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U.S., Mexico Join Forces to Improve Monsoon Forecasts

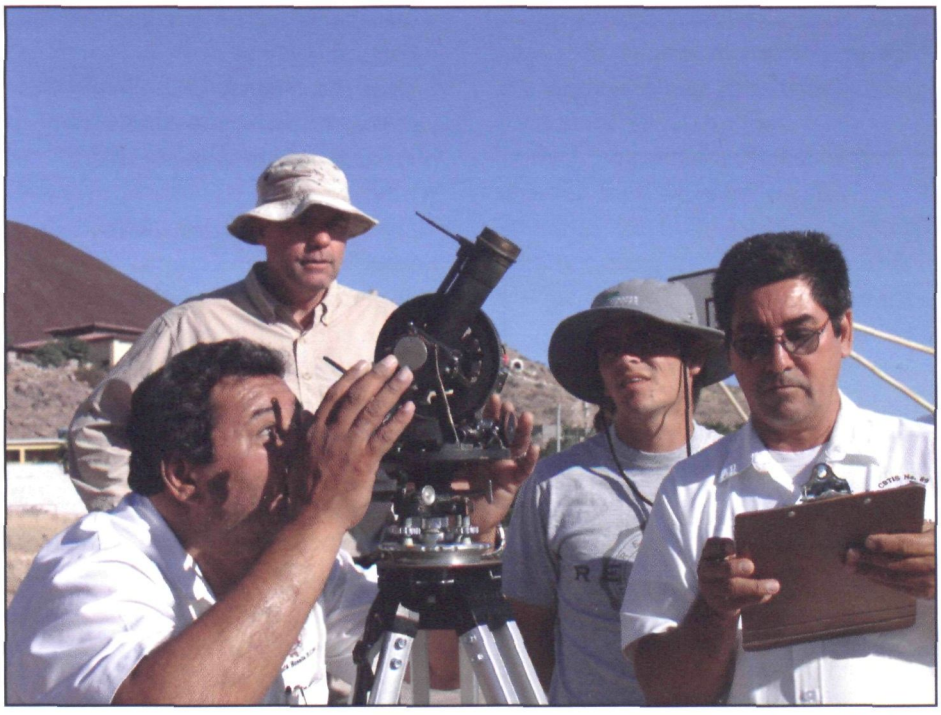
—By Susan Cobb and Keli Tarp

Through September, NOAA scientists are focusing their attention on storms in Mexico and in the deserts of the American southwest for clues that may ultimately lead to better predictions of summer rainfall in the United States.

For nearly four months, scientists from more than 30 universities, laboratories and agencies in the United States, Mexico and Central America have joined forces for the North American Monsoon Experiment, or NAME, the largest study ever of the midsummer rains that affect farming, ranching, wildfire control, water resource management and public safety throughout the southwestern U.S. and northern and western Mexico.

The researchers are collecting extensive atmospheric, oceanic and land-surface observations with a wide range of instruments in the core region of North American monsoons—northwest Mexico, the southwest U.S. and adjacent

continued on page 6



Rosario Douglas

Principal investigator Michael Douglas (rear) instructs University of Oklahoma graduate students (left to right) Isidro Flores, John Mejia and Reynaldo Esqueron to make balloon observations with an optical theodolite in the North American Monsoon Experiment.

Scientists Study New England Air Over Land, Sea

—By Jana Goldman

When studying air quality, bad is good.

That's why scores of researchers have been hoping for "bad," or polluted, air during the two-month New England Air Quality Study that ends this month in the northeastern United States.

In the study, scientists from NOAA and five other federal agencies, 25 U.S. universities and research institutes and three European agencies have used 12 planes, one ship, 55 ground stations and three satellites to collect a wide range of data on air columns from the U.S. west coast to continental Europe.

A major focus of the New England research is to determine where the air in the region comes from, what it brings with it and where it goes when it leaves the region. The study, carried out under the auspices of the International Consortium for Atmospheric Research on Transport and Transformation, builds on a previous air quality assessment in New England in 2002.

"So much to talk about and so little time to talk about it," said Fred Fehsenfeld of NOAA's Aeronomy Laboratory in Boulder, Colo., as he opened a day-long science meeting at the University of New Hampshire in Durham July 24 at the mid-point of the study.

continued on page 2

Recycled Paper

New England Air

continued from page 1

As a steady rain poured down outside the meeting hall, the more than 140 participating scientists and other observers who had gathered to discuss the project's progress were treated to photographs of other atmospheric phenomena observed in the study.

"Have any of you seen Chebogue Point?" asked Tim Bates of NOAA's Pacific Marine Environmental Laboratory in Seattle, Wash., and chief scientist on the NOAA Ship *Ronald H. Brown* for the project, as an image of dense fog with no discernable landmarks from the site of the Nova Scotia ground-based measurements earlier in the study flashed on the screen.

"I think we can mark the 'effect of fog' part of this study as completed," Bates said, as chuckles filtered through the audience. "We had enough of it," he said.

The effect of fog was about number nine on the laundry list of science goals that Bates wanted to achieve.

For a successful air quality study, scientists need a range of air conditions—from clean to dirty. While most of the air during the first part of the New England study was relatively clean, or not heavily polluted, during two days in July the scientists got a chance to look at some very polluted air.

And, sometimes, when the dirty air wasn't coming to the researchers, the researchers went to the dirty air.

Outside the port of Boston in mid-July, the NOAA Ship *Brown* laid in wait for a ship to cross its path so the scientists aboard could study the evolution of an exhaust plume.

"Ocean-going vessels are floating power plants," said Eric Williams of NOAA's Aeronomy Laboratory. "We wanted to track a cruise ship and study the exhaust plume looking for things like ozone, nitrogen, sulfur dioxide and carbon dioxide."

The liner *Norwegian Majesty*, on its weekly run to Bermuda, provided the opportunity.

"*Brown* was waiting for her," Williams said. And then the chase began, such as it was. "The cruise ships go pretty fast, about 30 knots. *Brown's* top speed is about 12 to 13 knots," Williams said.

Brown was designed to adapt to a variety of scientific needs. Inside large white containers secured to the ship's lower decks are a variety of instruments designed for specific tasks, such as two lidar, or laser radar, systems—one an ozone profiling device and the other a high-resolution Dopplar lidar developed by NOAA's Environmental Technology Laboratory in Boulder, Colo. Air conditioners humming loudly keep the containers and the delicate scientific equipment, as well as the scientists who operate them, cool.

Outside the containers, attached to towers in front of *Brown's* own exhaust stacks so as not to include the ship's plumes in the samples, is an assortment of devices, including a set of red plastic kitchen funnels, inverted and attached to poles with duct tape, serving as intake points. Another device is fashioned from a picnic cooler and duct tape to help collect humidity data.

Computers and other measuring and monitoring equipment fill the work spaces in the wet and dry labs on the ship.

But the NOAA Ship *Brown* was just one of the many observation platforms involved in the field study.

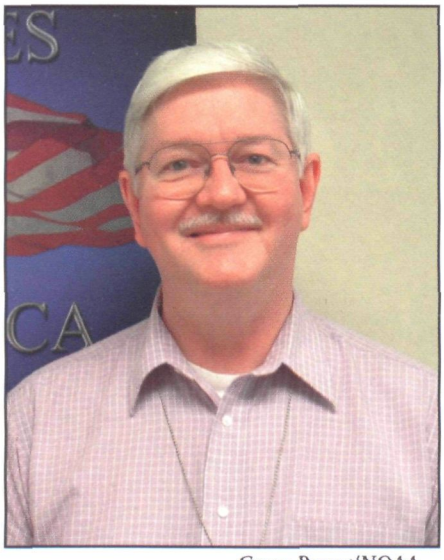
NOAA's P-3 Orion "hurricane hunter" aircraft "Kermit," which completed six air sampling flights by the end of July, and NASA's DC-8 research aircraft, which was halfway through its 20 scheduled flights, were joined by aircraft from the Meteorological Service of Canada and the Department of Energy-Brookhaven, plus aircraft from Great Britain and Germany to track air plumes once they left U.S. waters and headed across the Atlantic.

One component of the study is to get a vertical snapshot of an air plume from the ocean upwards into

continued on page 7

Steve Brown/NOAA

The NOAA Ship Ronald H. Brown makes a port call in Portsmouth, N.H., in July during the New England Air Quality Study.



Gregg Parent/NOAA

John Canter.

John Canter Is the August Employee of the Month

—By John Leslie

During his nearly 38 years of federal service, John Canter, the August Employee of the Month, has established a firm reputation for combining a tireless work ethic and a modest personality. Which is why, he said, he can't understand how his peers at NOAA's Satellites and Information Service nominated him for the honor.

"Now it means I really can't mess up," Canter said with a laugh.

But there is no concern about that at the office.

As a physical science technician, Canter helps create the launch timetables and maintenance and testing schedules for NOAA's Geostationary Operational Environmental Satellites spacecraft—crucial for NOAA meteorologists to develop accurate weather forecasts and for emergency personnel involved in search and rescue operations.

Currently, there are two GOES spacecraft hovering 22,300 miles above the Earth, in the eastern and western hemisphere, monitoring the atmosphere for triggers that spawn severe weather, including hurricanes, tornadoes, thunderstorms and flash floods.

As part of his job, Canter coordinates changes to the GOES instrument settings with spacecraft and ground systems engineers within the Office of Satellite Operations. He also works with software specialists to develop procedures that accomplish more work in less time, which allows the other schedulers to plan to launch more GOES spacecraft into orbit.

For Canter, his job often carries a mix of serenity and frenzy. In some instances, for example, Cantor has weeks, or even months, to plan a schedule for a particular maneuver for a satellite already in orbit or for one that's soon to be launched. But in other cases, he may have only a day, or a few hours, to schedule work on a spacecraft, especially during the hectic moments after a satellite has reached orbit.

"In this job, you have to be flexible, because sometimes after I build a schedule, I've had to change it quickly, because one of the engineers had a last minute request or idea," he said.

Each day, Canter builds schedules for four weather-imaging scenarios for NOAA's National Weather Service—a routine schedule for normal weather conditions, a rapid schedule for severe weather, a super rapid schedule for research and a full-disk schedule, which is used if GOES experiences an unusual problem.

"If there wasn't a schedule, there would be no GOES imagery," he said.

Born in Washington, D.C., and raised on a tobacco farm in southern Maryland, Canter started his federal career as a clerk typist at the National Archives two weeks after graduating from high school in

continued on page 8

Tony Pratt

Wendy Carey.

Wendy Carey Is the Team Member of the Month

—By Amy Painter

If anyone embodies the spirit of teamwork and collaboration, it is NOAA's August Team Member of the Month, Wendy Carey, a coastal processes/coastal hazards specialist with the Marine Advisory Service at the University of Delaware Sea Grant College Program. She is, according to those fortunate enough to have worked with her, someone who excels at building and nurturing effective partnerships.

Carey has played an instrumental role in the formation and success of a joint task force created by NOAA's National Weather Service and National Ocean Service, Sea Grant and the United States Lifesaving Association to increase public awareness about the dangers of rip currents and to provide a uniform national public safety message to reduce accidents and drownings.

Rip currents are a major coastal hazard, accounting for 80 percent of all surf zone rescues.

continued on page 8

Focus On...

NOAA's Olympic Coast National Marine Sanctuary Celebrates Tenth Anniversary

—By Sarah Marquis

NOAA's Olympic Coast National Marine Sanctuary celebrated its tenth anniversary July 16-17 with public exhibits, tours of the sanctuary vessel *Tatoosh*, a sea kayak demonstration and concerts on the Port Angeles, Wash., city pier.

Officials also dedicated the 800-square-foot Olympic Coast Discovery Center, which features exhibits and interactive kiosks on various marine subjects. Thirty volunteers recently completed training to work as docents in the center, which will become the showcase for the sanctuary's education programs as well as a base for its growing volunteer program.

During the festivities, Olympic National Park staff talked to youngsters about sea stars and mussels and other creatures that inhabit local intertidal waters, while marine sanctuary scientists led trips to nearby Hollywood Beach for hands-on learning experiences.

A crowd of hundreds witnessed a colorful, traditional cedar canoe welcome by Peninsula tribes on the beach, followed by a drum ceremony and blessing.

The tall ship *Lady Washington*, a replica of an eighteenth century coastal explorer that helped map the region and create the sea otter fur trade on the Olympic Coast, also was in port and open to visitors. *Lady Washington*, which was featured in the film, "Pirates of the Caribbean," is owned by the State of Washington and operated by a non-profit organization for sailing and environmental education. *Lady Washington's* port call followed a 10-day cruise with high school students conducting ocean science and sail training in the Olympic Coast National Marine Sanctuary.

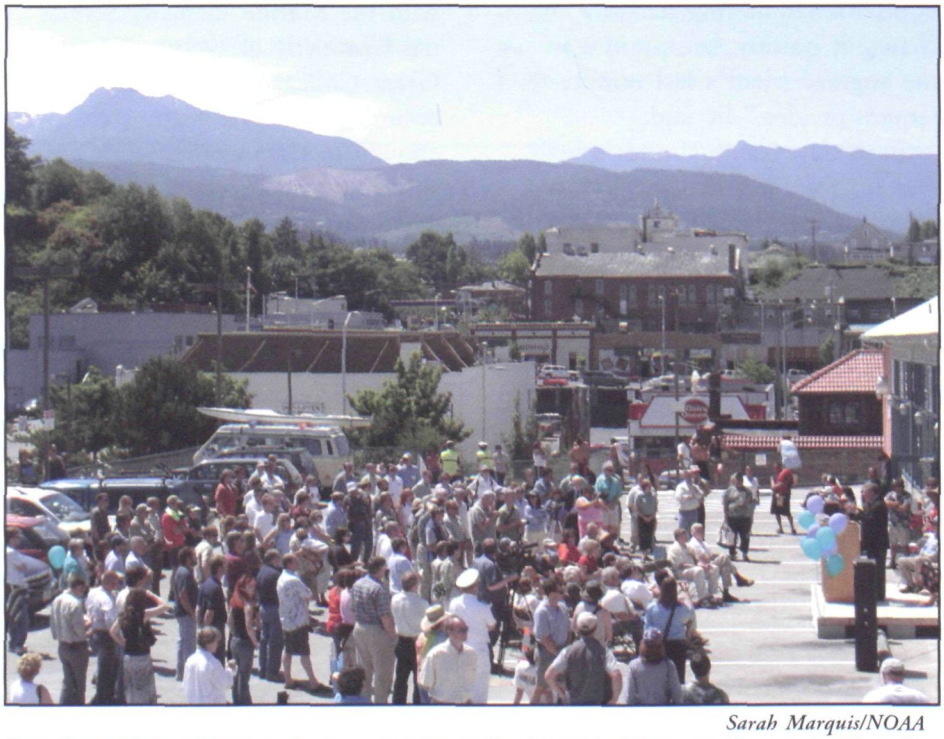
In a public lecture, University of Washington researcher and professor Julia Parrish explained how a long-term study of just one species can provide insight for the health of the entire sanctuary ecosystem.

Parrish also spoke of the human connection to the sanctuary. "I think that the incredible wildness and the biodiversity in the sanctuary are equaled by the cultural diversity," she said, "and it is those stable groups, those people, who have a vested interest in seeing the

continued on page 5

Sarah Marquis/NOAA

Visitors view a suspended model of the submersible Deep Worker in the Olympic Coast Discovery Center.



Sarah Marquis/NOAA

Rep. Norm Dicks addresses the crowd at the dedication of the Discovery Center, the Olympic Coast National Marine Sanctuary's new visitor center located in Port Angeles, Wash. Approximately 2,000 people visited July 16-17 to celebrate the sanctuary's tenth anniversary.

continued from page 4

sanctuary and the things within it survive through the next generations."

Sanctuary superintendent Carol Bernthal said, "Through our science and research, we've improved our understanding about the health of the ecosystem. We've formed partnerships with historic and cultural organizations to improve appreciation of maritime heritage. Our work with the maritime industry has demonstrated that commercial use in the sanctuary can continue while aggressively protecting marine resources. And we've engaged a growing number of citizen volunteers who educate the public and promote marine stewardship in the Olympic Coast."

Designated in 1994, the Olympic Coast National Marine Sanctuary covers 3,310 square miles of marine waters off the rugged Olympic Peninsula coastline. The sanctuary provides habitat for one of the most diverse marine mammal faunas in North America and is a critical link in the Pacific flyway.

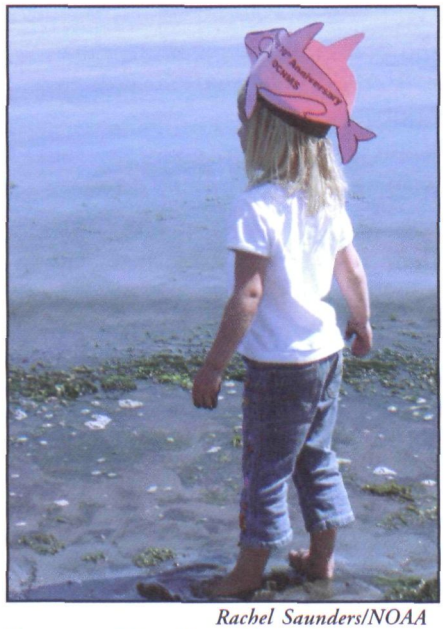
According to Robert Steelquist, the sanctuary's education and outreach coordinator, at the Discovery Center "the public will have a chance to learn what's under the water off the Olympic Coast. With the technologies available, we can change the center as we learn more about the sanctuary."

Sanctuary staff expect 45,000 visits per year.

"Having this visitor center here will be great for the Olympic Peninsula," said Rep. Norm Dicks, who helped dedicate the Discovery Center. "People will come here from all over the world," he said.

Rachel Saunders/NOAA

Penninsula tribes demonstrate traditional cedar canoes, while crowds watch from the Port Angeles pier and from Lady Washington, a replica of an eighteenth century coastal trader.



Rachel Saunders/NOAA

A young celebrant tests the waters.

Rachel Saunders/NOAA

Members of the host Lower Elwha Klallam tribe welcome the cedar canoes to the beach.

Monsoons

continued from page 1

oceanic areas. The data will be used to improve global weather and climate models by better representing rainfall processes.

U.S. participants also include more than 25 scientists from NOAA's National Weather Service, the National Science Foundation, NASA, Vaisala and the U.S. Departments of Agriculture and Defense. NAME forecast operations, located in the Weather Service weather forecast office in Tucson, Ariz., and in Mexico City, are coordinated with Mexico's Servicio Meteorologico Nacional and the Weather Service's National Centers for Environmental Prediction.

"This field campaign will improve our understanding of the daily cycle of precipitation in the complex terrain of the core monsoon region," said Wayne Higgins, NAME lead scientist and the principal climate scientist at the NOAA Climate Prediction Center. This new knowledge may also contribute to more accurate predictions of the droughts and floods associated with monsoons for Mexico and the western U.S., he said.

Summer monsoons are seasonal reversals of wind direction that occur in response to temperature differences between the land and sea, accompanied by increases and decreases in precipitation, and can occur over all low-latitude continental regions.

The North American monsoon, though much weaker than the Asian monsoon, exerts a strong influence on the precipitation, temperature and wind patterns in the core monsoon region but also over much of the western half of North America and adjacent ocean areas.

NAME's area of focus stretches east from the Gulf of California, across the Sierra Madre mountain range in northwestern Mexico and into the desert southwest of the U.S. These locations get most of their annual rainfall during the summer monsoon months, but forecast models have trouble predicting the fast and intense precipitation that can leave the public exposed to flash flooding and severe thunderstorms.

"NAME will increase the National Weather Service's ability to forecast monsoon-related weather at time scales ranging from just a few hours to a few months," said Erik Pytlak.

"NAME will increase the National Weather Service's ability to forecast monsoon-related weather at time scales ranging from just a few hours to a few months," said Erik Pytlak, science and operations officer for the Tucson forecast office, who has served as co-coordinator for NAME forecasting operations. "Our customers and partners call upon the National Weather Service, including our office here in Tucson, to provide this information so that they can make decisions—from postponing sporting events to preparing our partners for possible response and recovery actions, putting up flood barricades, allocating and distributing wildfire management resources and providing water resource planners key information to aid in their ongoing drought management efforts."

Forecasting responsibilities with NAME have been extensive. Daily forecasts focus on synoptic and large mesoscale features and associated weather phenomena throughout the southwest corner of the United States and most of Mexico. Weather briefings are then held at the University of Arizona's atmospheric science department.

"This has been a learning experience for all of us," Pytlak said. "Forecasting for a large area with specific science needs has been very different from our typical responsibilities."

Scientists and forecasters are excited about the data collected so far. "The results we've gathered have been very good, very intriguing," Pytlak said.

"The 2004 monsoon season has been unusual," Pytlak said. "It has allowed us to catch interesting features set off by unusually strong Gulf of California surges and back door cold fronts into New Mexico. This has had ramifications for storm prediction not only in the monsoon region but east of the Continental Divide.

"In addition, we sampled a break in the monsoon, which will allow the scientists to study what happens when the monsoon circulation gets disrupted," Pytlak said.

In the last few weeks of data gathering in September, forecasters hope the monsoon will become more typical.

The 2004 field campaign represents the middle of NAME's eight-year life cycle, which includes the planning, preparation, data collection, field analysis and modeling phases.

NOAA and university scientists spent May and June establishing observing networks and making them operational. One team led by Michael Douglas, a NAME principal investigator from NOAA's National Severe Storms Laboratory in Norman, Okla., distributed about 300 rain gauges and set up pilot balloon observing sites at strategic locations throughout Mexico. Douglas is fluent in Spanish and has spent years obtaining and installing affordable

continued on page 7

Monsoons

continued from page 6

weather observing equipment for Central and South America. He then trains local people to operate the systems.

"One of our pilot balloon observing sites employs a member of the city police force," Douglas said. "The observer comes to make the morning observation in uniform, complete with pistol."

Several Mexican C-band radars are part of the observing network along with the Boulder-based National Center for Atmospheric Research's S-Pol polarized Doppler radar, NOAA's radars on the P-3 research aircraft, and WSR-88D radars from the southern part of the U.S. Polarized radars give superior estimates of rain rates and can distinguish between rain, snow and hail. The rest of the observing network includes hundreds of simple rain gauges, three integrated sounding systems, hundreds of special radiosonde launches from both U.S. and Mexican radiosonde stations and wind soundings from two dozen pilot balloon sounding sites.

During NAME's six-week intensive operational period from early July to mid-August, Douglas coordinated the aircraft and oceanographic data gathering activities of NOAA's P-3 research aircraft, research ships from the Mexican navy and a Mexican research institution, all based in Mazatlan, Mexico.

In a few years, once scientists have analyzed the massive amounts of data gathered during NAME, they expect the results will improve NOAA's ability to monitor and predict drought and heavy rainfall, especially in the desert southwest. Ultimately, this information will help communities better prepare for the acute weather conditions associated with monsoons.

New England Air

continued from page 2

the stratosphere, which involves precise coordination between the ship, planes and satellites so that they all gather data at the same time and the same place—not an easy task.

"Coordination is one of the themes here," said NASA's Hanwat Singh, lead scientist on the DC-8. "We take a look at what the other platforms are doing and how we can coordinate with them. We are trying to add to the science. We do this by working with other groups."

At a press briefing for the project in Portsmouth, N.H., two days after the science meeting, Berrien Moore III, director of the University of New Hampshire's Institute for the Study of Earth, Oceans and Space, presented copies of the first data collected by a sensor developed at the university and used for the first time during the study.

Ann Hart, president of the University of New Hampshire, said, "We're looking at the evolution of pollution."

"NASA's interest is to help us connect local and regional changes on the global scale," said Associate Administrator Ghassam Asrar.

NOAA Administrator Conrad C. Lautenbacher, Jr., summed up progress in the project. "Data from this summer's experiment, combined with insights from work done in 2002, are providing new perspectives on long-standing questions. By pulling out all the stops and collecting data on the ground, in the air and at sea, we will have some good information on which to help guide our decisions in the future," he said.

While the researchers gather data for the regional air quality assessment and the larger climate portion of the project, they will also collect information that will be used in NOAA's daily experimental air quality forecasts that begin in mid-September in the Northeast.

Henry Fuelberg/FSU

The NOAA P-3 research aircraft nicknamed "Kermit" takes air samples during the New England Air Quality Study, which included data collection by 11 other planes, the NOAA Ship Ronald H. Brown, 55 ground stations and three satellites.

Carey

continued from page 3

"Wendy's positive attitude, tireless energy and diplomacy made her a real asset to the team," said James Murray, extension program leader for NOAA's National Sea Grant Office. "In addition, she brought a lot to the table as a highly regarded scientist in her field and a top notch Sea Grant extension agent."

Since its inception over a year ago, Carey has been involved in all aspects of the campaign, contributing the results of her ongoing research on rip currents, collaborating with other Sea Grant extension coastal processes specialists, communicating with coastal engineers involved in rip current research throughout the nation and coordinating a workshop to improve communication between research scientists and forecasters.

"Dr. Carey co-coordinated the first-ever national rip current technical workshop between the National Weather Service and Sea Grant," said Therese Pierce, chief of the Marine and Coastal Weather Services Branch and the task force lead. "The workshop generated a comprehensive list of operational forecast needs to assist Sea Grant researchers in planning. As a result, Weather Service headquarters is now working closely with the Sea Grant coastal natural hazards theme team."

Carey said she is hopeful that a national rip current research initiative may ultimately develop from this partnership.

Thanks in large part to Carey's contributions as the task force's coastal processes expert and to her efforts in obtaining input and comments on technical content from other Sea Grant experts, the group has produced a comprehensive public education campaign entitled "Break the Grip of the Rip!"

At a May press event, the task force unveiled a national brochure and a sign in both English and Spanish educating swimmers about rip current safety. The sign, brochure and a public service announcement are being widely disseminated nationwide.

There is also a new website (www.ripcurrents.noaa.gov) where rip current materials and surf zone forecast and safety information are available to the public.

Carey said the task force is an extension of her research and outreach work throughout Delaware.

As a Delaware Sea Grant scientist, Carey studies the forces that cause rip currents along the Delaware coast. She is currently working with beach patrols to provide wave and rip current observations from trained lifeguards stationed along the Delaware coast to Sea Grant scientists and meteorologists at the Mount Holly, N.J., weather forecast office. These observations are then entered into a database that will enable researchers to better predict these dangerous currents.

"It's been an honor and a pleasure to work with NOAA on this important public safety project," Carey said. "From the program management efforts at National Weather Service headquarters to the media and public relations work at the National Ocean Service and the National Sea Grant Office, to the significant research and outreach examples set by my counterparts in the North Carolina and Florida Sea Grant programs, the entire rip current task force group has worked very well together as a team. I have especially enjoyed meeting and interacting with NOAA colleagues and look forward to working with them on coastal hazards issues in the future," she said.

Canter

continued from page 3

June 1967. After a stint in the U.S. Air Force, Canter was hired as a computer operator by the National Environmental Satellite Service in Suitland, Md., where he spent the next nine years processing weather satellite data.

"In those days, we mounted a lot of tapes to record the images of GOES, which would spin one image every 30 minutes. Nothing like we have now," Canter said.

He then moved to the Satellite Operations Control Center, where he worked closely with satellites another nine years. During that time, he helped test ground systems in preparation for the GOES-I launch in 1994.

Lead GOES scheduler Kevin Ludlum said, "John should be proud of the fact that he provides error-free GOES schedules to the operations personnel. These schedules direct the satellite in imaging, sounding and health and safety operations. An error in a schedule could damage the satellite, which would result in the loss of vital weather information."

After almost 38 years of government service, Canter said the next schedule he's planning is for retirement.

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