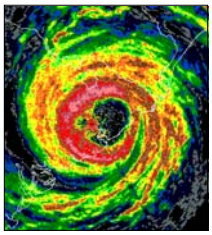
AOML Keynotes
Miami, Florida

July-August 2004 Atlantic Oceanographic and Meteorological Laboratory Volume 8, Number 4

## NOAA Reaffirms Likelihood of Active Season

NOAA issued an updated hurricane forecast for the Atlantic basin on August 10th, reaffirming its May 17th forecast that called for the likelihood of an active season. Hurricane specialists with the Climate Prediction Center, National Hurricane Center, and AOML's Hurricane Research Division (Christopher Landsea and Stanley Goldenberg) said a 90% probability existed that the remainder of the June 1-November 30th season would be marked by above-to-near normal levels of storm activity.



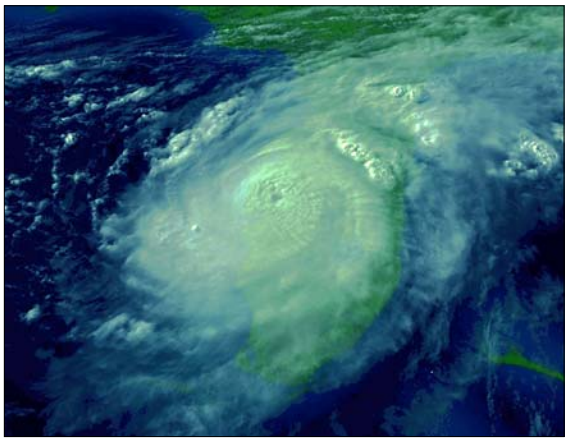
Twelve to 15 tropical storms are expected to form, with six to eight of these storms developing into hurricanes. Two to four hurricanes are predicted to become major hurricanes with sustained wind speeds of at least 110 mph.

Environmental conditions driving the forecast include the active phase of the Atlantic multi-decadal signal and a continuation of warmer than normal sea surface temperatures in the tropical Atlantic Ocean and Caribbean Sea. The active phase of the Atlantic multi-decadal signal, which began in 1995, has been a primary factor in the increased amount of hurricane activity observed since that time. Some uncertainty exists in the forecast about whether weak El Niño conditions will develop in the coming months; nevertheless, considerable tropical storm and hurricane activity is anticipated.

## Hurricane Charley Rips Through Florida

Several Florida communities, Punta Gorda, Port Charlotte, and Arcadia, were strongly impacted as Hurricane Charley made landfall along the southwest coast of Florida on August 13th. After coming ashore with winds of 145 mph, Charley moved rapidly to the northeast, cutting a path of destruction across Florida before skirting up the eastern seaboard with pounding winds and drenching rains.

Communities across Florida heeded the warnings of emergency officials and prepared for the arrival of Charley. Close to 1.9 million residents were urged to evacuate low-lying areas. The Tampa Bay-St. Petersburg area, the predicted site of landfall, was spared from the brunt of the storm when Charley unexpectedly took a slight jog to the east. Two hours before landfall, Charley once again surprised everyone by intensifying into a dangerous category 4 hurricane.



**Satellite image of Hurricane Charley making landfall along the southwest coast of Florida on August 13, 2004.**

Charley is the strongest storm to strike Florida since 1992 when powerful Hurricane Andrew made landfall in southeast Miami-Dade County. While not as destructive as Andrew, damages from Hurricane Charley are, nevertheless, tentatively estimated at close to 8 billion; the statewide death toll currently stands at 25. The two storms shared similar characteristics in that both were fast moving and compact, with relatively small eyewalls.

Before striking Florida, Charley also impacted Cuba, crossing over the western portion of the island shortly after midnight, August 13th, with winds of 110 mph. Charley raced across Cuba in less than two hours, its eyewall passing just to the west of heavily populated downtown Havana. Thousands were left stranded without electricity. Damage to homes and buildings was widespread, with many older structures left in ruin. Authorities reported four deaths. It was the most destructive storm to hit Havana Province in 90 years.

Not since Hurricane Donna plowed through Florida in September 1960 has the State had to contend with such far-reaching destruction. Twenty-five of Florida's 67 counties have been designated as federal disaster areas.

Recovery efforts are already underway to rebuild communities ravaged by Charley. AOML collected donations to assist the victims with much needed food, water, and supplies. A generous financial contribution was made to the American Red Cross Disaster Relief Fund.

## Study Highlights Role of Oceans in $CO_2$ Storage

An international team of scientists including AOML's Rik Wanninkhof, Tsung-Hung Peng, and the Rosenstiel School's Frank Millero, together with scientists from NOAA's Pacific Marine Environmental Laboratory, have documented the role of the oceans in absorbing anthropogenic sources of carbon dioxide ($CO_2$). The study appeared in the July 16th issue of the journal *Science*.*

The team examined ocean carbon data, along with other ocean observations such as temperature, salinity, oxygen, nutrients, and chlorofluorocarbon tracers, that were gathered during the 1990s from three major research programs: the World Ocean Circulation Experiment; Joint Global Ocean Flux Study; and NOAA's Ocean-Atmosphere Carbon Exchange Study (all with large participation from scientists at AOML and the Rosenstiel School). Synthesis of these observations resulted in the largest and most accurate data set of global ocean inorganic carbon measurements compiled to date.

Based upon the team's research and analysis, they determined that almost half (48%) of the $CO_2$ released into the atmosphere from fossil fuel burning over the past 200 years has been absorbed by the upper 10% of the ocean. Between 1800 and 1994, the ocean removed approximately 118 billion metric tons of anthropogenic $CO_2$ from the atmosphere, with about one-third of the removal occurring in the last two decades. Prior to the Industrial Revolution, atmospheric $CO_2$ concentrations were about 200-280 parts per million. Current $CO_2$ levels are near 380 parts per million. An additional finding of the study indicates that the ocean has been the only consistent long-term sink for anthropogenic $CO_2$.

*Sabine, C.L., R.A. Feely, N. Gruber, R.M. Key, K. Lee, J.L. Bullister, R.H. Wanninkhof, B. Tilbrook, F.J. Millero, T.-H. Peng, A. Kozyr, T. Ono, and A.F. Rios, 2004: The oceanic sink for anthropogenic $CO_2$. *Science*, 305(5682):367-371.

AOML Safety Committee meeting minutes and other safety-related documents can be viewed on the fourth floor bulletin board. Contact Scott Stolz, Safety Committee chairman (305-361-4544, Scott.S.Stolz@noaa.gov), for questions, comments, or concerns about safety issues at AOML.

## AOML Undergoes Change of Leadership

Judith Gray, Deputy Director of AOML, has been appointed as AOML's new Acting Director. Peter Ortner, who had served as the Acting Director since October 2003, has been given the title of AOML Chief Scientist.

Judith Gray

Peter Ortner

The changes in leadership at AOML were made at the request of NOAA Headquarters to comply with Department of Commerce policy. They were publicly announced at an all-hands staff meeting on July 19, 2004.

The transition of leadership has had little impact on the day-to-day operations at AOML: Judith Gray is continuing with the overall management of AOML, while Peter Ortner is overseeing AOML's scientific programs. Gray will serve as the Acting Director until a permanent Director can be found, a process currently underway.

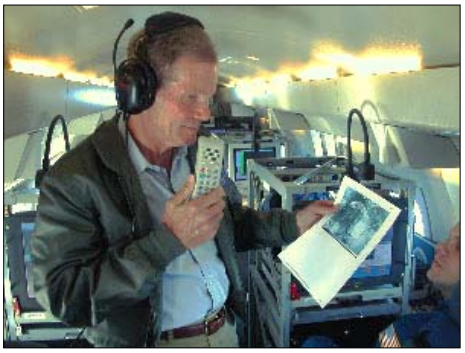
AOML commends Peter Ortner for his leadership and successful tenure as Acting Director.

## Senator Nelson Assists on Hurricane-Hunter Flight

U.S. Senator Bill Nelson flew aboard NOAA's Gulfstream-IV jet during a synoptic surveillance mission into Tropical Storm Bonnie and Hurricane Charley on August 11th. The aircraft left MacDill Air Force Base in Tampa, Florida in the early afternoon as both Bonnie and Charley threatened the west coast of Florida. In addition to the flight crew from NOAA's Aircraft Operations Center, a TV news crew from Tampa, Florida, and Stanley Goldenberg, a meteorologist with AOML's Hurricane Research Division, were also aboard the Gulfstream-IV jet.

**Stanley Goldenberg (standing) watches as Senator Bill Nelson processes and transmits dropsonde data during a reconnaissance mission aboard NOAA's Gulfstream-IV jet aircraft.**

During the 8.5-hour flight, Goldenberg was tasked with processing and transmitting data from the Global Positioning System (GPS) dropsondes deployed from the aircraft to gather temperature, humidity, pressure, and wind observations from Bonnie and Charley. Senator Nelson assisted Goldenberg in this effort by transmitting to the National Hurricane Center the processed data from eight of 28 sonde deployments. With Goldenberg's guidance, the Senator was able to process the data from one of the sondes by himself, enthusiastically going through the numerous steps to ensure quality control.



**Senator Nelson discusses Tropical Storm Bonnie and Hurricane Charley during a live television interview broadcast from onboard the Gulfstream-IV.**

Several live television interviews with Senator Nelson were broadcast from the Gulfstream-IV where he skillfully articulated details about the storms, as well as the significance of the Gulfstream-IV's current mission. Said Goldenberg, "I was concerned the flight might be boring for him, but the Senator was very interested in and appreciative of the science and forecast operations that NOAA's Aircraft Operations Center, National Hurricane Center, and Hurricane Research Division were conducting."

## Joint Study To Assess Impact of Dredged Sediments on Corals

Research was undertaken in early August to lay the foundation for monitoring coral reef habitats that are in close proximity to ocean dredged material disposal sites. The South Florida Offshore Plume Study, conducted from aboard the NOAA Ship *Nancy Foster*, was a collaborative effort jointly sponsored by AOML's Ocean Chemistry Division and the Environmental Protection Agency.


**The NOAA Ship *Nancy Foster* served as a research platform during a recent cruise in the Florida Straits jointly sponsored by AOML and the Environmental Protection Agency.**

During the week-long cruise, scientists tested instrumentation, deployed and bottom anchored an acoustic Doppler current profiler, and performed dive surveys to locate colonies of the coral *Montastrea sp*. Small samples of coral tissue were also collected and processed aboard ship.

Dredging operations are scheduled to begin in the fall of 2004 in both Miami and Ft. Lauderdale. Of particular concern is how the dumping of large volumes of dredged sediments at ocean disposal sites will impact adjacent coral reefs. Corals could potentially be affected by the deposition of sediments, exposure to elevated suspended loads, and the attenuation of light due to high turbidity.

The primary purpose of the cruise was to examine the feasibility of using a new molecular biomarker during the upcoming dredge operations to monitor the coral reef habitats as they undergo environmental stress. The biomarker, developed at the Georgia Institute of Technology, consists of a coral stress gene array that can detect changes in stress gene expression patterns in selected coral colonies, *i.e.*, *Montastrea sp*.

## Scientists Explore Collaboration with Chinese Investigators

A delegation of scientists with AOML's Physical Oceanography Division visited China on June 12-26, 2004 as guests of the Chinese Academy of Sciences. Drs. Silvia Garzoli, Robert Molinari, David Enfield, and Chunzai Wang were invited to China to explore the possibility of developing collaborative research efforts with Chinese investigators. During their two-week trip, they toured oceanographic and meteorological institutions, first in Hong Kong, then successively in Guangzhou, Shanghai, Hangzhou, Qingdao, and Beijing.


**Drs. Robert Molinari, David Enfield, Chunzai Wang, and Silvia Garzoli (back row, center) with researchers and students at the South China Sea Institute of Oceanology. The welcome banner overhead was hand painted.**

Technical presentations made before numerous audiences of investigators and students emphasized AOML's ocean and climate research and global ocean observing activities. Chinese scientists were particularly interested in computer animations of surface currents and shallow water drifter arrays in the western Pacific. Ocean modeling efforts in China are partially hampered by inadequate coverage and data availability with which to verify model experiments.

Tentative plans were discussed to provide Chinese laboratories with drifters for deployment in critical data-poor regions such as the South China Sea and the Yellow Sea. Drifter deployments in these areas represent an important contribution to the global ocean observing effort. Additional interest was expressed in the shallow drifters developed by AOML for exploration of nearshore environments where grounding and vandalism are particular concerns. Chinese meteorologists also expressed much interest in the possibility of adapting AOML's hurricane forecasting research to the challenge of improving Pacific typhoon forecasts.

Under the leadership of Dr. Garzoli, AOML is presently following up on the contacts made in China to develop them into fruitful collaborative relationships. Some joint climate research between AOML and Chinese researchers has already begun.

### Hurricane Preparedness and Recovery Coordination Team

AOML's Hurricane Preparedness and Recovery Plan for 2004 (available on the AOML Intranet) provides a course of action to prepare the facility for severe weather should a tropical storm or hurricane threaten south Florida. The Coordination Team is responsible for carrying out all operational elements of the Plan during preparatory and recovery phases for their respective group. Team members include:

**Office of the Director**
Judith Gray
Scott Stolz
Gregory Banes
Manuel Fraga (alternate)

**Computer Networks and Services**
Robert Kohler
Thomas Heeb

**Hurricane Research Division**
Neal Dorst
Peter Dodge (alternate)
Joseph Griffin (alternate)

**Ocean Chemistry Division**
Thomas Carsey
Michael Shoemaker

**Acoustics Research Group**
Jules Craynock
Joseph Bishop (alternate)

**Physical Oceanography Division**
Douglas Anderson
Craig Engler
Robert Roddy
David Bitterman (alternate)

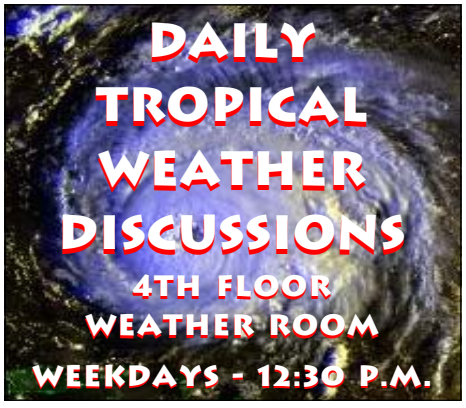
## Hurricane Researchers Kick off the Season with Safety Training

The month of June marked the beginning of the six-month long Atlantic hurricane season, as well as the Department of Commerce's National Safety Month. In preparation for its annual field program, which began in early August, AOML's Hurricane Research Division (HRD) held its first general aviation safety training on June 16th. The training was designed for HRD scientists who fly into and around the tropical cyclone environment aboard NOAA's research aircraft.

The day-long training was organized by HRD's Safety Committee and conducted by the staff of NOAA's Aircraft Operations Center (AOC) and Winslow Life Raft Company, manufacturer of the life rafts carried aboard AOC's two WP-3D aircraft and Gulfstream-IV jet. As operators of the aircraft, AOC is responsible for ensuring safe operation of the planes. As scientific crew aboard these planes, HRD recognizes the importance of being fully aware of and in compliance with AOC's safety guidelines and practices.

HRD staff were given a live demonstration of how to inflate a Winslow life raft. AOC personnel provided in-depth presentations about safety guidelines for both the WP-3D and Gulfstream-IV aircraft. An overview of special flight considerations for the 2004 Coupled Boundary Layer Air-Sea Transfer (CBLAST) experiment was also presented.

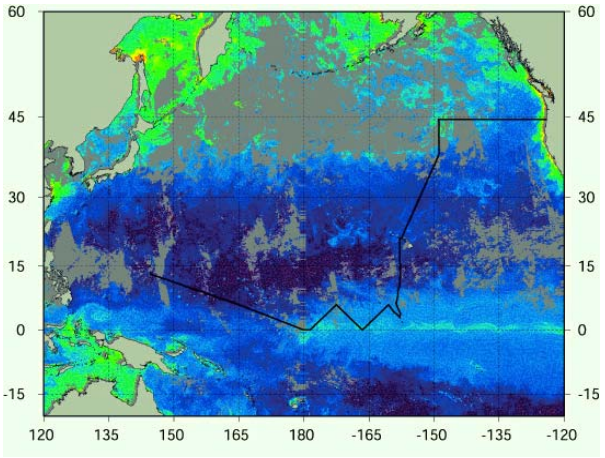
HRD's field program collects data for analytical and theoretical studies to advance knowledge of the structure and behavior of tropical cyclones. The ultimate goal of these studies is to produce more accurate forecasts, thereby reducing human and economic losses.




## NOAA and University Scientists Study Halocarbon Cycling in the Equatorial and North Pacific Ocean

*Shari Yvon-Lewis, Ocean Chemistry Division*

As part of a study supported by both the National Science Foundation and NOAA, scientists from two NOAA Research laboratories (Climate Monitoring and Diagnostics Laboratory and the Atlantic Oceanographic and Meteorological Laboratory) and the University of California (Irvine) participated in a research cruise aboard the UNOLS (University-National Oceanographic Laboratory System) ship *R/V Wecoma*. The ship departed Guam on May 22, 2004, stopped in Honolulu, Hawaii, and arrived in Newport, Oregon on July 2, 2004. The objective of this research effort was to obtain reliable measurements of the uptake of methyl bromide, methyl chloride, and other climatically important halocarbons in the equatorial and North Pacific Ocean.




**R/V *Wecoma* cruise track (departing Guam on May 22, 2004 and arriving in Newport, Oregon on July 2, 2004) overlayed on a map of chlorophyll from NASA's MODIS satellite.**

Methyl bromide ($CH_3Br$), which has both natural and anthropogenic sources, is a Class I ozone-depleting substance in the amended and adjusted *Montreal Protocol on Substances that Deplete Stratospheric Ozone.* Methyl chloride ($CH_3Cl$), the most abundant halocarbon in the atmosphere, is a naturally-occurring compound. We are examining the role of the ocean in regulating the atmospheric burdens of these and other climatically important trace gases.

Methyl bromide and methyl chloride are both produced and destroyed in the ocean through chemical and biological processes. Observed degradation rates are faster than can be explained by known chemical degradation reactions, and evidence suggests that this additional degradation is a bacterial process. We have not yet identified the organisms or reactions that produce $CH_3Br$ and $CH_3Cl$ at rates sufficient to explain observed concentrations. Observations have shown that, on the whole, the ocean is a net sink for $CH_3Br$ and low latitude regions are a net source of $CH_3Cl$, while the high latitude ocean is a net sink for $CH_3Cl$. Measurement coverage to date has been limited and sporadic, which restricts our ability to map the spatial and temporal variations that are necessary for understanding how the system will respond to perturbations (*e.g.*, global warming).

Results of the measurements made during this cruise will help improve our understanding of the role that the oceans play in the cycling of $CH_3Br$, $CH_3Cl$, and other naturally-occurring halocarbons. Measurements were made of the concentrations of $CH_3Br$, $CH_3Cl$, a suite of natural and anthropogenic halocarbons, and alkyl nitrates in the air, surface water, and at depth. Degradation rates were measured for $CH_3Br$ and $CH_3Cl$.

The combined results from these measurements will be used to constrain the budgets of these compounds in these waters at this time of year. The relative importance of the biological and chemical processes will be examined. Attempts will also be made to extract relationships between the degradation rates and concentrations measured and satellite measurements to develop proxies that can provide global coverage on shorter time scales.

At this time, there is insufficient data to examine seasonal and long-term trends in net flux, production, or degradation. Until satellite measurable proxies can be found, additional research cruises are needed to reduce the uncertainty in the global net flux estimate and to map the spatial and temporal variations in the net fluxes, production rates, and degradation rates of $CH_3Br$, $CH_3Cl$, and other climatically-important halocarbons.

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

## Recent AOML Publications*


Bell, G.D., S.B. GOLDENBERG, C.W. LANDSEA, E. Blake, R. Pasch, M. Chelliah, and K. Mo, 2004: Atlantic hurricane season. In *State of the Climate in 2003*, D.H. Levinson and A.M. Waple (eds.). *Bulletin of the American Meteorological Society,* 85(6):S20-S24.

Feely, R.A., R.H. WANNINKHOF, W.R. McGillis, M.-E. Carr, and C.E. Cosca, 2004: Effects of wind speed and gas exchange parameterizations on the air-sea $CO_2$ fluxes in the equatorial Pacific Ocean. *Journal of Geophysical Research,* 109(C8):C08S03, doi:1029/2003JC001896.

Hansell, D.A., H.W. Ducklow, A.M. Macdonald, and M.O. BARINGER, 2004: Metabolic poise in the North Atlantic Ocean diagnosed from organic matter transports. *Limnology and Oceanography*, 49(4):1084-1094.

Hare, J.E., C.W. Fairall, W.R. McGillis, J.B. Edson, B. Ward, and R.H. WANNINKHOF, 2004: Evaluation of the National Oceanic and Atmospheric Administration/Coupled-Ocean Atmospheric Response Experiment (NOAA/COARE) air-sea gas transfer parameterization using GasEx data. *Journal of Geophysical Research,* 109(C8):C08S11, doi:10.1029/2003JC001831.

Hu, C., F.E. Muller-Karger, G.A. Vargo, M.B. Neely, and E. JOHNS, 2004: Linkages between coastal runoff and the Florida Keys ecosystem: A study of a dark plume event. *Geophysical Research Letters*, 31(15):L15307, doi:1029/2004GL020382.

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POWELL, M.D., D. Bowman, D. Gilhousen, S.T. MURILLO, N. CARRASCO, and R. ST. FLEUR, 2004: Tropical cyclone winds at landfall: The ASOS-C-MAN Wind Exposure Documentation Project. *Bulletin of the American Meteorological Society*, 85(6):845-851.

Sabine, C.L., R.A. Feely, N. Gruber, R.M. Key, K. Lee, J.L. Bullister, R.H. WANNINKHOF, B. Tilbrook, F.J. Millero, T.-H. PENG, A. Kozyr, T. Ono, and A.F. Rios, 2004: The oceanic sink for anthropogenic $CO_2$. *Science*, 305(5682): 367-371.

WANNINKHOF, R.H., K.F. SULLIVAN, and Z. Top, 2004: Air-sea gas transfer in the Southern Ocean. *Journal of Geophysical Research,* 109(C8):C08S19, doi:10.1029/2003JC001767.

Ward, B., R.H. WANNINKHOF, W.R. McGillis, A.T. Jessup, M.D. DeGrandpre, J.E. Hare, and J.B. Edson, 2004: Biases in the air-sea flux of $CO_2$ resulting from ocean surface temperature gradients. *Journal of Geophysical Research*, 109(C8):C08S08, doi:10.1029/2003JC001800.


*Names of AOML authors appear in capital letters.

# Photo Documentation Project Improves Accuracy of Landfall Wind Estimates

**Photograph of a typical automated surface observation weather station (Opa Locka, Florida) used for documenting wind exposure.**

Scientists with AOML's Hurricane Research Division (HRD) are using photo documentation to improve wind speed estimates of landfalling tropical cyclones. The application of this new resource was reported in the June 2004 issue of the *Bulletin of the American Meteorological Society** (BAMS).

When a tropical cyclone comes ashore, winds over land are greatly affected by the presence of nearby trees, buildings, and other terrain features. These barriers can cause large discrepancies in the wind values observed at automated weather stations. According to Dr. Mark Powell, lead author of the BAMS study, "If a weather station has obstacles such as trees upstream, it will underestimate high wind conditions that can damage homes in open areas. It's important to correct these winds and get the data into the hands of the National Hurricane Center forecasters."

Historically, HRD scientists conducted field investigations after hurricane landfalls to photographically document and analyze a weather station's wind exposure. Efforts to reconstruct and correct a hurricane's wind fields to that of an open terrain exposure often added months to the retrospective analyses.

In 1998, Powell received a grant from the U.S. Weather Research Program to expedite this process. The Tropical Cyclone Wind Exposure Documentation Project represented a collaborative endeavor between HRD and several NOAA offices including the National Weather Service, National Climatic Data Center, and National Data Buoy Center.

Digital cameras were distributed to National Weather Service forecast offices from Texas to Maine, as well as Hawaii, Puerto Rico, the Virgin Islands, and Guam. The upstream terrain at more than 200 automated weather stations was photographed for eight wind direction sectors. The resulting wind exposure photo documentation was placed on both the National Climatic Data Center (www.ncdc.noaa.gov/oa/climate/stationlocator.html) and National Data Buoy Center (www.ndbc.noaa.gov) web sites.

HRD scientists are now able to assign factors that automatically correct the wind observations from each station. An estimate of the aerodynamic roughness is obtained and mean wind field measurements corrected to an open terrain exposure. The open terrain exposure is consistent with the tropical cyclone advisories and forecasts issued by the National Weather Service, as well as building design wind load standards published by the American Society of Civil Engineers.

The corrected wind data are then combined in real-time with additional surface wind measurements from reconnaissance and research aircraft, satellites, ships, and buoys. A software program developed at HRD, the Real-Time Hurricane Wind Analysis System (H*Wind), analyzes these observations and produces high-quality hurricane wind fields every 3-6 hours as a storm makes landfall. The analyses are made available as research products to a variety of users including forecasters, researchers, engineers, and the insurance industry.

The Tropical Cyclone Wind Exposure Documentation Project has enabled researchers to correct underestimated winds by photographically documenting the surrounding terrain at automated weather stations. Additional information about the project can be found on the HRD web site at www.aoml.noaa.gov/hrd/asos.

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*Powell, M.D., D. Bowman, D. Gilhousen, S.T. Murillo, N. Carrasco, and R. St. Fleur, 2004: Tropical cyclone winds at landfall: The ASOS-C-MAN Wind Exposure Documentation Project. *Bulletin of the American Meteorological Society,* 85(6):845-851.

AOML hosted a Commuter Seminar on July 22nd to assist employees in providing options for commuting to work. Representatives from South Florida Commuter Services and Miami-Dade Transit presented information on the benefits of using public transportation (buses, metrorail, tri-rail), as well as ride sharing, van pooling, transit subsidies, and discount passes. The seminar was organized by Scott Stolz, AOML Associate Director, and Stanley Goldenberg, a long-time public transit enthusiast.

Here are a few useful commuter tips from the seminar:

• The South Florida Commuter Services web site (www.1800234ride.com) offers an abundance of information about commuting options in south Florida, as well as an extensive listing of transportation program links.

• Emergency Ride Home Program: Employees who use public transportation, ride share, or bicycle/walk to work at least three days a week are eligible to receive up to six free taxi rides home per year. Register for the program on the South Florida Commuter Services web site.

• View a map of the Miami-Dade Transit B-Bus route at www.co.miami-dade.fl.us/transit/images/pdfs/routes/102.pdf.

• SmarTraveler Interactive Telephone System: Dial 511 any time for accurate, up-to-the-minute, route specific traffic information.

• Federal employees can participate in NOAA's Transportation Subsidy Program (www.rdc.noaa.gov/~nfo/files/TSP%20Presentation3.htm) by completing Form 42-28. Forms must be returned to Cathy Steward by October 1, 2004.

• For general transit information, contact Stanley Goldenberg (305-361-4362; Stanley.Goldenberg@noaa.gov).

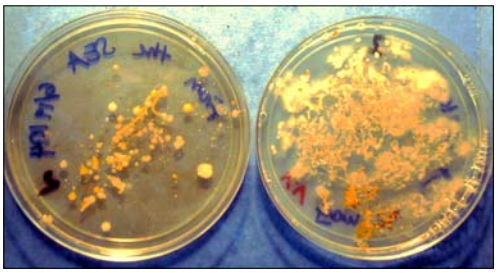
## RSMAS Shuttle

AUGUST 25-DECEMBER 3, 2004
(MONDAY THROUGH FRIDAY)

| Viscaya Station to RSMAS: | RSMAS Station to Viscaya: |
|---|---|
| 8:15 AM | 8:30 AM |
| 8:45 AM | 3:30 PM |
| 3:50 PM | 5:30 PM |

# Students Discover Microscopic World of Marine Bacteria

AOML microbiologist Kelly Goodwin helped teach young girls about the invisible world of marine bacteria at a recent outreach effort jointly sponsored by the University of Miami's Rosenstiel School and the American Association of University Women. "Explore Marine Science" featured activity workshops presented by five women scientists aimed at sparking interest in both science and the ocean. More than 40 girls (6th and 7th graders) attended the event held on Saturday, July 19th, at the Rosenstiel School campus.



**Photograph from Goodwin's Explore Marine Science web page that depicts bacteria from a marine source (seaweed) growing on a terrestrial (left) and marine (right) medium.**

Goodwin's presentation, "Seawater: More than Meets the Eye," was designed as a simple introduction to microbiology and the concept of hypothesis-based research. Students were challenged to determine what type of culture media would best support the growth of marine bacteria, microscopic life forms living in the ocean. They were taught how to plate samples onto Petri dishes and then given the task of plating marine (seawater, seaweed, and seagrass) and land-based sources of bacteria (leaves, dirt, swabs from their bodies and the bottoms of their shoes) onto dishes coated with either marine or terrestrial agar. Goodwin used pre-cultured samples to demonstrate the conclusion that bacteria from marine sources grew best on a medium that contained salt.

As an additional activity, Goodwin collected the students' samples and gave them her web address (www.aoml.noaa.gov/ocd/people/goodwin/). With the assistance of laboratory technician Anjali Sardeshmukh, the samples were incubated, photographed, and placed on a newly created web page. Students were invited to visit the web page to view images of their cultured samples and to review what they had learned.

While the field of marine science encompasses many disciplines, Goodwin is optimistic that at least a few girls were inspired by the amazing world that exists within a single drop of seawater and that there's much more to science than meets the eye.

# Site Survey Pinpoints Location for New CREWS Station

A site survey of Discovery Bay, Jamaica was completed in July to pinpoint the best location for a new Coral Reef Early Warning System (CREWS) monitoring station. Jules Craynock, an oceanographer with AOML's Ocean Chemistry Division and the AOML Unit Diving Supervisor, joined a team of Jamaican reef experts as they visited several prospective sites to evaluate ocean floor characteristics and nearby coral reef ecosystems.

**The CREWS site survey team in Discovery Bay, Jamaica included (left to right): Dr. Peter Gayle, University of West Indies Discovery Bay Marine Laboratory; Sean Green, National Environment and Planning Agency; Jules Craynock, AOML/Ocean Chemistry Division; and Leslie Walling, Mainstreaming Adaptation to Climate Change (MACC) Project for the Caribbean.**

As a result of the survey team's efforts, a position for the new CREWS station was determined. Pylon construction is expected to begin late in 2004 or early 2005. If all goes well, the Discovery Bay station should be fully operational by spring 2005. It will become part of the CREWS network of observing stations that monitor environmental conditions at coral reef sites around the world. The Discovery Bay station is being established through a collaborative agreement between NOAA and the Mainstreaming Adaptation to Climate Change (MACC) Project.

## Welcome Aboard

NOAA Corps Officer, Ensign Hector Casanova, joined the staff of the Ocean Chemistry Division in June. Casanova is a NOAA certified working diver who will assist Dr. John Proni with field operations in Biscayne Bay, as well as with other diving assignments and general data analysis in support of the Division.

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Truls Johanessen of the University of Bergen's Geophysical Institute in Norway began a year-long sabbatical visit with the Ocean Chemistry Division in July. Dr. Johanessen is chairman of the Surface Ocean Lower Atmosphere Study (SOLAS) Implementation Group and will be finishing the implementation plan during his sabbatical. He will also be working with the ocean carbon groups at AOML and the Rosenstiel School on investigations of the ocean carbon cycle in the North Atlantic Ocean.

## Farewell

Robert Britter, Technical Information Specialist with the NOAA Regional Library at AOML, retired on July 30, 2004 after 15 years of federal service. Bob retired early to pursue other career opportunities.

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Matthew Eastin, a National Research Council postdoctoral associate with the Hurricane Research Division, left AOML in July to begin an assistant professorship at Central College in Pella, Iowa. Matthew collaborated with Drs. Frank Marks and John Gamache during his year at AOML on a dual-Doppler analysis of Hurricane Guillermo (1997).

## Moving On Up

Thomas Carsey, an atmospheric chemist with the Ocean Chemistry Division, has been selected to serve as the Division's new Deputy Director, a position left vacant by the retirement of Michael Farmer.

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AOML receptionist, Jennifer Calderon-Diaz, has been selected to serve as the new executive secretary for the Hurricane Research Division, a position left vacant by the retirement of Sandra Taylor.

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Monica Rodriguez, an administrative assistant with the Office of the Director, has been selected to serve as AOML's receptionist, a position left vacant by the transfer of Jennifer Calderon-Diaz to the Hurricane Research Division.

## Congratulations

Michael Farmer, Deputy Director of AOML's Ocean Chemistry Division, retired on August 21, 2004 after 25 years of federal service. Mike joined the staff of the Ocean Chemistry Division in 1987 as an atmospheric chemist. During the eight years he served as a scientist with the Division, he studied nitrogen compounds, pre-cursors of tropospheric ozone production, and participated in numerous research cruises in the Atlantic and Pacific Oceans. In 1995, he accepted the administrative position of Deputy Director for the Division.

Mike and his wife Andrea, who recently retired from the Dade County Public School system, are moving to Mike's home town of Duncan, Oklahoma. He looks forward to dabbling in his woodworking shop and building furniture, honing his piano skills, visiting with old friends, and spending time with his nine grandchildren. Mike also looks forward to collaborating with Andrea, a quilter, and selling their wares at arts and crafts festivals.

Sandra Taylor, executive secretary with AOML's Hurricane Research Division, is retiring after 20 years of federal service. Sandy joined the staff of the Hurricane Research Division in 1994. Prior to her position at AOML, she worked for the State Department. On July 24th, Sandy married Donald Hart at a service held in Miami. A few days later, the newlyweds left Miami to begin their new life together in California.

AOML's 2004 summer interns performed a variety of technical and computer-related tasks for the Hurricane Research (HRD), Ocean Chemistry (OCD), Physical Oceanography (PhOD), and Computer Networks and Services (CNS) Divisions. Here is a roster of their names and their AOML mentors:

Brett Carrington, Miami-Dade School for Advanced Studies ..... Mark Powell/Sonia Otero (HRD)
Chris Chow, MAST Academy ..... Zia-Zhong Zhang (OCD)
Meredith Chow, MAST Academy ..... Joe Bishop/Pedro Pena (OCD)
Ramin Daneshzadeh, Cyprus Bay High School ..... Joe Bishop (OCD)/Alejandra Lorenzo (CNS)
David Glenn, Mississippi State University ..... Chris Landsea (HRD)
Justin Kovac, Montgomery Blair High School ..... Gustavo Goni (PhOD)
Isha Renta, Howard University ..... Mark Powell (HRD)
Jamese Sims, Jackson State University ..... Chris Landsea (HRD)
Jeremy Sowers, MAST Academy ..... Mike Shoemaker/Louis Florit (OCD)
Daniel Stern, Cornell University ..... Sim Aberson (HRD)
Lenworth Woolcock, Florida International University ..... Chris Landsea (HRD)


**AOML's 2004 summer interns (left to right, standing): Ramin Daneshzadeh, Daniel Stern, Lenworth Woolcock, Brett Carrington, David Glenn, Jamese Sims, and Justin Kovac. Seated: Isha Renta, Jeremy Sowers, Chris Chow, and Meredith Chow.**

## Travel

Frank Marks was a keynote speaker at the International Conference on Storms in Brisbane, Australia on July 5-9, 2004.

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Christopher Landsea participated in the visiting scientist program aboard the Royal Caribbean Cruise Lines Ship *Explorer of the Seas* on July 11-18, 2004.

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Howard Friedman and Erica Rule attended NOAA's Diversity Conference in Norfolk, Virginia on July 12-16, 2004.

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Jules Craynock participated in a site survey for a new Coral Reef Early Warning System (CREWS) station in Kingston, Jamaica on July 12-16, 2004.

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Robert Molinari attended a Steering Committee meeting of the African Multidisciplinary Monsoon Analysis program in Geneva, Switzerland on July 23-28, 2004.

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Jia-Zhong Zhang and Judith Gray attended the NOAA Leadership Seminar in Airlie, Virginia on July 24-26, 2004. Gray was an invited speaker.

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Eric Stabenau and Louis Florit conducted field research at the Coral Reef Early Warning System (CREWS) station in Lee Stocking Island, Bahamas on July 26-30, 2004.

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Robert Kohler and Alejandra Lorenzo attended the 2004 NOAA Webshop Conference in Philadelphia, Pennsylvania on July 26-30, 2004.

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Chunzai Wang was an invited speaker at the American Meteorological Society's 13th Conference on Interactions of the Sea and Atmosphere in Portland, Maine on August 9-13, 2004.

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Silvia Garzoli attended meetings of the Office of Global Programs and the Climate Board in Washington, D.C. on August 19-20, 2004.

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Judith Gray and Jules Craynock participated in the visiting scientist program aboard the Caribbean Cruise Lines ship *Explorer of the Seas* on August 29-September 5, 2004.

## July-August 2004 Informal Research Reports*

**July 14** ***Hurricane Guillermo (1997): Preliminary Results from a Dual-Doppler Analysis***

**Dr. Matthew Eastin, Hurricane Research Division**

**July 20** ***Transport Variability of the Deep Western Boundary Current and the Antilles Current off Abaco Island, Bahamas***

**Dr. Christopher Meinen, Physical Oceanography Division**

**July 22** ***Part I: Estimating the Probability of Rapid Intensification in the Atlantic and East Pacific Basins***

***Part II: Performance of an Inland Wind Decay Model in Hurricane Isabel (2003)***

**Mr. John Kaplan, Hurricane Research Division**

**July 27** ***The Atlantic Hurricane Reanalysis Project: Results for the 1910s, 1920s, and 1930s***

**Dr. Christopher Landsea, Hurricane Research Division**

**July 29** ***Preliminary Studies of the Intense Eyewall Feature in Hurricane Isabel (2003)***

**Dr. Sim Aberson, Hurricane Research Division**

**August 10** ***Meridional Heat Transport in the South Atlantic***

**Dr. Silvia Garzoli, Physical Oceanography Division**

**August 19** ***The Reanalysis of Three Catastrophic Hurricanes that Impacted Florida during the 1920s***

**Mr. Steven Feuer, Hurricane Research Division**

**August 24** ***Acoustics and Cetaceans: Insights Gained from the GU-04-02 Gulf of Mexico Marine Mammal Survey***

**Dr. David Palmer, Ocean Chemistry Division**

***Presentations begin at 3:00 p.m. in the first-floor conference room.**

*Keynotes* is published bi-monthly by the Atlantic Oceanographic and Meteorological Laboratory. Contributions and/or comments are welcome and may be submitted via email (Gail.Derr@noaa.gov), fax (305) 361-4449, or mailing address: NOAA/AOML, *Keynotes*, 4301 Rickenbacker Causeway, Miami, FL 33149.

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