his busy schedule to relax and destress.

Happy
Holidays

Happy Holidays 2010!



AOML hosted its annual holiday party on December 7th. Friends and coworkers gathered in the lobby to mix, mingle, and enjoy a turkey dinner with all the trimmings. Adding to the festivities were AOML's holiday musicians guided by Jack Stamates, an oceanographer with the Ocean Chemistry Division. String players (Jack Stamates/Gail Derr/Erica Rule—violin, Stanley Goldenberg—viola, Lindsey Visser—cello) played traditional tunes, while Rick Lumpkin offered up a bit of *Jingle Bell Rock* on electric blues guitar. A rare performance by the Mid-Atlantic Ridgerunners featured Jack Stamates on fiddle and Jules Craynock on the Gibson Mastertone five-string banjo. Santa Claus (Michael Shoemaker) also made a special guest appearance, pictured to the left with Chloe Kelble, the youngest member of AOML's extended family. Santa departed AOML amidst a lobby full of dancers. In between the music, singing, dancing, and eating, raffle prizes were awarded. The happy event was organized by AOML's Buoy and Gulls club.

Travel

Kevin Helmle attended the 2010 annual meeting of the Geological Society of America in Denver, Colorado on November 1-3, 2010.

Silvia Garzoli and Gustavo Goni attended a planning meeting for the new NOAA Climate Service in Charleston, South Carolina on November 3-5, 2010.

Alan Leonardi attended a meeting of the Northern Gulf Institute Executive Council in Washington, DC on November 8-9, 2010.

Michael Jankulak and Rachel Kotkowski serviced the Integrated Coral Observing Network (ICON) station in La Parguera, Puerto Rico on November 8-12, 2010.

Derek Manzello and Dwight Gledhill attended a workshop for NOAA's Coral Reef Monitoring Plan in Silver Spring, Maryland on November 15-18, 2010.

Robert Rogers attended the 7th International Workshop on Tropical Cyclones hosted by the World Meteorological Organization in La Reunion, France on November 15-20, 2010.

Chunzai Wang was an invited speaker at the New Strategies for Evaluating ENSO (El Niño/La Niña Southern Oscillation) Processes in Climate Models Workshop in Paris, France on November 17-19, 2010. He also attended a meeting of NOAA's Modeling, Analysis, Predictions, and Projections (MAPP) program in Washington, DC on December 2-3, 2010.

Kelly Goodwin attended an Integrated Ecosystem Assessment meeting for the California Current in Long Beach, California on December 7, 2010.

Diana Aranda, Francis Bringas, Shaun Dolk, Gustavo Goni, Caridad Gonzalez, Rick Lumpkin, and Robert Roddy attended the Fourth International Port Meteorological Officers Workshop in Orlando, Florida on December 8-10, 2010.

Silvia Garzoli and Claudia Schmid attended a U.S. Argo Science and Implementation Panel meeting in Seattle, Washington on December 8-10, 2010.

Robert Atlas, Dwight Gledhill, Derek Manzello, Paul Reasor, Tomislava Vukicevic, Chunzai Wang, and Michelle Wood attended the American Geophysical Union's Fall Meeting in San Francisco, California on December 13-17, 2010.

Recent Publications*

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*AOML authors are denoted by capital letters.

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HAPPY NEW YEAR!