Ocean Acidification Poses Two-Front Assault on Coral Reefs

Researchers measured a net loss of coral reef framework due to bioerosion at reefs in volcanically acidified water

Ocean acidification poses a two-front assault on coral reefs according to scientists studying reef systems in volcanically acidified water of the southwest Pacific Ocean, simultaneously slowing the growth of new coral skeletons while accelerating the rate at which they are worn away by bioeroding communities.

The research, performed by scientists with AOML’s Ocean Chemistry and Ecosystems Division, the University of Miami’s Cooperative Institute for Marine and Atmospheric Studies, and the Australian Institute of Marine Science, used cutting-edge techniques to examine the response of experimental reef skeletal material to ocean acidification over a 2-year period and, for the first time, quantified all functional groups that act upon reef habitat permanence (e.g., calcifiers, macroborers, microborers, and grazers).

The study findings, published in the November 16th issue of the Proceedings of the Royal Society B, measured changes in the framework of two naturally high carbon dioxide reef sites in southeastern Papua New Guinea. Carbon dioxide at these reefs bubbles up through the water from subterranean volcanic sources, creating conditions that approximate what the rest of the world’s oceans will experience in the future due to ocean acidification.

The science team used micro-computed tomography to analyze the combined impact of organisms that add to and break down reef framework. These technologies enabled them to peer inside coral skeletons to view the boreholes left by worms, as well as create three-dimensional digital models to precisely measure the net difference between new coral material added by calcifying organisms and coral material lost through bioerosion from worms and other organisms. They found that the naturally acidic water enhanced the activity of worms and other bioeroders that bore into the reef structure, resulting in an overall net loss of the framework that forms the foundation of the coral reef habit.

“This is the first study to piece together all of the coral reef ocean acidification processes, simultaneously looking at the different organisms that grow and erode reef habitats, and their net effects on one another over time,” said Ian Enochs, a Cooperative Institute coral ecologist at AOML and lead author of the study.

Funding for the study was provided by NOAA’s Ocean Acidification and Coral Reef Conservation programs, as well as the Great Barrier Reef Foundation in collaboration with the Australian Institute of Marine Science.

November 30 marked the official end of the 6-month long Atlantic hurricane season, and it was a busy one for AOML’s hurricane researchers. From early June to the beginning of October, scientists with the Hurricane Research Division (HRD) participated in 49 missions aboard NOAA’s Hurricane Hunter aircraft to gather data on six tropical systems—Colin, Earl, Hermine, Javier (eastern Pacific), Karl, and Matthew. They also supported eight missions of NASA’s Global Hawk unmanned aerial vehicle, processing data remotely from instruments aboard the Global Hawk in real time.

All of the data gathered provided forecasters at the National Hurricane Center with critical information about the strength and direction of the winds found in various tropical systems, the regions of heaviest precipitation, and the atmospheric steering currents that influence track and landfall location, enabling them to provide the public with accurate, up-to-date forecasts. As part of HRD’s annual hurricane field campaign, more than 1000 dropwindsondes were launched from Hurricane Hunter aircraft in and around storms to measure atmospheric pressure, temperature, and humidity.

This massive dropwindsonde deployment was executed through the Intensity Forecasting Experiment (IFEX), a multi-year effort to improve intensity forecasts by collecting data from all stages of the tropical cyclone life cycle, and the Sensing Hazards with Operational Unmanned Technology (SHOUT) campaign. IFEX is conducted in collaboration with NOAA’s Environmental Modeling Center and National Hurricane Center, while SHOUT is conducted in cooperation with NASA and NOAA’s Earth System Research Laboratory.

A few highlights for HRD from this season’s efforts include:

• Testing and development of new observing technologies such as Doppler Wind Lidar data gathered in Hurricane Earl and eastern Pacific Tropical Storm Javier.

• Observing the protracted genesis and gradual intensification of long-lived Hurricane Hermine.

• Collecting a unique dataset in Karl, including its gradual intensification to a tropical storm and its extratropical transition. Karl became the first tropical system that HRD researchers were able to observe from cyclogenesis to extratropical transition.

• Sampling much of the life cycle of Matthew, including its intensification to a major, Category-5 hurricane, secondary eyewall formation, glancing blow to the Florida coast, and landfall in South Carolina.

The various datasets gathered this year will be studied extensively to look for possible relationships between rainfall patterns and storm intensity changes. The dropwindsonde and Doppler radar data collected will be used to improve a new generation of computer simulations that model the inner workings of the hurricane vortex, ultimately leading to improved forecasting of intensity change, a central goal for HRD.

Overall, the 2016 Atlantic hurricane season was the most active and costliest since 2012. It will also be denoted in the record books as one of the longest, beginning in mid-January with the formation of Hurricane Alex in the northeast Atlantic and ending late in November with the formation of Hurricane Otto in the Caribbean. By far, the most powerful storm of 2016 was Hurricane Matthew, which left a trail of destruction throughout the Caribbean before sweeping up the eastern seaboard of Florida. Matthew became the first Category-5 hurricane in the Atlantic since Hurricane Felix in 2007 and caused more than 1,600 fatalities. Florida’s 11-year hiatus from landfalling hurricanes also ended this year as Hurricane Hermine came ashore along the Florida Panhandle in early September as a Category-1 hurricane with 80 mph winds.

In total, 15 named storms developed during the 2016 Atlantic hurricane season, including 7 hurricanes and 3 major hurricanes with winds above 110 mph (see table at left).
Inexpensive Temperature Sensor Unlocks Coral Monitoring Challenge

The novel design of a new, inexpensive sea temperature sensor developed at AOML has fueled discussions for it to be deployed at coral reef sites around the world using kick starter or crowd sourcing funds.

AOML researchers recently developed a new, inexpensive sensor that has the potential to drastically improve the ability to measure and monitor changing temperatures at reef sites on an unprecedented scale. The sensor, known as Opuhala,* costs roughly $10 in parts to produce but provides highly accurate measurements. With production costs of only 10% of that of off-the-shelf temperature sensors, colleagues have expressed an interest in deploying the sensor at coral reefs around the world.

The sensor not only will provide data on microhabitat sea temperature fluctuations at coral reefs, but will also provide an environmental context for studying coral bleaching, often triggered by prolonged exposure to warm ocean waters over a period of days. Current global sea surface temperatures are monitored via satellite. The expanded global observations offered by the Opuhala sensor could provide an important comparison between ocean surface temperatures and the temperatures at deeper regions where corals live.

AOML researchers, led by Dr. Natchanon Amornthammarong of the Ocean Chemistry and Ecosystems Division, were prompted to develop the sensor based on the need to observe temperature variations at multiple locations at reef sites, allowing scientists to observe changes at the microhabitat scale. With larger reefs measuring several meters tall by tens of meters wide, temperature can vary by more than a few degrees from the top to the bottom of a reef, as well as from the nearshore to the oceanside portion of a reef landscape.

Observing small-scale fluctuations in temperature along many points at a reef will enable scientists to better understand why some species or colonies of coral undergo bleaching while others do not; it will also provide a broader interpretation and validation for satellite measured sea temperature readings.

AOML is currently testing the sensor at local reef sites; several were deployed in November at depths of up to 110 feet. The sensors will remain in place for approximately 2 months, measuring sea temperature every 10 minutes, then retrieved to evaluate their performance. Additional sensors to measure pressure, light, and conductivity will be added in future tests. The sensors can function for periods of up to 5 months using two AA batteries.

All collected data are embedded on a microchip to enable data retrieval in the event of a flooded sensor. In the near future, the Opuhala sensor will be configured to transfer its data underwater via infrared communication.

Once tested and operational, initial deployments are planned in support of AOML’s ongoing coral research through the Coral Reef Early Warning System network in the Florida Keys, the Caribbean, Sri Lanka, and elsewhere under a broad program conducted in collaboration with ReefCheck, a global coral reef monitoring organization (www.reefcheck.org).

*The new sensor is named for Opuhala, the Hawaiian goddess of coral and coral reefs.

Researchers Assess Microbial Biodiversity of Florida Keys Microbiome

AOML researchers and divers collected water, sediment, and coral tissue samples from the Florida Keys National Marine Sanctuary in December for the Marine Biodiversity Observing Network (MBON). The work, part of the AOML-Coral Genomic Observing Network (CGON), seeks to characterize the microbial community structure and biodiversity of coral reef microbiomes in the Florida Keys in support of a larger MBON effort to document biodiversity across trophic levels. The project uses a variety of traditional and state-of-the-art molecular tools such as Next-Generation-Sequencing (NGS) and molecular microbial source tracking to better characterize the overall coral reef community structure and health trends. This is an ongoing program that samples critical sentinel coral reef sites at Molasses Reef, Cheecha Rocks Reef, Tennessee Reef, Sombrero Reef, Looe Key Reef, and Western Sambo Reef on a bimonthly basis. The CGON component of the larger Florida Keys MBON program is conducted by AOML in collaboration with partners from the University of South Florida and the Florida Keys National Marine Sanctuary.
In November, AOML scientists—Bob Castle, Charlie Fischer, Jay Hooper, and Andy Stefanick—joined 25 other scientists from 14 academic, international, and federal institutions aboard the NOAA Ship Ronald H. Brown for the start of the decadal reoccupation of the P18 transect. P18 is a reference section of the Global Ocean Ship-based Hydrographic Investigation Program (GO-SHIP) in the Pacific Ocean that was last sampled in 2008.

Decadal sampling of GO-SHIP ocean transects enables researchers to monitor the inventories and transport of carbon dioxide, heat, freshwater, salinity, oxygen, nutrients, and traces gases in the ocean. The program serves to constrain long-term changes and variability in marine biogeochemical and physical processes in response to natural and human-induced forcing.

During sampling operations along the 103°W meridian from Baja, California to Antarctica, high-quality measurements will be obtained at all ocean depths, with surface to bottom sampling conducted at roughly 225 stations via a conductivity-temperature-depth (CTD) instrument package. Data from CTD casts are critical to the success of the cruise, providing precise measurements of salinity, temperature, and oxygen at various depths throughout the water column. Water samples from the CTD instrument package will also be used to measure dissolved inorganic carbon, pH, nutrient concentrations, chlorophyll levels, and a variety of other parameters. In total, data will be collected for 20 different scientific projects to study phenomena and changes in the ocean that have occurred since 2008.

These measurements are a cornerstone of numerous efforts to constrain long-term changes and decadal variability in ocean properties and are critical for calibrating and validating other observation and modeling programs. A highlight of the cruise will be the deployment and validation of six novel biogeochemical Argo profiling floats that, after deployment, will obtain profiles of temperature, salinity, oxygen, nitrate, and pH over the next 5 years in the Southern Ocean, a sparsely sampled region.

After the completion of leg 1, the Brown will make a port stop at Easter Island. Sampling operations for the cruise will end in February 2017 with a port stop in Punta Arenas, Chile.

The US component of GO-SHIP is jointly funded by the Climate Observation Division of NOAA’s Climate Program Office and the National Science Foundation’s Division of Ocean Sciences. For program details, visit www.go-ship.org.

New Textbook Highlights Recent Advances in Tropical Cyclone Research

Dr. Sundararaman Gopalakrishnan, a meteorologist with AOML’s Hurricane Research Division (HRD), along Professor U.C. Mohanty of the Indian Institute of Technology-Bhubaneswar, are editors of a new textbook—Advanced Numerical Modeling and Data Assimilation Techniques for Tropical Cyclone Prediction—released by Springer International in December. The book is based on a series of lectures presented by scientists from the United States, India, and Australia during an intensive, 6-day workshop in Bhubaneswar, India in July 2012. It is intended to serve as a teaching and/or reference resource at universities and academic institutions for researchers and post-graduate students.

Comprised of 27 chapters, the textbook provides a broad overview of recent advances in tropical cyclone research, including state-of-the-art observations, data assimilation and vortex initialization techniques, and computer modeling with a focus on genesis, intensification, motion, and storm surge prediction. Three of the chapters are authored by HRD scientists: (1) Advancing the understanding and prediction of tropical cyclones using aircraft observations by Frank Marks; (2) Advanced diagnostics for the HWRF hurricane modeling system by Thiago Quirino and Sundararaman Gopalakrishnan; and (3) The Hurricane Boundary Layer by Sundararaman Gopalakrishnan et al.

The textbook was formally released in India by the Minister for Petroleum and Natural Gas during the opening day of a national tropical meteorology symposium held in December. The NOAA Regional Library at AOML has purchased two copies of the book (1st ed., 2017, approx. 746 pp., 150 illus., hardcover, ISBN 978-94-024-0894-2), one located at the AOML library and the other at the National Hurricane Center library in Miami.
AOML Fifth Underwater Glider Mission Ends

In November, AOML and CARICOOS (Caribbean Regional Association for the Integrated Coastal System) researchers successfully recovered two sets of underwater gliders from the coastal waters north and south of Puerto Rico. The gliders were originally deployed this past July and August to study the ocean’s role in tropical cyclone development and intensification, as well as improve understanding of air-sea interaction processes during hurricane force wind events. During their 3-4 month deployment, the gliders measured seawater properties that included temperature, salinity, dissolved oxygen, current velocity, chlorophyll, and chromophoric dissolved organic matter. Each glider gathered between 1,000-1,500 profiles of each parameter for a total of more than 25,000 profiles. These data, including time series obtained during Hurricane Matthew, were transmitted in real-time to the Global Telecommunication System and assimilated into numerical forecast models. AOML’s sixth underwater glider mission is scheduled to begin in February 2017. The project is funded by AOML, NOAA’s Office of Oceanic and Atmospheric Research, and CARICOOS.

Global Drifter Array Continues Transition to Iridium

In March 2014, researchers with the Global Drifter Program (GDP) at AOML announced they would begin transitioning its array of satellite-tracked drifting buoys from Service Argos to Iridium, as well as include the newer Iridium data in its quality-controlled data sets. The change was undertaken to provide global data with transmission delays of only a few minutes, plus significant cost savings. The first milestone of this transition is to reach an array that is 80% Iridium by September 30, 2018.

As of October 31, 2016 the array was 41% Iridium and 59% Service Argos, while this same time in 2015 the array was 30% Iridium and 70% Service Argos. Simulations by Rick Lumpkin, the GDP-GDP principal investigator, indicate that the Iridium percentage will rapidly increase throughout fiscal year 2017 as all major drifter manufacturers now exclusively produce Iridium drifters. Shaun Dolk of the GDP Operations Center at AOML is responsible for deploying the new drifters worldwide to replace Service Argos drifters currently in the array.

Because Iridium does not provide accurate locations (unlike Argos), Iridium drifters are equipped with Global Positioning System (GPS) receivers. As noted during the 2016 Data Buoy Cooperation Panel meeting by Erik Valdes of the GDP Data Assembly Center at AOML, GPS time-to-first-fix provides an extremely robust indication of drogue presence, meaning that this can now be evaluated much more rapidly than previously possible.

Mayra Pazos, the manager of the Data Assembly Center at AOML, is leading the effort to incorporate Iridium data in the delayed mode, quality controlled data sets. Mayra and Erik are also responsible for assigning identification numbers to all the drifters (Iridium and Argos) for data insertion on the Global Telecommunications System (GTS) to ensure that the data are transmitted to the GTS as soon as possible and to stop GTS insertion when the data are no longer reliable. To recognize their work on this transition, Mayra and Erik were awarded an AOML achievement award on December 8, 2016.

Woods Hole Gulf Stream Glider Deployed from Miami

Scientists with the Woods Hole Oceanographic Institution (WHOI) visited AOML in November to prepare an underwater glider for deployment in the Gulf Stream. The WHOI glider will be carried by the Gulf Stream and recovered off the coast of Massachusetts in approximately 3 months. This National Science Foundation-funded project is a collaboration between the Scripps Institution of Oceanography, WHOI, and AOML, with AOML providing the glider port, working space for refurbishment of the glider before its launch, expertise, tools, storage, and occasional assistance with future at-sea deployments. AOML hopes this collaboration will leverage expertise and elevate AOML’s own glider project, currently dedicated to covering components of the tropical Atlantic.

Woods Hole Gulf Stream Glider Deployed from Miami

In November, AOML and CARICOOS (Caribbean Regional Association for the Integrated Coastal System) researchers successfully recovered two sets of underwater gliders from the coastal waters north and south of Puerto Rico. The gliders were originally deployed this past July and August to study the ocean’s role in tropical cyclone development and intensification, as well as improve understanding of air-sea interaction processes during hurricane force wind events. During their 3-4 month deployment, the gliders measured seawater properties that included temperature, salinity, dissolved oxygen, current velocity, chlorophyll, and chromophoric dissolved organic matter. Each glider gathered between 1,000-1,500 profiles of each parameter for a total of more than 25,000 profiles. These data, including time series obtained during Hurricane Matthew, were transmitted in real-time to the Global Telecommunication System and assimilated into numerical forecast models. AOML’s sixth underwater glider mission is scheduled to begin in February 2017. The project is funded by AOML, NOAA’s Office of Oceanic and Atmospheric Research, and CARICOOS.

Global Drifter Array Continues Transition to Iridium

In March 2014, researchers with the Global Drifter Program (GDP) at AOML announced they would begin transitioning its array of satellite-tracked drifting buoys from Service Argos to Iridium, as well as include the newer Iridium data in its quality-controlled data sets. The change was undertaken to provide global data with transmission delays of only a few minutes, plus significant cost savings. The first milestone of this transition is to reach an array that is 80% Iridium by September 30, 2018.

As of October 31, 2016 the array was 41% Iridium and 59% Service Argos, while this same time in 2015 the array was 30% Iridium and 70% Service Argos. Simulations by Rick Lumpkin, the GDP-GDP principal investigator, indicate that the Iridium percentage will rapidly increase throughout fiscal year 2017 as all major drifter manufacturers now exclusively produce Iridium drifters. Shaun Dolk of the GDP Operations Center at AOML is responsible for deploying the new drifters worldwide to replace Service Argos drifters currently in the array.

Because Iridium does not provide accurate locations (unlike Argos), Iridium drifters are equipped with Global Positioning System (GPS) receivers. As noted during the 2016 Data Buoy Cooperation Panel meeting by Erik Valdes of the GDP Data Assembly Center at AOML, GPS time-to-first-fix provides an extremely robust indication of drogue presence, meaning that this can now be evaluated much more rapidly than previously possible.

Mayra Pazos, the manager of the Data Assembly Center at AOML, is leading the effort to incorporate Iridium data in the delayed mode, quality controlled data sets. Mayra and Erik are also responsible for assigning identification numbers to all the drifters (Iridium and Argos) for data insertion on the Global Telecommunications System (GTS) to ensure that the data are transmitted to the GTS as soon as possible and to stop GTS insertion when the data are no longer reliable. To recognize their work on this transition, Mayra and Erik were awarded an AOML achievement award on December 8, 2016.

Woods Hole Gulf Stream Glider Deployed from Miami

Scientists with the Woods Hole Oceanographic Institution (WHOI) visited AOML in November to prepare an underwater glider for deployment in the Gulf Stream. The WHOI glider will be carried by the Gulf Stream and recovered off the coast of Massachusetts in approximately 3 months. This National Science Foundation-funded project is a collaboration between the Scripps Institution of Oceanography, WHOI, and AOML, with AOML providing the glider port, working space for refurbishment of the glider before its launch, expertise, tools, storage, and occasional assistance with future at-sea deployments. AOML hopes this collaboration will leverage expertise and elevate AOML’s own glider project, currently dedicated to covering components of the tropical Atlantic.

Woods Hole underwater glider.
AOML Celebrates Staff Accomplishments

AOML hosted an awards ceremony on December 8 to celebrate staff accomplishments. More than 30 individuals from AOML’s three science divisions and the Office of the Director were recognized for their outstanding work achievements over the past fiscal year. Craig McLean, the assistant administrator of NOAA’s Office of Oceanic and Atmospheric Research, was also on hand to present year-in-service awards to nine individuals in recognition of their dedicated service to the federal government. Additionally, AOML Deputy Director Dr. Molly Baringer announced the lab’s top three outstanding scientific papers for fiscal year 2016. Following the ceremony, Craig McLean hosted a town-hall style meeting with AOML staff.

Below is a listing of the individuals who received certificates of appreciation and federal year-in-service awards, as well as the citations for AOML’s three outstanding scientific papers.

Hurricane Research Division (HRD)

Bachir Annane—For comprehensive and timely analyses using the OSSE framework to evaluate the impact of the CYGNSS scatterometer dataset on tropical cyclone forecasts.

Lisa Bucci, Kelly Ryan, and Jun Zhang—For successfully operating and executing the Doppler Wind Lidar instrument on NOAA’s P-3 Hurricane Hunter aircraft during the 2015 and 2016 IFEX hurricane field programs.

Shirley Murillo—For excellence in leading the Hurricane Research Division’s Observing System Simulation Experiment science research group.

Sonia Otero—For software engineering leadership during the development of the Airborne Atmospheric Measurement and Profiling System (AAMPS), the principal aircraft data system used on the NOAA P-3 and Gulfstream-IV Hurricane Hunter aircraft from 2007-2016.

Ocean Chemistry and Ecosystems Division (OCED)

Natchanon Amornthammarong—For pioneering work to establish and develop a novel and inexpensive sea temperature sensor.

Ian Enochs—For management of the effort to establish a new and novel experimental network of aquariums deemed the Future Research Laboratory for the study of ocean acidification and other deleterious environmental parameters on coral reef ecosystems.

Physical Oceanography Division (PhOD)

Thomas Sevilla—For spending 68 days at sea in support of the Physical Oceanography Division’s research programs, the greatest number of sea days of all PhOD staff during fiscal year 2016.

Francis Bringas, Ricardo Domingues, Grant Rawson, Ulises Rivero, and Thomas Sevilla—For constant and uninterrupted piloting of four underwater gliders during the 2016 Atlantic hurricane season in support of AOML’s Underwater Glider Program.

Mayra Pazos and Erik Valdes—For expanding the Global Drifter Program’s Drifter Assembly Center infrastructure to incorporate Iridium satellite-tracked drifter data. (continued on next page)
Charita Atluri, Elizabeth Forteza, Vicki Halliwell, Jaya Nair, Reyna Sabina, and Claudia Schmid—For developing a major system upgrade that allows for the flexible use of multiple profiles that meet the needs of the satellite and biogeochemical communities (by adding the flexibility to incorporate bio-Argo profiles such as oxygen, nutrients, pH, etc.).

Office of the Director (OD)

John McKeever—For exceptional support of AOML’s computer security measures and preparation of the annual report of the AOML Director mandated by NOAA’s Office of Oceanic and Atmospheric Research.

Ruth Almonte, Lillian Estefan, John Festa, Ramon Hurlockdick, Dalynne Julmiste, and Esa Peltola—For exceeding OAR’s fiscal year 2016 budget closeout benchmark of 98% by 2%, masterfully obligating federal appropriations at 100% in support of AOML’s programmatic, operational, and cooperative institute endeavors.

Ivan Castro—In recognition of your 10 years at AOML, serving as the initial point of contact for guests and colleagues, as well as supporting customer service and security measures to ensure the integrity of AOML’s operating procedures.

The following peer-reviewed journal articles were recognized as AOML’s top three outstanding scientific papers for fiscal year 2016 (AOML authors are denoted by bolded lettering):


Federal Year-In-Service Awards

<table>
<thead>
<tr>
<th>Years</th>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Pedro Pena</td>
<td>Physical Scientist, PhOD</td>
</tr>
<tr>
<td>15</td>
<td>Dalynne Julmiste</td>
<td>Administrative Officer, OD</td>
</tr>
<tr>
<td>25</td>
<td>Emy Rodriguez</td>
<td>Administrative Assistant, OCED</td>
</tr>
<tr>
<td></td>
<td>Jack Stamates</td>
<td>Oceanographer, OCED</td>
</tr>
<tr>
<td>30</td>
<td>Elizabeth Johns</td>
<td>Oceanographer, PhOD</td>
</tr>
<tr>
<td>35</td>
<td>Stanley Goldenberg</td>
<td>Meteorologist, HRD</td>
</tr>
<tr>
<td></td>
<td>Michael Shoemaker</td>
<td>Electronics Technician, OCED</td>
</tr>
<tr>
<td>40</td>
<td>Robert Atlas</td>
<td>AOML Director, OD</td>
</tr>
<tr>
<td></td>
<td>Joseph Griffin</td>
<td>Computer Scientist, HRD</td>
</tr>
</tbody>
</table>

AOML Deputy Director Molly Baringer (left) with Ian Enochs, Derek Manzello, Graham Kolodziej, and Lauren Valentino for authoring one of AOML’s top three peer-reviewed journal articles for fiscal year 2016.
First-Floor Offices at AOML Under Construction

In October, efforts began to completely renovate several office areas on the first floor of AOML, including the work space of Office of the Director staff and individuals with the Physical Oceanography and Ocean Chemistry and Ecosystems divisions. Staff occupying these areas have been temporarily relocated to other offices throughout the AOML facility during the estimated 4 months of demolition, asbestos abatement, and construction needed to complete the project. In the interim, the area will be bustling with activity as work crews tear down and remove old material and then build 11 new offices, a conference room, and a reception area. Redesign of the 2,850 square-foot area was undertaken to improve its function, safety, and aesthetics and marks the first major overhaul of these work spaces in more than 35 years.

Electrical wires and air conditioning ductwork dangle from above while debris litters the floor of a partially demolished office area on the first floor.

Dr. Kathryn Sullivan Visits NOAA’s Virginia Key Science Labs

NOAA Administrator Dr. Kathryn Sullivan visited Virginia Key on November 2-3 and was warmly welcomed by staff from both AOML and the Southeast Fisheries Science Center (SEFSC). Dr. Sullivan hosted an informal all-hands meeting on November 2 for the AOML-SEFSC community to speak about NOAA, its accomplishments and future science directions, and her time as its leader. She also premiered an informal award called the “Order of Sherman’s Lagoon” that she presented to Howard Friedman of AOML for his long-term support of diversity and equal employment opportunity and to Isabel Holder of SEFSC for her long-term skill in meeting organizationally mandated budgetary benchmarks. A question and answer session followed.

The next day she toured both facilities to meet with leaders and become better acquainted with the research conducted at each lab. At AOML, she meet with researchers to learn about advances in tropical cyclone research and efforts to improve tropical cyclone forecasts, as well as innovative observing technologies being developed and used at AOML to better document the changing physical, chemical, and biological properties of the ocean and how these changes impact climate, weather, and marine ecosystems.

Clockwise from upper left: Ulises Rivero shows off the new Iridium antenna developed at AOML; Gustavo Goni discusses AOML’s underwater glider program to improve hurricane forecasts and better understand upper ocean thermodynamics; Dr. Kathryn Sullivan joins Ian Enochs, Paul Jones, and Graham Kolodziej in the newly constructed Future Reef Lab to study how coral species will respond and adapt to climate change; Sundararaman Gopalakrishnan discusses improvements to the Hurricane Weather Research and Forecasting model; Pamela Fletcher presents Dr. Sullivan with a copy of the book Tropical Connections: South Florida’s Marine Environment; and Natchanon Amornthammarong explains the workings of a new, low-cost temperature sensor developed at AOML for eventual deployment at coral reef sites around the world.
Dr. Cristina Carollo joined the staff of AOML’s Ocean Chemistry and Ecosystems Division in November as an assistant scientist with the University of Miami’s Cooperative Institute for Marine and Atmospheric Studies. Cristina will work with Dr. Chris Kelble on an integrated ecosystem assessment project for the Gulf of Mexico to further the understanding of how ecological changes may affect coastal communities. She holds a PhD in Physical Oceanography from the University of Reading (United Kingdom) and has worked in the Gulf of Mexico region for the past 11 years. Much of her recent career has been focused on investigating the links between the biophysical environment and human well-being through the study of ecosystem services.

Mu-Chieh Ko (aka Laura) joined the staff of AOML’s Hurricane Research Division (HRD) in November as a senior research associate with the University of Miami’s Cooperative Institute for Marine and Atmospheric Studies. Laura holds a Master of Professional Science degree in Meteorology and Physical Oceanography from the University of Miami’s Rosenstiel School. Her thesis concentrated on validating the cyclogenesis forecast capability of the basin-scale HWRF model. She will work with HRD’s modeling group with her primary responsibility being to maintain the HWRF system.

Dr. Nicole Millette joined the staff of AOML’s Ocean Chemistry and Ecosystems Division in November as a post-doctoral scientist funded through the Northern Gulf Institute of Mississippi State University. For her PhD research, Nicole studied winter dinoflagellate blooms in Chesapeake Bay at Horn Point Laboratory. She will work with Dr. Chris Kelble on water quality studies of Biscayne Bay. Her initial focus will be to analyze existing data on nutrients, chlorophyll-a, and other water quality parameters obtained from Biscayne Bay.

Farewell

Ivan Castro, AOML’s receptionist for the past 10 years, retired in December. A free-lance writer, translator, and former journalist with the Miami Herald and Radio Marti, Ivan was always ready to share an interesting story, historical perspective, or a joke. He daily tended to an assortment of administrative duties and served as the initial point of contact for guests and colleagues at AOML, interacting with everyone who visited the laboratory. Ivan also supported the lab’s security protocols, thereby ensuring the integrity of AOML’s operating procedures.

Michael “Shoe” Shoemaker, an electronics technician with AOML’s Ocean Chemistry and Ecosystems Division, retired in December after 35 years of federal service. Shoe began his career at AOML in 1985, after having served 7 years in the US Army, by working as the night-time backup operator for the Vax cluster computer system. As part of his duties, he was responsible for wiring the facility for computer terminals, as well as repairing computer printers and other equipment. He also worked to configure the Ethernet at AOML, a critical part of the lab’s original connection to an interesting new phenomenon in the early 1990s called the Internet.

Shoe provided support for the Hurricane Research Division’s Landfalling Hurricane Project for a few years, completing an extensive amount of electrical work in preparation of a new generation of Doppler radar instruments to be used for weather forecasting. His career took a turn towards coral research, however, when he helped establish a server for the world’s first coral-related website dedicated to the Coral Health and Monitoring Program.

This project led to Shoe’s full-time support of coral research at AOML. With the growing need to assess environmental conditions at reef sites, Shoe lent his electrical engineering expertise to help design, construct, install, and maintain a network of Coral Reef Early Warning System (CREWS) stations that are now scattered throughout the Caribbean and elsewhere. CREWS stations are vital for monitoring the health and well-being of coral reefs and are a component of NOAA’s Integrated Coral Observing Network.

Congratulations

Jason Dunion, a University of Miami Cooperative Institute scientist with AOML’s Hurricane Research Division, earned his doctoral degree in November from the College of Arts and Sciences at the State University of New York-Albany. Jason’s thesis, The Tropical Cyclone Diurnal Cycle, uses a combination of satellite data, numerical modeling, and aircraft observations to explore cyclical pulses in tropical cyclones (TCs) that regularly propagate away from the storm each day. These TC diurnal pulses affect a deep layer of the atmosphere, can significantly impact storm structure as they evolve, and appear to represent an underappreciated, yet fundamental TC process.

Howard “Howie” Friedman, the deputy director of AOML’s Hurricane Research Division, was honored by Dr. Kathryn Sullivan, NOAA Administrator, and AOML director Dr. Bob Atlas during an all-hands meeting of NOAA’s Virginia Key employees on November 2. Howie received the first ever Order of Sherman’s Lagoon award, bestowed to honor his exemplary service to NOAA’s mission. The award recognized Howie’s long-term efforts to promote equal employment opportunity, diversity, and educational and outreach activities at AOML. Howie was also recognized for his 55 years of dedicated federal service. The award is broadly based on the comic strip Sherman’s Lagoon by Jim Toomey.
Recent Publications (AOML authors are denoted by bolded capital letters)


