

Fieldwork

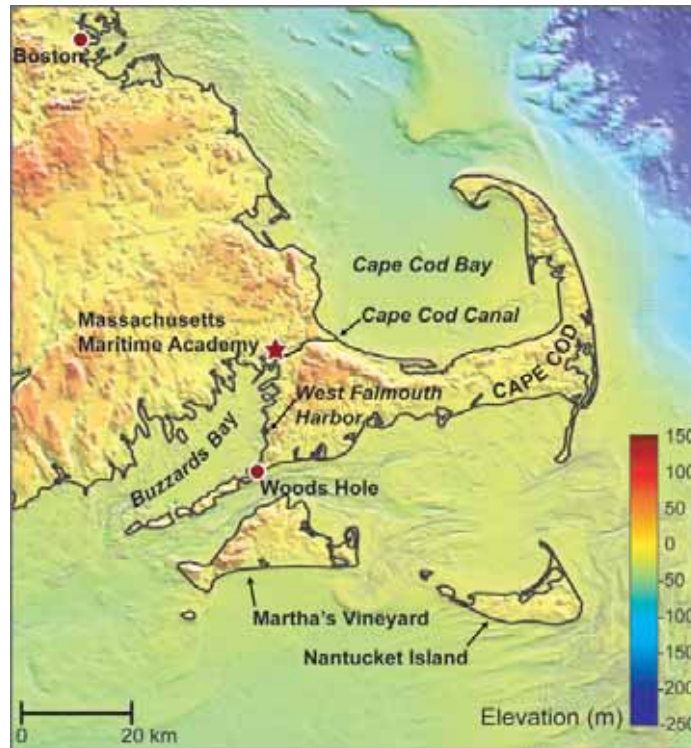
USGS Steers Science at Massachusetts Maritime Academy— Measuring Tidal Flows in the Cape Cod Canal

By Neil K. Ganju

A new pilot study in Buzzards Bay, Massachusetts, is the first step toward better understanding of the bay's water quality, ecosystems, and potential for tidal power. As part of the study, the U.S. Geological Survey (USGS) Woods Hole Coastal and Marine Science Center deployed a sideward-looking acoustic Doppler current profiler (ADCP) to measure water currents and tidal flows in the Cape Cod Canal. The Massachusetts Maritime Academy (MMA), located at the southwest end of the canal, is ideally situated for measuring the canal's influence on upper Buzzards Bay. While deploying such an instrument isn't anything new, the location of the instrument definitely raised some eyebrows.

During the first reconnaissance trip to the MMA in October 2009, MMA's director of Marine Operations **Billy Klimm** noted that the hulking steel rudder of the 550-ft Training Ship (TS) *Kennedy* was aimed directly perpendicular to the Cape Cod Canal, an optimal orientation for mounting the ADCP. Tied securely to a dock on the MMA campus, the ship would remain in place until a training cruise in January 2010—plenty of time for a 4-week deployment of the ADCP. Once the Massachusetts Department of Transportation and the ship's captain approved a mount design, USGS divers **Chuck Worley** and **Mike Casso** installed the ADCP 3 m below the water surface using a low-impact wood frame designed by **Jon Borden**, **Worley**, and **Bob Barton**. **Borden** also deployed a conductivity, temperature, and depth (CTD) sensor on the seabed near the vessel.

(Tidal Flows continued on page 2)



Coast of Massachusetts in the region of Cape Cod.



*Part of the campus of the Massachusetts Maritime Academy, as seen from the Training Ship *Kennedy*. The Cape Cod Canal is in the middle ground, and a railroad bridge crosses the canal in the left background.*

Sound Waves

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Submission Guidelines

Deadline: The deadline for news items and publication lists for the April issue of *Sound Waves* is Wednesday, February 10.

Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.

Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator® files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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Want to e-mail your question to the USGS? Send it to this address: ask@usgs.gov

Fieldwork, continued

(Tidal Flows continued from page 1)

The measurements will address two goals for the USGS and the MMA. Firstly, they will support the USGS development, recently begun, of a 3D numerical model of Buzzards Bay, using the USGS-sponsored Community Sediment-Transport Model. The modeling will support water-quality and ecological studies in Buzzards Bay and West Falmouth Harbor, in collaboration with the USGS Geochemistry group, Cornell University, and the Marine Biological Laboratory. Modeling Buzzards Bay requires water-velocity data at both the seaward end and the canal end of the bay. The seaward data can be extracted from larger, regional-scale models, but there is little information on the water velocity through the Cape Cod Canal. Secondly, the MMA is currently planning a pilot tidal-energy study adjacent to the TS *Kennedy*. Velocity measurements will aid the MMA in estimating the power available from tidal currents at different locations in the canal.

To measure current velocities, the ADCP relies on the Doppler effect: sound emitted by a source moving toward you reaches your ear at a higher frequency than sound emitted by a source moving away from you. For example, a train horn has a higher pitch (higher frequency) as the train approaches and a lower pitch as it recedes. Transducers on the ADCP emit pulses of sound energy at a known fre-



Stern of the 550-ft-long, 13,000-ton Training Ship Kennedy, with top of rudder just visible above the water.

quency and then receive the sound energy that bounces back to the instrument after hitting particles suspended in the water. Sound bounced back by particles moving toward the ADCP will arrive with a higher frequency than the original sound pulses, whereas sound bounced back by particles moving away from the ADCP will have a lower frequency. The instrument uses these frequency shifts to calculate how fast the particles and the water around them

are moving. To learn more about ADCPs, visit the Woods Hole Oceanographic Institution's Web page at <http://www.whoi.edu/instruments/viewInstrument.do?id=819>.

An ADCP mounted on the seafloor, sometimes called an upward-looking ADCP, can measure current velocities over a range of depths, from the bottom all the way up to the surface, thus creating a vertical "velocity profile" of currents at a particular site. Sideward-looking ADCPs

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Sideward-looking ADCP on rudder mount, before deployment.



Fieldwork, continued

(Tidal Flows continued from page 2)

measure water velocities along a horizontal line at a fixed depth; they can create a horizontal velocity profile across an entire channel, for example. Sideward-looking ADCPs are typically used to aid in port management and navigation, as well as to develop flow-rating curves—graphs of the mathematical relationship between water level and flow—in open channels. The sideward-looking ADCP used in this study was deployed at the entrance to West Falmouth Harbor earlier this year as part of the pilot study, and a continuous record of tidal water flow over a 2-month period was generated using the data.

The Cape Cod Canal presents a very different challenge from West Falmouth Harbor, owing to the width of the canal (approximately 200 m) and large turbulent eddies that form during flood and ebb tides. Ebb tide carries water from Cape Cod Bay through the canal to Buzzards Bay. Cape Cod Bay is typically cooler than Buzzards Bay. Therefore the rate of tidal flow affects the temperature field in northern Buzzards Bay. Variations in habitat quality (for example, the amount of dissolved oxygen) might be linked to variations in water temperature, and so accounting for canal water in the numerical model will be important.



Chuck Worley (in dive gear) and **Pat Dickhudt** move the ADCP into position. **Mike Casso** (also in dive gear) is seated to the left of **Worley** on the rudder; he is mostly hidden by the hull in this view.

Perhaps the biggest challenge in deploying the ADCP was mounting the unit with minimal tilt. Because the instrument has only two beams (that is, it emits sound pulses and receives their echoes in just two directions), it can only resolve currents that are aligned with the transducer. Open channels typically have the largest velocities in the horizontal, along-channel direction, so the transducer must

be aligned in the same direction. Any rotation of the unit will result in current measurements in a direction not consistent with horizontal flow. After securing the ADCP to the rudder, **Worley** and **Casso** came to the surface concerned that there might have been a slight rotation of the unit. The deployment software was not as concerned, however, and reported a nearly negligible tilt of just 0.09 degrees! ❄️

Research

Peace River in Florida Loses as Much as 11 Million Gallons a Day to Sinkholes and is Vulnerable to Running Dry

By **Patricia Metz** and **Matthew Cimitile**

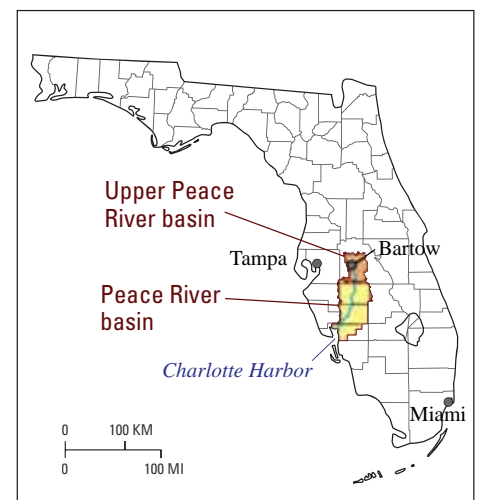
The Peace River is one of the largest watersheds in Florida, extending from central Florida's phosphate mining district to the southwest coast, where it discharges into Charlotte Harbor. The river serves as a drinking-water supply for a growing population of downstream residents in southwest Florida.

A 5-year U.S. Geological Survey (USGS) study conducted by hydrologists **Patricia Metz** and **Bill Lewelling** reports that the upper Peace River near Bartow, Florida, can lose large quantities of water to underlying aquifers. On average, the upper Peace River loses water at a rate

of 11 million gallons per day (17 cubic feet per second) to sinkholes, fractures, and crevices along a 2-mile section of the river south of Bartow. These losses make the river vulnerable to running dry during periods of low rainfall, and they limit its ability to support ecosystems and provide water to residents downstream.

The upper Peace River flows through karst, a type of topography formed in limestone that can be dissolved by rainwater, which is naturally slightly acidic (with a pH below 7.0). Such topography is characterized by sinkholes, caves, and un-

(Peace River continued on page 4)



Location of study area.



The Peace River flowing at 29 cubic feet per second on June 16, 2006, near Bartow, Florida.



About one month before, the same section of the Peace River ran dry at the end of the spring dry season in early May.

(Peace River continued from page 3)

derground drainage. The bedrock beneath the upper Peace River is mainly limestone, and the river and floodplain contain numerous karstic features, including sinkholes, fissures, cavities, and conduits.

Although the upper Peace River has long flowed through karst, it has not always been vulnerable to running dry. Historically, the upper Peace River flowed year round, and its floodplain contained artesian wells and a spring (Kissengen Spring) that discharged an average of 20 million gallons per day (31 cubic feet per second) into the river. Now, however, the upper Peace River goes dry during below-average rainfall years and when aquifer levels are low. During 7 of the past 10 years, the river has gone dry in this area, mostly during the end of the spring dry season. During 2000-2002, the dry area extended beyond this 2-mile section, and the USGS streamflow gage at Bartow recorded periods of no flow for the first time in its 68-year history. The river at this gage once again went dry for several days in May 2009.

About 10 prominent karst features in the low- and high-water channel of the upper Peace River provide the paths through which large amounts of streamflow drain to the underlying aquifers. The largest single-day loss measured during the 2002-2007 study period was 32 million gallons per day on June 28, 2002.

(Peace River continued on page 5)



This whirlpool (center) indicates loss of streamflow to a fracture as river water flows down to the underlying aquifer.



Increase in ground-water use resulted in cessation of flow at Kissengen Spring, shown here in April 2006.

Research, continued

(Peace River continued from page 4)

Streamflow losses varied throughout each year and were related to seasonal fluctuations in groundwater levels. During this study, the largest streamflow losses occurred at the beginning of the summer rainy season (May and June), when groundwater levels were low and large volumes of water were needed to replenish unfilled cavities and void spaces in the underlying aquifers.

“The greatest influence on streamflow declines in the upper Peace River is the lowering of the groundwater levels below the riverbed elevation,” said Metz. “As groundwater levels decline below the riverbed elevation, the cavernous layers capture the river flow and divert it through holes and cracks into the groundwater system.” This study shows that streamflow losses are exacerbated during drought years, which is also when groundwater use increases.

Streamflow declines have resulted in changing flow patterns, streamflow loss, and the drying up of the artesian wells and Kissengen Spring. The progressive, long-term decline of streamflow in the upper



Streamflow loss prevents the river from supporting downstream ecosystems, resulting in accumulation of dead fish and snakes at Catfish Sink.

Peace River began as early as the 1950s, with intensive groundwater withdrawals for phosphate mining. In 1975, when groundwater use for phosphate-mining processes was at its maximum, groundwater levels were as much as 50 feet below the riverbed elevation along the upper Peace River. Since then, there has been a reduction in the use of groundwater for mining processing, and aquifer levels have risen. Currently, groundwater levels remain as much as 30 feet below the riverbed elevation, depending on climatic conditions and groundwater use. Although the aquifer levels have risen in this region, groundwater levels that are still below the riverbed elevation create the potential for streamflow losses through the karst features.

This USGS study was funded in cooperation with the Southwest Florida Water Management District (SWFWMD) to understand the relation between geology,

groundwater levels, and streamflow losses. The study also helps explain other factors affecting historical and current streamflow trends of the upper Peace River. The report, “Hydrologic Conditions that Influence Streamflow Losses in a Karst Region of the Upper Peace River, Polk County, Florida” (USGS Scientific Investigations Report 2009-5140, <http://pubs.usgs.gov/sir/2009/5140/>), will provide residents, businesses, regulatory agencies, and scientists with information that can help them make informed decisions about water-supply issues in central Florida.

For more information, including a photo gallery of the Peace River during various hydrological conditions, a video of the river flowing into a sinkhole, a bibliography of previous USGS publications on the Peace River, and a link to the new report, visit http://fisc.er.usgs.gov/featured_science_archive/peace_river.html. ❁



Crevasse Sink extends 25 feet across the riverbed and is one of many karst features that transfer millions of gallons of water from the surface to below ground.



USGS hydrologist Bill Lewelling records land-surface elevations at Dover Sink.

New Discoveries About the Deep Ocean Could Improve Climate Projections

By Harry Dowsett, Marci Robinson, and Jessica Robertson

New discoveries about the deep ocean's temperature variability and circulation system could help improve projections of future climate conditions.

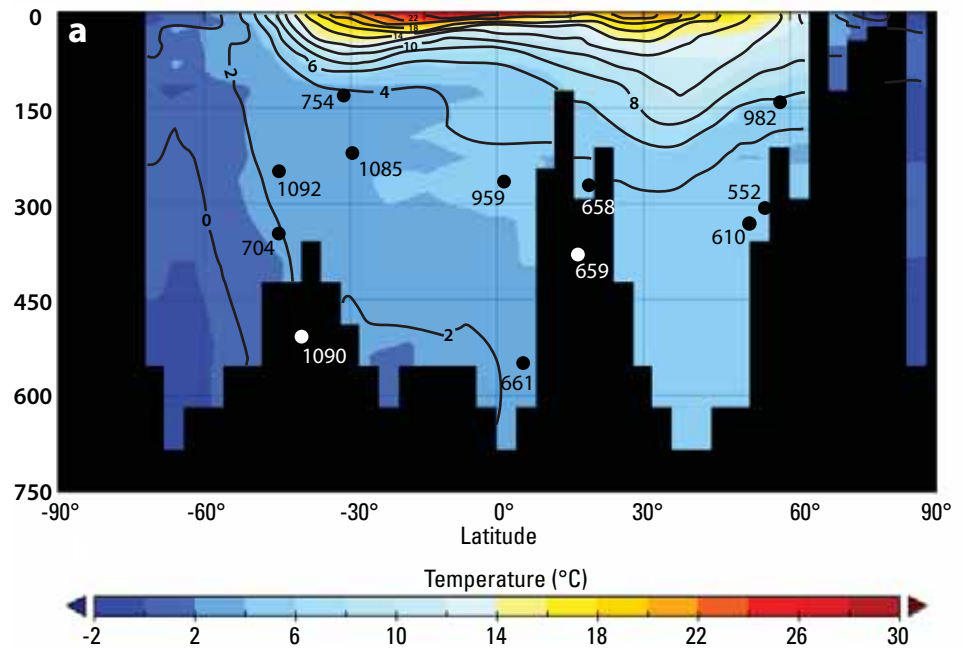
The deep ocean is affected more significantly by surface warming than previously thought, and this understanding allows for more accurate predictions of factors such as sea-level rise and ice-volume changes.

High ocean-surface temperatures have also been found to result in a more vigorous deep-ocean circulation system. This increase results in a faster transport of large quantities of warm water, with possible impacts that include reduction of sea-ice extent and overall warming of the Arctic. (See related article "Arctic Could Face Warmer and Ice-Free Conditions," this issue.)

"The deep ocean is relatively unexplored, and we need a true understanding of its many complex processes," said U.S. Geological Survey (USGS) Director **Marci McNutt**, speaking from the United Nations Climate Change Conference in Copenhagen last December. "An understanding of climate change and its impacts based on sound, objective data is a keystone to the type of long-term strategies and solutions discussed at the conference."

USGS scientists created the first ever 3D reconstruction of an ocean during a past warm period, focusing on the mid-Pliocene warm period 3.3 to 3 million years ago. This work is discussed in a recently published article, "Pliocene Three-Dimensional Global Ocean Temperature Reconstruction," in the journal *Climate of the Past* (v. 5, p. 769-783, <http://www.clim-past.net/5/769/2009/>).

"Our findings are significant because they improve our previous understanding that the deep ocean stayed at relatively constant, cold temperatures and that the deep-ocean circulation system would slow down as surface temperatures increased," said USGS scientist **Harry Dowsett**. "By looking at conditions in the past, we acquire real data that allow us to see the global climate system as it actually functioned."



*Profile of ocean temperature along a meridian at approximately 20°W (eastern Atlantic Ocean). South Pole at left, North Pole at right. Land areas and seafloor are black; major features, left to right: Antarctica (approx 90-75°S), Mid-Atlantic Ridge (approx 40°S), continental slope off Africa (approx 15°N), Iceland atop Mid-Atlantic Ridge (approx 65°N), and eastern edge of Greenland (approx 80°N). All temperatures in °C; contour interval is 2°C. Numbered dots are Deep Sea Drilling Project and Ocean Drilling Program sites from which data were used for mid-Pliocene temperature reconstruction. Black contour lines show modern temperature; colored regions show temperatures during the mid-Pliocene. Differences in temperature can be surmised by comparing color contours to black contour lines. For example, site 959 is slightly cooler than 4°C in the modern ocean but was slightly warmer than 4°C in the mid-Pliocene. For more information, see article in *Climate of the Past* (<http://www.clim-past.net/5/769/2009/>).*

"The average temperature of the entire ocean during the mid-Pliocene was approximately one degree warmer than current conditions, showing that warming wasn't just at the surface but occurred at all depths," said USGS scientist **Marci Robinson**. "Temperatures were determined by analyzing marine plankton fossils, which are organisms that inhabited the water's surface, as well as fossils of bottom-dwelling organisms known as ostracodes."

Global average surface temperatures during the mid-Pliocene were about 3°C (5.5°F) warmer than today and within the range projected for the 21st century by the Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>). Therefore, the mid-Pliocene may be one of the

closest analogs in helping to understand Earth's current and future conditions. USGS research on the mid-Pliocene has also produced the most comprehensive global reconstruction of climate conditions for any warm period prior to the last interglacial (approximately 125,000 years ago).

To learn more about USGS research on the mid-Pliocene, listen to a USGS CoreCast interview with **Harry Dowsett** and **Marci Robinson**, "Want Clues to Climate Change? Let's Look Back 3 Million Years..." (Episode 115, <http://www.usgs.gov/corecast/details.asp?ep=115>) and read a related *Sound Waves* article, "Getting Warmer? Prehistoric Climate Can Help Forecast Future Changes" (January/

(Deep Ocean continued on page 7)

(Deep Ocean continued from page 6)

February 2009, <http://soundwaves.usgs.gov/2009/01/>).

Technical articles on the subject include the recent report in *Climate of the Past* (v. 5, p. 769-783, <http://www.clim-past.net/5/769/2009/>) and reports in *Nature Geoscience* (Decem-

ber 6, 2009, <http://dx.doi.org/10.1038/ngeo706>) and *Stratigraphy* (v. 6, no. 4, p. 265-275, <http://www.micropress.org/stratigraphy/>).

The USGS led this research through the Pliocene Research, Interpretation and Synoptic Mapping (PRISM) group.

The primary collaborators in PRISM are Columbia University, Brown University, the University of Leeds, the University of Bristol, the British Geological Survey, and the British Antarctic Survey. Learn more about PRISM research at <http://geology.er.usgs.gov/eespteam/prism/>. ☼

Arctic Could Face Warmer and Ice-Free Conditions

By Marci Robinson and Jessica Robertson

There is increased evidence that the Arctic could face seasonally ice-free conditions and much warmer temperatures in the future, according to a recent report by the U.S. Geological Survey (USGS).

Scientists documented evidence that the Arctic Ocean and Nordic Seas were too warm to support summer sea ice during the mid-Pliocene warm period (3.3 to 3 million years ago). This period was characterized by warm temperatures similar to those projected for the end of this century, and is used as an analog to understand future conditions. (See related article “New Discoveries About the Deep Ocean Could Improve Climate Projections,” this issue.)

The USGS found that summer sea-surface temperatures in the Arctic ranged from 10 to 18°C (50 to 64°F) during the mid-Pliocene, whereas current temperatures are around or below 0°C (32°F).

Examining past climate conditions allows for a true understanding of how Earth’s climate system really functions. USGS research on the mid-Pliocene has also produced the most comprehensive global reconstruction of climate conditions for any warm period prior to the last interglacial (approximately 125,000 years ago). This reconstruction will help refine climate models, which currently underestimate the actual rate of sea-ice loss in the Arctic.

Loss of sea ice could have varied and extensive consequences, such as contributions to continued Arctic warming, accelerated coastal erosion due to increased wave activity (for example, see <http://soundwaves.usgs.gov/2009/05/research2.html>), impacts to large predators (polar bears and seals) that depend on sea-ice cover, intensified mid-latitude storm tracks

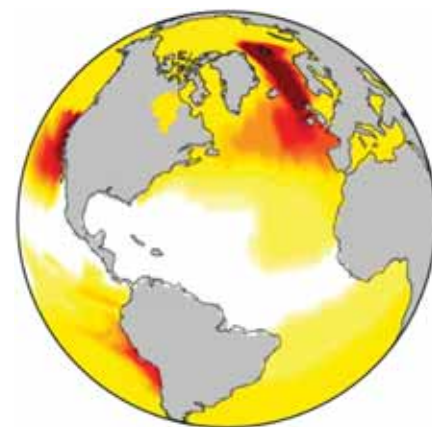
and increased winter precipitation in western and southern Europe, and less rainfall in the American West.

“In looking back 3 million years, we see a very different pattern of heat distribution than today, with much warmer waters in the high latitudes,” said USGS scientist and report author **Marci Robinson**. “The absence of summer sea ice during the mid-Pliocene suggests that the record-setting melting of Arctic sea ice over the past few years could be an early warning of more significant changes to come.”

Global average surface temperatures during the mid-Pliocene were about 3°C (5.5°F) warmer than today and within the range projected for the 21st century by the Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>).

To learn more about USGS research on the mid-Pliocene, listen to a USGS CoreCast interview with **Harry Dowsett** and **Marci Robinson**, “Want Clues to Climate Change? Let’s Look Back 3 Million Years...” (Episode 115, <http://www.usgs.gov/corecast/details.asp?ep=115>) and read these related *Sound Waves* articles: “New Discoveries About the Deep Ocean Could Improve Climate Projections” (this issue) and “Getting Warmer? Prehistoric Climate Can Help Forecast Future Changes” (January/February 2009, <http://soundwaves.usgs.gov/2009/01/>).

Technical articles on the subject include the recent report, “New quantitative evidence of extreme warmth in the Pliocene Arctic,” published in the journal *Stratigraphy* (v. 6, no. 4, p. 265-275, <http://micropress.org/stratigraphy/>), and reports in *Climate of the Past* (v. 5, p. 769-783, <http://www.clim-past.net/5/769/2009/>) and *Nature Geosci-*



Mid-Pliocene August SST anomaly (°C)
 -8.0 -6.0 -4.0 -2.0 0.0 2.0 4.0 6.0 8.0

Mid-Pliocene versus modern sea-surface-temperature (SST) anomalies, based on the PRISM SST reconstruction. Yellow, orange, and red colors indicate areas where average sea-surface temperatures were warmer during the mid-Pliocene than today. These anomalies show little difference from modern temperatures near the equator, with increasingly warmer mid-Pliocene temperatures toward the pole.

ence (December 6, 2009, <http://dx.doi.org/10.1038/ngeo706>).

Scientists studied conditions during the mid-Pliocene by analyzing fossils dated back to this time period. The USGS led this research through the Pliocene Research, Interpretation and Synoptic Mapping (PRISM) group. The primary collaborators in PRISM are Columbia University, Brown University, the University of Leeds, the University of Bristol, the British Geological Survey, and the British Antarctic Survey. Learn more about PRISM research at <http://geology.er.usgs.gov/eespteam/prism/>. ☼

Sound Science Leads to Sound Stewardship: Miami Conference on the Caribbean and Central America

By Ann Tihansky

Sound scientific information is a critical resource for decision makers when forecasting the success of economic development and resource sustainability. The January 12 earthquake disaster in Haiti illustrates the value that scientific advisories can have in helping countries minimize risk and prepare and plan for the inevitable effects of natural disasters like earthquakes, hurricanes, landslides, and other extreme Earth-system events.

The U.S. Geological Survey (USGS) has the scientific expertise and capabilities to support scientific programs that inform governments about infrastructure design and other ways to minimize risk and boost preparedness. Many of our neighboring nations in the Caribbean and Central and South America wrestle with issues pertaining to impacts from geologic hazards and the need to work across political boundaries to maintain sustainable fisheries and tourism. Science plays a large role in supporting sound economic development. A few examples include identifying and mitigating geologic hazards, incorporating impacts expected from climate change in development plans, and understanding environmental impacts on global economic trade.

For the second year in a row, the USGS has hosted a booth at the Caribbean-Central American Action (CCAA) Miami Conference on the Caribbean and Central America to raise awareness about USGS scientific expertise and programs that could benefit neighboring nations. Many of these nations are not familiar with the USGS or the possibility that USGS programs could be tapped for assistance. The Republic of Haiti was featured prominently in this year's conference, which included a keynote address by the Prime Minister of Haiti, **Jean-Max Bellerive**. Other sessions focusing on Haiti brought together stakeholders to discuss the important role that sustainable resources and preparedness for natural hazards play in economic growth and foreign investment. The conference agenda is posted online at http://www.c-caa.org/pdf/09MC_agenda.pdf. The



Jean Weaver (center) meets with NOAA representatives Adam Baske (left) and Nancy Daves as they discuss their presentation plans for the NOAA breakfast session, "Building a Sustainable Environment—Highlighting the Tools that NOAA is Using to Help the Caribbean Basin in its Disaster Preparedness and in the Protection of its Natural Resources," at the CCAA meeting in Miami.

meeting took place in Miami, Florida, from November 30 to December 2, 2009.

Jean Weaver coordinates USGS science activities throughout the Caribbean and Central and South America through the USGS International Program Office. She sees the CCAA conference as an opportunity to reach out to these international audiences and improve communication between governments. For the past 2 years, **Weaver** has been accompanied by **Ann Tihansky**, from the USGS Science Center in St. Petersburg, Florida, to help represent many current USGS programs in the region. By participating in this conference, **Weaver** hopes to meet the goal of sharing USGS science and supporting governmental agencies beyond our borders.

The USGS booth at the 2009 conference drew a lot of attention. An assortment of fact sheets on hazards, climate change, energy resources, water resources, and invasive and endangered species prompted questions about mapping tools, tsunami-warning networks, and hurricane impacts from visitors who spoke French, Spanish, and the Haitian Creole.

Weaver points out that science is the basis of sound resource stewardship. Scientifically based infrastructure, for example, allows more efficient response to and mitigation of damage from hazards, and can provide consistent quality and quantity of drinking water. Additionally, well-managed natural resources are able to sustain a viable tourism industry that relies on healthy ecosystems. The USGS strives to provide unbiased scientific information useful to a variety of users. International partnerships that share scientific findings with neighboring nations can help ensure economic viability. Healthy ecosystems will support robust industry.

Visitors to the USGS booth included the Secretary of State from Puerto Rico, the Minister of Tourism from El Salvador, representatives from the Maritime Security Council, the U.S. Department of State, the U.S. Southern Command (part of the Department of Defense), the Caribbean Trade Center, students and faculty from universities in Puerto Rico and the Virgin Islands, realtors, and members of the world bank-

(Neighboring Nations continued on page 9)

(*Neighboring Nations continued from page 8*)

ing community, such as the Inter-American Development Bank (IADB). There were also representatives from embassies and the U.S. Agency for International Development (USAID), along with representatives from the U.S. commercial section of the Department of Commerce who are hoping to promote U.S. commercial opportunities in the region.

Plenary speakers during luncheon and evening programs included **Rick Wade**, Office of the Secretary, U.S. Department of Commerce, who brought forth **President Obama's** message about the importance of science for informed decision making. He highlighted U.S. agencies, such as the National Oceanic and Atmospheric Administration (NOAA),

the USGS, the U.S. Coast Guard, the U.S. Southern Command, and the State of Florida legal department, as important partners that are in the position to guide, aid, and support our neighboring nations in managing resources across the region. Other distinguished speakers included **Kenneth Merten**, the U.S. Ambassador to Haiti; retired U.S. Senator **Bob Graham**; **Kenneth McClintock**, Secretary of State, Puerto Rico; and **Peter Kent**, the Minister of State for Foreign Affairs of the Americas, Canada.

Walter Bastian, Deputy Assistant Secretary for the Western Hemisphere in the International Trade Administration (U.S. Department of Commerce), kicked off a NOAA breakfast session titled "Building a

Sustainable Environment" that highlighted issues in which science is a prominent player in preparing the region for environmental challenges. Attendees filled the room as the presenters described NOAA programs and noted their partnership with the USGS, highlighting ocean acidification, tsunami-warning systems, coastal hazards, seismic networks, and coral-reef health.

The USGS and NOAA hope to explore with CCAA avenues to align forces to help promote intergovernmental partnerships that benefit the region. One proposed option is a session at the 2010 CCAA conference that includes the USGS sharing expertise about how science informs society and improves decision making. ❁

USGS Research Shows Value of Tampa Bay's Tidal Wetlands at 5th Bay Area Scientific Information Symposium

By Matthew Cimitile, Justin Krebs, and Adam Brame

Scientists from the U.S. Geological Survey (USGS) in St. Petersburg, Florida, presented papers at the 5th Bay Area Scientific Information Symposium (BASIS) in Florida in late October 2009. This latest in a series of meetings organized approximately every 5 years revisited the science from the first symposium nearly three decades ago. It is a forum for bringing the science community together to discuss current and future environmental conditions and new ways of balancing current ecosystem and human needs in the Tampa Bay region. Resource managers and scientists from disciplines spanning geology, hydrology, and fish ecology participated in presentations and panel discussions on recent scientific studies, environmental regulations, and issues impacting area ecosystems. The Tampa Bay Regional Planning Council, the Tampa Bay Estuary Program, and a steering committee of Tampa Bay experts hosted the 4-day BASIS 5 meeting.

The first BASIS meeting was organized in 1982, at a time when local newspapers were claiming that Tampa Bay was dead. The bay was heavily polluted with nitrogen; water clarity was poor; algae blooms

were rampant; and seagrasses, mangroves, and wetlands were disappearing. BASIS 1, which addressed the state of the bay and conditions crippling its environment, led to some of the first concerted efforts to improve the ecosystem.

Twenty-seven years later, Tampa Bay is a shining example of a recovering estuary. Seagrass and mangrove habitats are increasing, water quality and clarity are improving, and species of bay scallops and spotted seatrout are returning, according to the Tampa Bay Estuary Program (<http://www.tbep.org>). These successes are largely the result of greater regulatory control of pollutants, such as nitrogen, and greater emphasis on sustainable management of resources, such as fisheries, with many such policies derived from previous BASIS meetings.

Besides looking back to update science from the first meeting, BASIS 5 also served as a platform to highlight new scientific studies that examine the performance of the estuary ecosystem in the face of greater urbanization and population growth. One of the major problems facing Tampa Bay is continued coastal development, which threatens tidal streams and



*Tidal tributaries were the focus of a half-day session at BASIS 5, with USGS fish ecologist **Justin Krebs** leading the discussion and presenting his own study.*

rivers. The conversion of coastal land to impervious surfaces surrounding natural tributaries is bringing about immediate physical and chemical changes and setting the stage for eventual biological changes related to deteriorating habitat

(*BASIS 5 continued on page 10*)

Meetings, continued

(BASIS 5 continued from page 9)



Natural tributaries (far left) are characterized by natural shoreline vegetation and limited development in the surrounding watershed, whereas urban tributaries (left) have modified channels, hardened shorelines, high-density urban development, and large areas of impervious surface in the surrounding wetlands.

quality. Modified for years and woefully understudied until recently, tidal tributaries were the focus of a half-day session led by USGS fish ecologist **Justin Krebs** and featuring collaborative research by USGS scientists and others from various agencies around Tampa Bay.

One such study sought to determine the extent to which coastal development is affecting the quality of tidal tributaries as fish habitat. **Krebs**, working with USGS scientist **Carole McIvor** and University of South Florida Chair of Integrative Biology **Susan Bell**, collected fish, shrimp, and crabs from tidal wetlands during a 2-year study. “By comparing the community structure—the identity and abundance of species—and the health of common species, we hoped to assess the relative quality of these understudied but potentially critical habitats for fish populations in Tampa Bay,” said **Krebs**.

The scientists sampled tidal tributaries in urban, natural, industrial, and mosquito-ditched sites. Urban sites were the most altered habitat, having, on average, less than 20 percent natural cover. Non-urban sites—industrial, mosquito-ditched, and natural sites—retained, on average, approximately 60 percent or more natural vegetation. Among the more common organisms collected were grass shrimp and fish species like sailfin molly, Atlantic silversides, and killifishes.

The study revealed that the total abundance of all fishes and crustaceans was independent of the type or degree of development in the surrounding watershed. However, the nekton community—mobile

marine organisms—in urban creeks was noticeably different from those in non-urban tributaries. Many common fish and shrimp species were underrepresented in tributaries in urban areas. Those that were found were in poorer condition, having 10 to 15 percent smaller body size than nekton from natural, industrial, and mosquito-ditched tributaries.

“Natural habitats typically have diverse fish communities made up of many different species, but when these habitats are developed, the natural processes like hydrology can be altered, eventually degrading water quality and habitat,” said **Krebs**. “For example, changes in water quality can cause a reduction in the number of species in the fish community and lead to certain, more tolerant species becoming more numerous. Though these tolerant species may be able to persist, they may still suffer in terms of reduced body size due to the stresses of a degraded habitat.” Differences found in fish condition and community structure among tidal wetlands are likely due to shoreline modification, channel dredging, and construction of impervious surfaces, all of which degrade the water quality in urban tributaries.

Coastal development is also likely to impact large numbers of

popular sport fish in Florida that use tidal wetlands for nursery habitat. An example is the common snook (*Centropomus undecimalis*). It is one of the most highly sought species in a sport-fishing industry that generated \$4.4 billion for the Florida economy in 2006, according to the U.S. Census Bureau. Along the Gulf Coast alone, an estimated 1.5 million anglers target common snook today. USGS fishery technician **Adam Brame** presented a paper at BASIS 5 that characterized the preferred habitat for juvenile snook within a tidal creek of the Tampa Bay watershed. “The economic impact of the snook fishery on the State of Florida is easily in the millions of dollars,” said **Brame**. “There is a pressure and desire to catch these fish, but without fully understanding their life history, and especially their early life history, where there is a lack of data, activities such as fishing and coastal development can have adverse impacts on the population in the long run.”

(BASIS 5 continued on page 11)



Sailfin mollies in good condition (top row) weigh more than fish of the same length in poor condition (bottom row). Poor condition can be caused by low availability of food resources and physiological stress resulting from poor water quality and predation pressure.

Meetings, continued

(BASIS 5 continued from page 10)

Brame collected more than 450 juvenile snook, along with water-quality and habitat data, from two habitats (ponds and creeks) at two locations (upstream and downstream) in Frog Creek in the Terra Ceia Aquatic Preserve in southern Tampa Bay. He collected a variety of data, including length, weight, abundance, and isotopic signatures of carbon and nitrogen.

Snook abundance varied by habitat type, with a larger number found in ponds. “There are a couple of possible explanations for this,” said **Brame**, “such as lower predation or higher prey availability in ponds, but more likely it is related to energetics.” Juvenile snook expend less energy in ponds—where water flow is largely negligible—than in creeks that are constantly flowing.

Water-flow characteristics also explain why snook found in ponds were isotopically enriched in ^{15}N , a stable isotope of nitrogen that is heavier than the much more abundant ^{14}N . **Brame** explained: “In these tidal creeks, there is a lot of organic-matter input, such as leaves. In a creek most of this matter washes away, but it stays in ponds and is broken down more slowly, causing a nutrient-recycling effect,” which leads to ^{15}N enrichment.



Adam Brame (left) and **Justin Krebs** seine for juvenile snook in an upstream stretch of Frog Creek.

Distinct differences in the isotopic composition of snook between ponds and the creek indicate little movement by snook between the two habitats, again pointing to the value of the pond habitat as primary nursery grounds.

Contributions from these two studies involving tidal creeks are building upon research that will be used in the future to better protect and conserve these habitats, just as science from previous BASIS meetings has improved habitats throughout Tampa Bay. To view the program and abstracts from the October meeting, download the Tampa BASIS 5 Program (full version) from the Web page at <http://www.tbrpc.org/events/basis5/>. ❁



A few of the more than 450 samples collected by **Brame** to better define juvenile snook ecology.

Antarctic Treaty Linkages: Seismic Data, Music, and Paleoclimates

By Alan Cooper

U.S. Geological Survey (USGS) emeritus scientist **Alan Cooper** was invited to Washington, D.C., in early December 2009 to participate in the Antarctic Treaty Summit, marking the 50th anniversary of the hugely successful Antarctic Treaty (<http://www.state.gov/www/global/arms/treaties/arctic1.html>). **Cooper** initiated and has led the Antarctic Seismic Data Library System for Cooperative Research (SDLS, <http://sdls.ogs.trieste.it/>) during the past 18 years. The SDLS provides open access worldwide to Antarctic multichannel seismic-reflection data collected by many countries to study the structure of the Earth's crust in the Antarctic region. It is the only geoscience organization directly linked to the Antarctic Treaty System (through the Treaty Consultative Party Recommendation XVI-12). The SDLS and

its current host program, Antarctic Climate Evolution (ACE, http://www.csam.montclair.edu/earth/eesweb/scar_ace/), are the centerpieces for the Scientific Committee on Antarctic Research's stratigraphic and paleoclimate studies of the Antarctic continental margin. The two current related ACE/SDLS studies are the Circum-Antarctic Stratigraphy Project (CASP, <http://hdl.handle.net/10013/epic.33019>) and the Integrated Ocean Drilling Program (IODP) Drilling Leg 318 off Wilkes Land, Antarctica (January/February 2010, http://iodp.tamu.edu/scienceops/expeditions/wilkes_land.html).

The Treaty Summit brought together principally diplomats and selected scientists from the 43 signatory countries of the Antarctic Treaty to discuss the history, achievements, and future plans

for the dynamic Treaty system, which is dedicated to preserving Antarctica as a continent for peace and science. The importance of the Treaty Summit was emphasized in the keynote addresses by **Prince Albert II** of Monaco and **John Holdren** (Assistant to the President for Science and Technology) and by a U.S. House of Representatives Resolution honoring the 50 years of Antarctic Treaty successes (<http://www.atsummit50.aq/stories/story.php?id=39>).

Ban Ki-moon, Secretary-General of the United Nations, in his video message to delegates at the Summit, stressed the importance of the Antarctic Treaty as a unique example of international cooperation. He called climate change the greatest threat to Antarctica and urged delegates to

(Antarctic Treaty continued on page 12)

(Antarctic Treaty continued from page 11)



The Left Bank/Rive Gauche trio (left to right) **Julianne Stafford**, **Alan Cooper**, and **Larry Schemel** play historical music of Antarctica in the Space Race Gallery of the National Air and Space Museum for the Golden Anniversary Gala held during the Antarctic Treaty Summit. As the program proceeded, historical photographs, song lyrics, journal excerpts, and explanatory text were displayed on the screens behind the trio.

“do your part to ensure that this month’s conference in Copenhagen [U.N. Climate Change Conference, Dec. 7-18] lays the foundation for a legally binding climate treaty” (<http://www.atsummit50.aq/video/>). His comments and the meeting discussions clearly illustrated that the difficulties faced in 1959 during the Cold War in creating and implementing the dynamic Antarctic Treaty were similar to the difficulties now faced during the “warming crisis” by those seeking a climate-change treaty.

Cooper attended the Summit to present a poster titled “Harmonies of Ice and Past Climate Change: Antarctic Paleoclimate,

SCAR and Treaty Successes,” which outlined the successes of the SDLS and ACE program in studying the paleoclimate history of Antarctica in support of the Treaty. An emeritus scientist with the USGS Western Coastal and Marine Geology Team, **Cooper** is also a musician, and in that capacity he was invited to prepare and perform a set of historical music of Antarctica for the Golden Anniversary Gala at the Treaty Summit. The 70-minute program of music selections, accompanied by photographs and text, spanned the time from the explorations of Captain Cook to the signing of the Treaty and outlined the many ways that music has served as

an interface between explorers, scientists, and administrators of Antarctica—and has been a subtle but important part of Antarctic history. **Cooper** is violinist with the Left Bank/Rive Gauche trio (<http://www.leftbanktrio.com/>), in which all members are experienced Earth scientists as well as musicians. The other trio members are **Larry Schemel** (USGS emeritus scientist in the Water Resources Discipline) and **Julianne Stafford** (USGS Volunteer for Science with the Western Coastal and Marine Geology Team). The trio performed the historical music in the Space Race Gallery of the National Air and Space Museum in downtown Washington, D.C. ❁

USGS Coastal and Marine Geology Program Continues its Presence at the SACNAS National Conference

By **Ben Gutierrez** and **Claudia Flores**

For the third consecutive year, **Claudia Flores** and **Ben Gutierrez** of the U.S. Geological Survey (USGS) Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts, attended the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference. The conference was held in Dallas, Texas, from October 15 to 18, with the theme “Improving the Human Condition: Challenges for Interdisciplinary Science.” The conference focuses on helping students connect with professional scientists and assisting them in their pursuit of

graduate school and professional opportunities in the sciences. Approximately 2,700 participants attended this year’s meeting, with 1,600 of those attendees being graduate or undergraduate students.

Flores and **Gutierrez**, who are members of SACNAS (<http://www.sacnas.org/>), are active at the national conference both because of their personal commitment and because of their work with the multi-institution Woods Hole Diversity Advisory Committee (<http://www.woodsholediversity.org/>), which strives to increase the participation of women and underrepresented mi-

norities in the Earth and ocean sciences and in the Woods Hole Scientific Community. The USGS exhibit booth provided **Flores** and **Gutierrez** with the opportunity to reach out to students, teachers, and research professionals. Additionally, they were able to interact with students from a range of disciplines during several mentoring sessions and workshops.

The USGS exhibit highlighted USGS research in the northern Gulf of Mexico and extreme-storm-response work. Posters were provided by **Dave Twichell** and **Elizabeth**

(SACNAS continued on page 13)

Meetings, continued

(SACNAS continued from page 12)

Pendleton as well as **Nathaniel Plant** and **Karen Morgan**. Also at this meeting, **Sere-na Moseman**, a former USGS Mendenhall Postdoctoral Research Fellow, organized and chaired a session titled “Serving our Communities Through Marine Science: An Ocean of Opportunities.” The session was designed to give students the opportunity to learn about the ocean sciences, their influence on society, and what education and career options are available.

SACNAS’s primary mission is to mentor aspiring science and engineering students from minority communities. Each year, the 4-day national conference seeks to provide an open environment for developing and furthering minority involvement in the sciences and is attended by undergraduate and graduate students, postdocs, and research and academic scientists, as well as K-12 educators. Conference activities are centered on exposing students to science, technology, engineering, and math (STEM) opportunities; guiding students in career development; and showcasing research by minority students in graduate and undergraduate programs through oral and poster presentations. Mentoring begins well before the meeting, with at least two experts reviewing each submitted abstract and sending detailed feedback to the student author. More than 800 student abstracts were accepted to the 2009 conference (the abstracts can be downloaded from <http://www.sacnas.org/abstracts.cfm>). All poster and oral presentations were evaluated using a similar process. This year in particular, the conference included several activities focused on connecting students with science professionals in one-on-one settings. Consequently, in addition to staffing their exhibit, **Flores** and **Gutierrez** were able to have in-depth conversations with students on topics ranging from working for the USGS to pursuing graduate studies and exploring different disciplines via internship opportunities.



Typical scene from the SACNAS conference exhibit hall, where exhibits and student posters are combined to facilitate interactions between students and science professionals. Commonly, the SACNAS National Conference includes more than 200 exhibitors, from universities, nonprofit organizations, and State and Federal Agencies.

Next year’s SACNAS National Conference will be held September 30 to October 3, 2010, in Anaheim, California. For more information about SACNAS, its national conference, and its mission statement, visit <http://www.sacnas.org/>. Anyone in the USGS who is interested in participating in exhibitor activities, volunteering as a speaker, or passing along information and opportunities for students at the next SACNAS conference is invited to contact **Claudia Flores** (cflores@usgs.gov) or **Ben Gutierrez** (bgutierrez@usgs.gov). ❁

USGS and NOAA Host Airborne Lidar Processing System (ALPS) Workshop

By **Emily Klipp** and **Amar Nayegandhi**

The U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) cosponsored a workshop on Airborne Lidar Processing System (ALPS) software, which is used to process lidar (light detection and ranging) data collected from a unique system on a light aircraft. Airborne-lidar data are useful for mapping land and the nearshore seafloor in coastal areas where the water is clear enough to transmit the light emitted by a lidar instrument.

The workshop was hosted by members of the Coastal and Marine Geology

Program (CMGP) from the USGS Science Center in St. Petersburg, Florida, in collaboration with NOAA’s National Geodetic Survey (NGS) Remote-Sensing Division. Led by **Amar Nayegandhi** (Jacobs Technology, Inc./USGS), the workshop took place October 27-30, 2009, at the NOAA NGS office in Silver Spring, Maryland. The workshop objective was to provide hands-on training in the ALPS software, and to explore and process lidar data and imagery acquired by the Experimental Advanced Airborne Research Lidar (EAARL) system (<http://ngom.usgs.gov/dsp/tech/eaarl/>). The workshop also gave participants an opportunity to discuss collaborations on the acquisition and application of lidar data and development of the ALPS software. The workshop included representatives from Federal agencies and academia, including the National Park Service (NPS), the U.S. Bureau of Reclamation, the U.S. Forest Service, NOAA, and the University of Idaho.

The EAARL is an airborne lidar system that provides unique capabilities to survey coral reefs, nearshore benthic

(ALPS Workshop continued on page 14)

Meetings, continued

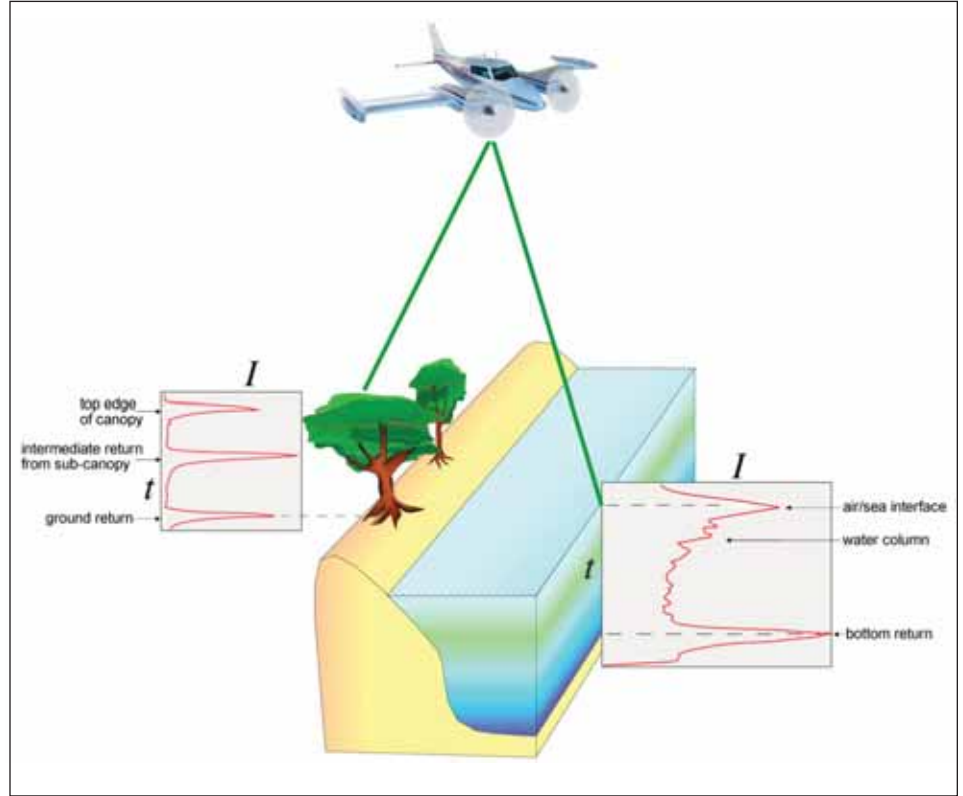
(ALPS Workshop continued from page 13)

habitats, coastal vegetation, and sandy beaches. Operating in the blue-green portion of the electromagnetic spectrum, the EAARL is specifically designed to measure shallow submerged topography and adjacent coastal land elevations seamlessly in a single scan of transmitted laser pulses.

The USGS ALPS software has been developed in an open-source programming environment on a Linux platform. ALPS supports the exploration and processing of lidar data acquired by the EAARL system in an interactive mode or batch mode. The workshop provided hands-on training for attendees to interact with modules developed for lidar-raster and waveform investigation and digital-camera-image playback. The class covered processing workflow—the steps involved in converting raw lidar data to digital-elevation models (DEMs) that represent submerged, bare-earth (elevation of ground surface beneath vegetation), or canopy (elevation of top of vegetation) topography—including automated and semi-automated tools to filter and manually edit data. The training workshop also provided an opportunity for users to better understand the EAARL lidar waveforms and to explore the use of these waveforms in various scientific, inventory, and monitoring activities.

The workshop began with several presentations explaining EAARL, ALPS, and how the CMGP is collaborating with various Federal, State, and local agencies to obtain high-resolution topographic and bathymetric data for scientific studies and resource management. **John Brock** (USGS, Reston, Virginia) presented the history and importance of developing this lidar capability in the CMGP. The principles and capabilities of the EAARL system were summarized by **Wayne Wright** (USGS, St. Petersburg). **Nayegandhi** then provided an overview of ALPS.

The workshop continued with hands-on, guided instruction on how to use ALPS, interspersed with presentations on related topics. **Jamie Bonisteel** (Jacobs Technology, Inc./USGS) was the primary instructor. **Chris Parrish** (NOAA/NGS) presented NOAA NGS Remote-Sensing

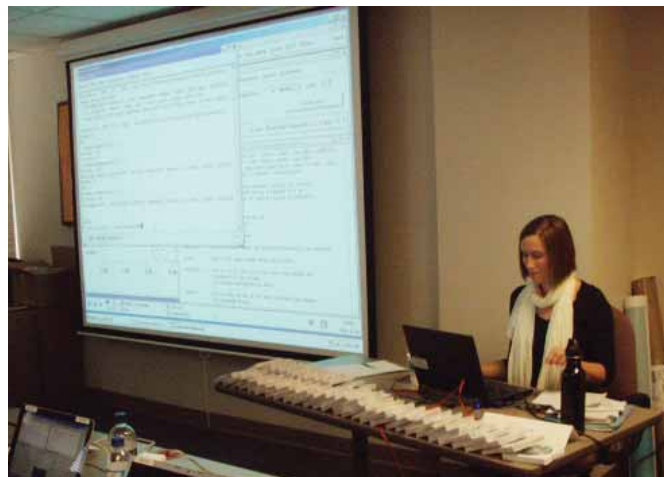


How lidar works. Light reflected from various surfaces provides mapping information about features on land and beneath shallow (light-transmitting) water. Graphs show generalized patterns of data returned from vegetated land (left) and submerged topography (right). I =intensity of returned light; t =time.

Division use of EAARL data in shoreline mapping, and **Nayegandhi** explained the mapping of vegetation structure using waveform lidar. **Jim McKean** (U.S. Forest Service) presented an overview of the application of EAARL submerged and floodplain topography data in riverine

environments. **Richard Mitchell** (Jacobs Technology, Inc./USGS) and **Wright** introduced the new ALPS Multi-Processing System (AMPS), which is capable of reducing the processing time by several orders of magnitude, thereby enabling a quick review of data in the field. **David**

(ALPS Workshop continued on page 15)

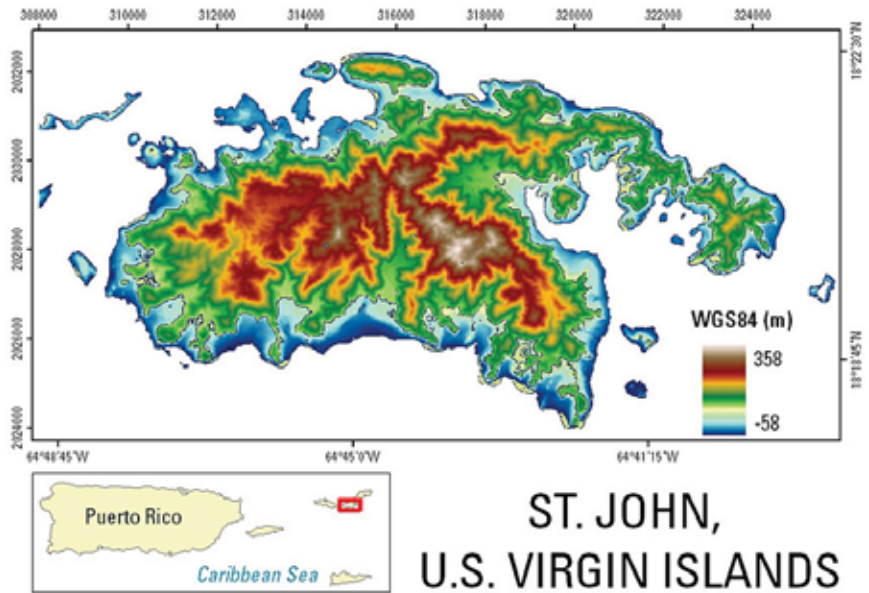


***Jamie Bonisteel** was the primary instructor of the week-long ALPS workshop.*

Meetings, continued

(ALPS Workshop continued from page 14)

Nagle (Jacobs Technology, Inc./USGS) demonstrated the use of ALPS in conjunction with commercial software to georeference and mosaic color-infrared (CIR) photography that is collected by the EAARL system simultaneously with lidar data. **Xan Yates** and **Emily Klipp** (Jacobs Technology, Inc./USGS) presented an overview of the process of publishing lidar data as USGS Data Series DVD products. The published data products ensure that high-resolution digital-elevation data are available to the research community and the general public in a format that is fully documented and usable in standard Geographic Information System (GIS) software. The workshop ended with a demonstration of Global Mapper—software for viewing and manipulating spatial datasets—presented by **Bonisteel**, who showed examples of how to plot, review, and interact with DEMs and CIR photography processed in ALPS. ❁



Subaerial (land) and submerged (seafloor) topography on and around St. John, U.S. Virgin Islands, created from lidar data collected by EAARL in 2003. The subaerial topography is “first surface” topography, produced by using data from laser pulses that bounced off the first surface encountered, typically the tops of trees or buildings. The ability of the lidar system’s laser light to penetrate shallow, nearshore water enabled the creation of this seamless topobathymetric mosaic. WGS stands for “World Geodetic System,” a standard reference frame for mapping and other uses. WGS 84 was produced in 1984 and last revised in 2004. Color-coded elevations are in meters (m).

Awards

Awards for USGS Publication on the Coral Reef of South Molokaʻi, Hawaiʻi

By Helen Gibbons

The U.S. Geological Survey (USGS) publication *The Coral Reef of South Molokaʻi, Hawaiʻi—Portrait of a Sediment-Threatened Fringing Reef* (USGS Scientific Investigations Report 2007-5101) was honored with two awards last year. It won a 2009 National Association of Government Communicators (NAGC) Blue Pencil Award of Excellence, announced in April 2009, and the Association of Earth Science Editors (AESE) 2009 Outstanding Publication Award in the print category, announced in September 2009.

Both awards acknowledge the work of scientific editors **Michael E. Field**, **Susan A. Cochran**, **Joshua B. Logan**, and **Curt D. Storlazzi** of the Western Coastal and Marine Geology Team; and text editor



Peter H. Stauffer and designer and layout artist **David R. Jones** of the Menlo Park Publishing Service Center. Released in late 2008, the publication is posted online at <http://pubs.usgs.gov/sir/2007/5101/> and described in *Sound Waves*, January/February 2009, at <http://soundwaves.usgs.gov/2009/01/pubs.html>.

The AESE Award for Outstanding Publication recognizes a recently published Earth science publication that demonstrates outstanding editing, design, illustration, writing, efficiency of production cost, and overall effectiveness in achieving its publication goal (<http://www.aese.org/shell.html?page=awards&menu=l#OutstandingPub>). This award was presented during a banquet held October 31, 2009, at the AESE Annual Meeting in Houston, Texas, where it was accepted by **Peter Stauffer** on behalf of the group. In an e-mail message notifying the recipients of the award, the chair of the AESE Awards Committee wrote, “The judges were quite impressed with this very attractive book with superb illustrations.”

(Publication Awards continued on page 16)

(Publication Awards continued from page 15)

The NAGC award was a Blue Pencil Award of Excellence for a Technical or Statistical Report (Category 11). The annual NAGC Blue Pencil & Gold Screen Awards Competition recognizes superior government communication products and those who create them (<http://www.nagc.com/Awards/>). Although the group

who produced the *Coral Reef of South Moloka'i* could not attend the awards banquet last April in Orlando, Florida, they were quite pleased with the honor.

“The quality of submissions this year was absolutely amazing,” stated **Maria VanderKolk**, NAGC competitions chair. “In addition, the expertise, as well as the

number of judges, representing agencies at all levels of government and throughout the nation, was extremely gratifying. All those who submitted to the Blue Pencil & Gold Screen Awards Competition can be confident that they competed against the best, and were judged by the best.”

Congratulations to the award winners!✿

Staff and Center News

New USGS Director Visits Centers in California

By Helen Gibbons

The right place at the right time: that's what the U.S. Geological Survey (USGS) centers in Menlo Park and Santa Cruz, California, turned out to be in the week before Christmas, as new USGS Director **Marcia McNutt** made her way home for the holidays. After representing the USGS at the U.N. Conference on Climate Change in Copenhagen, **Director McNutt** flew to San Francisco to participate in the annual meeting of the American Geophysical Union, and then visited the two USGS centers before taking a holiday break at her home in the Monterey Bay area.

On December 21, **Director McNutt** came to the USGS campus in Menlo Park—her first center visit since she became Director of the USGS. She met briefly with center chiefs before addressing an overflow crowd of employees in the campus auditorium. The Director spoke for about 5 minutes and then held a 45-minute question-and-answer session. Afterwards, she mingled with employees at a reception outside the auditorium. It was a celebration not only of her appointment as USGS Director, but also of her return to the Menlo Park center, the place that gave her “my first real job after I got my Ph.D.” and where she worked for 3 years in the 1970s with what is now the Earthquake Hazards Team.

The next day, **Director McNutt** visited the Western Coastal and Marine Geology Team's Pacific Science Center in Santa Cruz. Her visit began with a short tour and a presentation about the center's establishment and newly begun expansion. The Director then received briefings on team

research from **Sam Johnson** and **Guy Cochran** (seafloor mapping applied to habitat, fault characterization, and sediment transport), **Bruce Jaffe** (Samoa tsunami response), **Patrick Barnard** (modeling of sea-level rise and severe-storm impacts), **Jon Childs** (Law of the Sea), and **Renee Takesue, Jessica Lacy, Amy Draut, Patrick Barnard, and Peter Swarzenski** (short summaries of research by each of these relatively new team members). Accompanying **Director McNutt** were Southwest Area Regional Executive **Mike Shulters** and Senior Science Advisor **Len Gaydos**, who joined her in a discussion with center chief **Mike Carr** and associate chief **Jon Childs** about future directions for marine sciences.

The managers rejoined employees for a potluck lunch at the nearby Seymour Marine Discovery Center at Long Marine Laboratory, part of the University of California, Santa Cruz. Additional attendees included scientists from outside the team, such as **Tim Tinker**, lead scientist at the Santa Cruz Field Station of the USGS Western Ecological Research Center, and **Larry Freeman**, chief of the Marina Field Office of the USGS California Water Science Center. During the event, **Director McNutt** gave a brief address and then moved from group to group to converse with the scientists about the USGS and its future directions.

Director McNutt's visit to the Santa Cruz center came exactly 2 months after she was confirmed as the USGS's new Director on October 22, 2009. Before that, she had served as president and chief



New USGS Director **Marcia McNutt** speaks to employees in Menlo Park, California. Photograph by **Mike Diggles**, USGS.

executive officer of the Monterey Bay Aquarium Research Institute (MBARI) in Moss Landing, California, a nonprofit organization whose work focuses on developing technology to address key research questions in the ocean sciences.

To learn more about **Director McNutt**, read her biography at <http://www.usgs.gov/aboutusgs/organized/bios/mcnutt.asp>. Interested readers can also view a video of her confirmation hearing before the U.S. Senate Committee on Energy and Natural Resources and read the statement she submitted to the committee (go to http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=11dce130-cdc2-1a8d-aea0-e1311e8d3a10 and click “View Archive Webcast” to see video; click on link “Marcia McNutt – Director, U.S. Geological Survey” to reach a page from which her statement can be downloaded).✿

Gaye Farris Retires from the USGS National Wetlands Research Center

By Gabrielle B. Bodin

Gaye Saucier Farris retired December 31, 2009, as information and technology branch chief of the U.S. Geological Survey (USGS)'s National Wetlands Research Center in Lafayette, Louisiana, according to Center Director **Janine Powell**.

Farris worked for the center for 29 years, 26 as a Federal employee and 3 as a Louisiana Geological Survey employee on loan to the center. In that time, she was a technical editor, a supervisory technical information specialist, and acting assistant director in 1988 and 2007-2009. She worked at the Center in Slidell, Louisiana, from 1980 until 1992, when the Center moved its headquarters to Lafayette.

Farris has received numerous honors, including the Meritorious Service Award, the highest mid-level career award given by the Department of the Interior, which she received in 1995. In 1988, she was named outstanding research employee in the U.S. Fish and Wildlife Service, the agency that then contained the National Wetlands Research Center.

In 2007, **Farris** was named a Gulf Guardian by the U.S. Environmental Protection Agency for her career of communicating scientific information about the Gulf Coast. She also shared in three Lantern Awards from the Southern Public Relations Federation for promoting the importance of the Gulf of Mexico.

Farris and the Center's publishing staff have produced dozens of publications that have received national recognition, including awards from the National Association of Government Communicators and the Society for Technical Communication. Three were named "Notable Government Documents," an honor annually bestowed on a small selection of government publications by the American Library Association. **Farris** was managing editor of one of those publications, "Our Living Resources" (http://biology.usgs.gov/status_trends/catalog.do?item=reports_and_publications&start=25). She was also managing editor of "Science and the Storms" (<http://pubs.usgs.gov/circ/1306/>), which reported on the USGS response to the hurricanes of 2005, espe-



Gaye S. Farris was recently honored in Lafayette, Louisiana, with a retirement party, with the theme of "Queen of Hearts." The former branch chief of information and technology of the USGS National Wetlands Research Center is pictured here with center scientists, from left, **Jim Grace**, **Tom Doyle**, and **Tommy Michot**. She worked for the center for almost 30 years.

cially Katrina and Rita. In addition, **Farris** has written numerous articles about the Center's research.

Farris received a USGS Shoemaker Communications Award in 2008 for her speech on the professional and personal aspects of communicating during Hurricane Katrina. She shared in two other Shoemaker Awards for her contributions to the publication "Fragile Fringe" (http://www.nwrc.usgs.gov/fringe/ff_index.html) in 1997 and as a contributing editor to the USGS's *Sound Waves* newsletter in 2004.

In addition to her government work, **Farris** belonged to several professional organizations. She was president from 2001 to 2003 of the National Association of Government Communicators, which honored her contributions in 2008 by establishing a scholarship in her name.

Before entering government service, **Farris** was a journalist and teacher. During the 1960s and 70s, she was a reporter for the *Times-Picayune/States-Item* in

New Orleans and the *Cincinnati Post and Times-Star* and wrote a weekly column for the *Slidell Times*. She was a science, journalism, and English teacher in Jefferson and St. Tammany parishes, and was named outstanding young educator by the Slidell Jaycees in 1978.

Farris graduated magna cum laude in 1964 from Loyola University, where she was a member of Cardinal Key, Delta Epsilon Sigma, and the Thirty Club honor societies. She received distinction on her comprehensive examination for her master's degree in English in 1985 from the University of New Orleans, where she was a member of Phi Kappa Phi Honor Society. **Farris** also studied with **Ernest Gaines**, writer-in-residence at the University of Louisiana at Lafayette in 1992.

Farris and her husband, **Lionel**, will soon join their sons, **Greg** and **Jeff**, and their families in Florida. **Farris** says she plans to write fiction and rediscover the wonders of childhood with her granddaughter **Jordan**. ❁

Recently Published Articles

- Ackleh, A.S., Carter, J., Cole, L., Nguyen, T., Monte, J., and Pettit, C., 2010, Measuring and modeling the seasonal changes of an urban Green Treefrog (*Hyla cinerea*) population: Ecological Modelling, v. 221, no. 2, p. 281-289, doi:10.1016/j.ecolmodel.2009.10.012 [<http://dx.doi.org/10.1016/j.ecolmodel.2009.10.012>].
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