NOAA REPORT

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Heavy Rains, Floods Spoil U.S. West Coast New Year

—By Jim Teet

A series of winter storms spoiled New Year's Eve activities along most of the U.S. west coast, with heavy rains and flooding accompanied by strong winds and high surf. Although the storms struck during a major holiday period, NOAA's National Weather Service acted quickly to provide warnings, watches and other services before and during the storms.

NOAA's California-Nevada River Forecast Center in Sacramento and the Northwest River Forecast Center in Portland, Ore., jumped into around-the-clock mode to monitor stream gages and assist weather forecast offices from San Diego, Calif., to Seattle, Wash., warn of potential flooding.

Both centers use hydrologic models to simulate and forecast river flows, based on observations and forecast precipitation. Real-time and forecast river levels are then made available on the World Wide Web.

The heavy rains were caused by a shift in the jet stream, which helped break down a persistent high-pressure ridge that had kept the western U.S. very dry during November and most of December. As the high-altitude jet stream shifted southward, it brought with it much warmer temperatures and

continued on page 6

Juan Oliphant

A diver approaches a 20-foot great white shark off Oahu, Hawaii, one of the largest great whites ever encountered by humans. See story on page 4.

GOES Readied for February Launch

—By John Leslie

After several delays in 2005, the Boeing Delta IV rocket that will carry NOAA's next-generation GOES-N weather and climate satellite into orbit is now set to lift off in February from the Kennedy Space Center at Cape Canaveral, Fla.

Deployment of the satellite, which was built by Boeing and originally scheduled for launch last spring, was postponed a number of times for a variety of reasons, including technical problems with the rocket and a strike by Boeing machinists.

Once GOES-N is launched and reaches orbit, it will be renamed GOES-13 and included in a repositioning of satellites that will improve weather forecasts in South America and continue momentum toward building the Global Earth Observation System of Systems.

GEOSS is a planned global integration of environmental monitoring and sensing systems agreed to by the U.S., 60 other nations and the European Commission that will help nations around the world better predict weather and climate and prepare for natural hazards.

Under the plan, another of NOAA's GOES spacecraft, GOES-10, will be moved from its current position overlooking the U.S. to a new orbit at 60 degrees west longitude that would enhance satellite detection of storms, floods

continued on page 7

Runaway Weather, Climate Buoy Rescued Off Japan

—By Jana Goldman

An ocean buoy packed with atmospheric, oceanographic and solar sensing instruments that broke loose from its mooring in the North Pacific Ocean this past November should soon be back on line, thanks to the scientific collaboration between NOAA and the Japan Agency for Marine-Earth Science and Technology, called JAMSTEC for short.

The Kuroshio Extension Observatory, operated by NOAA's Pacific Marine Environmental Laboratory in Seattle, Wash., had just finished more than a year of sending back data for winds, air temperature, relative humidity, solar radiation, atmospheric carbon dioxide and sea surface and subsurface temperature and salinity when it broke free from its mooring about 300 miles east of Japan. KEO had been moored in an area of circulating ocean waters known to scientists as the Kuroshio Extension recirculation gyre that can have strong and deep currents, high winds and rough seas, although conditions were relatively benign on the day the buoy broke free.

"We were worried we would lose this valuable buoy and the high-resolution data stored onboard. The buoy is an element of the Global Earth Observation System of Systems," said Meghan Cronin, an oceanographer at the Pacific Marine Environmental Laboratory and lead scientist on the KEO project.

Because the buoy sends back its position via satellite, as well as a portion of the data it is designed to collect, scientists knew within hours of the break that something had happened.

"Fortunately, Dr. Hiroshi Ichikawa, a JAMSTEC lead researcher, had just left Yokosuka, Japan, aboard the R/V *Kaiyo* to do some work in the area," Cronin said. "He very graciously revised his cruise plan and within hours was heading toward the drifting buoy. Two days later, after drifting about 40 nautical miles, it was successfully recovered."

Rescuing a drifting buoy from the open ocean is not just a matter of coming alongside the buoy and hoisting it aboard the ship. Delicate maneuvers and much skill go into such an operation.

Cronin said the team was lucky because there were buoy mooring technicians aboard *Kaiyo* who could assist with the safe recovery of the five-meter surface buoy structure, 2,000 meters of mooring line and more than $150,000 worth of scientific sensors.

"We faxed and emailed written instructions, mooring diagrams and diagrams of various components to assist with the recovery and held a ship-to-shore conference call with our mooring technicians here at NOAA PMEL and the mooring technicians aboard the R/V *Kaiyo*," Cronin said.

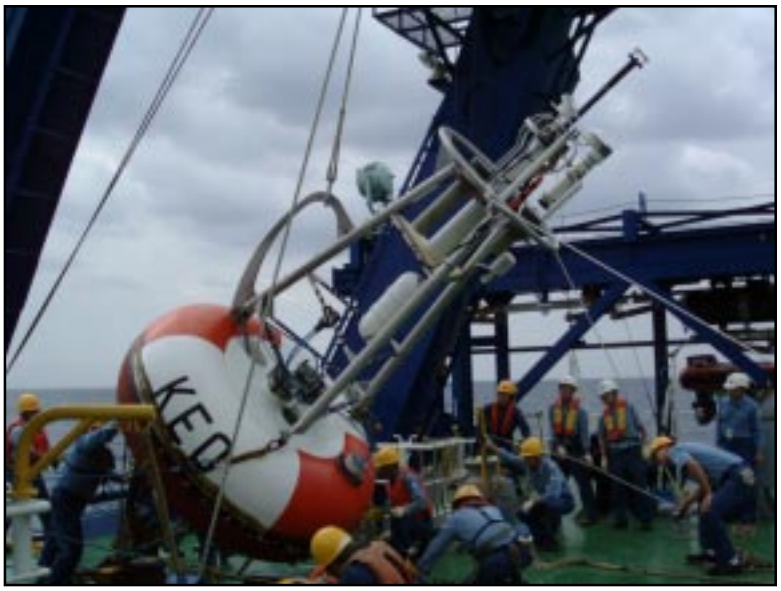
Cronin said scientists also were able to "call" the buoy and reprogram the Global Positioning System to transmit its location every hour, greatly helping those aboard the ship locate their quarry.

She noted that the mooring broke just below the deepest sensor, so while KEO traveled untethered, it continued doing what it was designed to do—collect and send data.

The Pacific Marine Environmental Laboratory sent a technician to Japan to meet the R/V *Kaiyo* when the ship came into port in late November. The technician was able to download the data and pack the mooring to be sent back to Seattle.

Engineers are studying the break in the nylon rope to determine the cause and prevent this from occurring in future deployments.

"This story may not have had such a happy ending if it were not for the fast action by JAMSTEC," said Sidney Thurston, director of NOAA's Office of Climate Observation. "The KEO rescue is greatly appreciated and a tribute to the long history of collaboration between JAMSTEC and NOAA."



JAMSTEC

Technicians from the Japan Agency for Marine-Earth Science and Technology recover a sophisticated NOAA weather and climate buoy in the Pacific Ocean.

Petra Gonzales/NOAA

Gloria Lockett.

Gloria Lockett Is the Employee of the Month

—By Jana Goldman

Gloria Lockett takes pride in knowing that her work helps to save lives.

The NOAA Atlantic Oceanographic and Meteorological Laboratory mathematician works in Miami, Fla., at the Tropical Prediction Center/National Hurricane Center with the models that are used by NOAA's National Weather Service and the Federal Emergency Management Agency for forecast, warning and recovery purposes.

We try and get the data out there so lives can be saved," she said. "I'm proud that they are using the data, not just letting it sit on a shelf."

"She does a good job," said Howie Friedman, deputy director of the lab's Hurricane Research Division. "She exercises exceptional ability, judgment, discretion and knowledge of a substantial body of technical information practices as she supports NOAA's mission."

Lockett's job includes working with the Sea Lake Overland Storm Surge models, called SLOSH models for short, which provide potential storm surge information to NOAA hurricane forecasters to produce timely and accurate warnings.

Lockett works on mathematical calculations for the SLOSH computer models that represent water depths, bridges, roads and other unique physical features of specific coastal locations where storm surges are possible. If there's a hurricane in the forecast, the model's forecast data must be updated every 6 hours.

"I've been working with the SLOSH program for 20 years," Lockett said. "There may be other programs out there, but I know that this one works and I enjoy it because it does work."

Lockett, who has been with NOAA for 31 years and also participates in AOML's Equal Employment Opportunities and diversity activities, expanded her math skills into meteorology under a 1974 NOAA program looking to increase the agency's cadre of meteorological mathematicians.

"I was part of a group of nine mathematicians that NOAA took and sent to be trained as meteorologists," she said. "Although I can be technically called a meteorologist, I am more comfortable as a mathematician."

Her skills came into play during the record-breaking 2005 hurricane season. Lockett provided real-time potential storm surge values for land-falling hurricanes Arlene, Katrina, Ophelia, Rita and Wilma. Normally, SLOSH runs are started about 24 hours before the storms are expected to make landfall or approach land. In the case of Hurricane Rita, a category 5 storm over the Gulf of Mexico, the deputy secretary of Commerce requested that the SLOSH storm

continued on page 8

Dan Purcell/NOAA

Lawrence Schinn.

Lawrence Schinn Is the Team Member of the Month

—By Keli Tarp

Lawrence Schinn is a "can do" kind of guy who led a team that came up with innovative ways to replace cables used to transfer data from NOAA's national network of weather radars, called NEXRAD, to forecast office's of NOAA's National Weather Service, other government users and the public. The team's work reduced overall costs of this $1.6-million project by an estimated 50 percent.

Schinn is an engineering manager for SI International, a contractor working with the Tri-Agency Radar Operations Center operated by NOAA, the FAA and the Air Force in Norman, Okla. Schinn led his team in the installation of technologically superior fiber optic communications cables to replace the aging metal cables that were becoming increasingly susceptible to data loss, especially during lightning events.

"This project has a major impact

continued on page 8

Focus On...

A Happy Human Encounter With a Great White Shark

—By Dane Konop & Jim Milbury

Photographs of one of the largest great white sharks ever encountered close up by humans may provide NOAA Fisheries scientists with important evidence about the behavior of these widely feared but little understood predators.

When commercial tour guide Jimmy Hall took a group of divers off the north shore of Oahu, Hawaii, to observe sharks in December, he expected only to see the usual assortment of sandbar and Galapagos sharks, which range from four to 12-feet long.

But when tourists suspended from the boat in a shark-proof aluminum cage began yelling, "There's a giant shark! There's a giant shark!" he thought they might be seeing a whale shark.

As he and his mates watched from the dive boat, Hall said, "I see this shape coming up and it's not the broad head of a whale shark and it was so impossibly huge. I said, 'That's a small humpback whale.' I figured it was a baby humpback whale; that's how huge this thing was. One of my deck hands said, 'It's a white.' And I said, 'A white what?' since it was way too big to be a shark."

Grabbing his video and still cameras and defying common sense, Hall dove into the water.

"She was being very calm and she wasn't eating anything," Hall said. "I kept my back to the cage." At first, Hall said, everyone was very excited. "Then we kind of mellowed out," he said. "We saw she was sticking around and we just enjoyed the show."

Juan Oliphant

Jimmy Hall, a free-swimming diver leading a group of tourists to observe sharks off the north shore of Oahu, Hawaii, approaches a 20-foot great white shark.

Juan Oliphant

The little understood great white shark is the top predator in the oceans, but is threatened by over fishing.

Great white sharks are rarely seen off Hawaii, but are widely feared because of occasional attacks on humans, usually surfers or surface swimmers.

"Of course I was a little concerned," Hall said. "I just spent three days in Guadalupe watching the white sharks, so I wasn't completely unfamiliar with that shark. I swim with sharks all the time. This is the biggest shark I've even seen."

Hall's crew had chummed the water to attract sharks. "I think she came to the smell of the bait, but she wasn't eating anything while she was there," he said.

Hall said he never felt threatened by the great white shark. "She came [by me] many times. I was able to touch her on her dorsal fin, on her pectoral fin, on the side, on the tail. A couple of times she swam right up to me and we were just a couple of feet apart, nose to nose."

Little is known about the

continued on page 5

continued from page 4
movements and habits of great white sharks.

"Since June 2001, we've only had nine good, reliable sightings," said John Naughton, a marine biologist for NOAA's Pacific Islands Regional Office and advisor to the State of Hawaii's Shark Task Force in Honolulu. "We've [only] had two known white shark attacks since records have been kept out here. The rest have been [mostly] tiger sharks."

Naughton is not surprised that Hall was not attacked by the white shark, which mainly feeds on seals. "It's almost as if they just don't recognize us as food if they get a good look at you, particularly if you're down on scuba or where they can see you very clearly. It's just that great whites are capable of doing so much damage in such a short period of time that it's dangerous to swim with them."

NOAA and other scientists are increasingly interested in studying the behavior of these mysterious animals to protect humans from sharks and sharks from humans.

White sharks are protected under international treaty, but still may be accidentally caught by some commercial or recreational fishers or targeted by fishing fleets of countries that did not sign the agreement. Even accidental fishing can have a devastating impact on white sharks and other shark species.

Juan Oliphant

During his 45-minute encounter with the great white shark, which may provide scientists with rare evidence about great white behavior, guide Jimmy Hall said the shark did not feed and never acted aggressively, even allowing him to pet her.

"Sharks are probably the most endangered component of the fish community," said Russ Vetter, a marine biologist at NOAA's Southwest Fisheries Science Center in La Jolla, Calif. "Whereas a tuna fish would put out maybe a million eggs over a spawning season, a shark will put out one to ten very large, live-born pups. So when you fish a shark fishery down, it takes generations for it to recover, even if all the young live."

Naughton said he has sent the photographs of the great white encounter off Oahu to other scientists around the world in the hopes of identifying the female shark by the characteristic scarring on her side made by a male shark during mating. In addition to providing a unique and exciting view of the behavior of white sharks, the footage may help scientists better understand their movements through the ocean and provide fresh insights into their interactions with humans.

"They're just a fascinating animal," Naughton said. "They are the apex predator in the ocean, the *T. Rex* of the ocean, and they've been around since the time of the dinosaurs."

Our growing understanding of where and how great white sharks live gives hope that these magnificent animals will continue to survive.

Juan Oliphant

While photographers snapped away from the safety of an aluminum cage suspended in the water, the apparently pregnant great white shark seemed curious but not aggressive, often gently rubbing her belly against the side of the dive excursion boat and dive cage.

Winter Storms

continued from page 1

abundant moisture from the South Pacific.

While the extent of the damages is still being assessed, nine people died due to the storms, thousands of homes and businesses were flooded and some 600,000 people welcomed the New Year without power. Along some rivers, levees and other flood-control devices were weakened and many roads were closed due to mud slides and flooding.

The potential for devastating weather from this shifting weather pattern was recognized by NOAA forecasters well in advance. David Reynolds, meteorologist in charge of NOAA's San Francisco Weather Forecast Office in Monterey, said that NOAA long-range precipitation forecasting has progressed "a long way" in the past 10 years. For this cycle of storms, forecast offices began notifying emergency managers and the public the Friday before Christmas, almost a week before the first storm.

"Many parts of NOAA contributed to make this early forecast," Reynolds said. "[NOAA's National Environmental Satellite, Data and Information Service] now provides us images that depict quantitative moisture over the Pacific. This gives us the ability to look at how a weather system may tap into tropical moisture."

While daily forecast models were providing a less-than-clear picture of what was to come, forecasters were confident the pattern was about to change. Conference calls among western region forecast offices raised awareness among forecasters about the impact of the tropics on mid-latitude weather patterns, while experimental modeling by NOAA's National Climatic Data Center indicated a pattern of wet weather during the last week of December.

Reynolds said that similar experiences during other holiday events, such as New Year's 1997, highlighted the need to provide the public some warning before the long Christmas-New Year's holiday period started. "The models, imagery and our historical perspective gave us the confidence to get an alert out quickly," he said. "The initial flooding potential outlook, warning of heavy rains and possible flooding, went out five days before the first storm arrived."

As Dec. 27 neared, guidance by NOAA's National Centers for Environmental Prediction indicated between 10 to 20 inches of rain could fall on northern California and Oregon over a five-day period.

The California forecast offices and river forecast centers had established a teleconference bridge with the North California Coastal Offices of Emergency Services. Calls involving all offices took place twice a day beginning Dec. 27. These provided direct communications with emergency managers in each county and pointed out that stream and river levels could be updated as often as hourly by the California-Nevada and Northwest river forecast centers.

Robert Hartman, hydrologist in charge of the California-Nevada center, said, "It was through one of these calls we learned that Sonoma County would be unable to conduct evacuations on the lower Russian River once the water level exceeded 39 feet. [Flood stage was 32 feet.] That allowed us to put extra emphasis on keeping them informed in a timely manner."

The forecast offices in Portland and Medford, Ore., joined with the Northwest River Forecast Center to keep residents and emergency officials posted on rainfall that caused widespread flooding, high-wind damage, coastal tidal floods and several landslides. Daily conference calls beginning Dec. 28 between the two Weather Service offices, Oregon's Department of Emergency Management and several county emergency officials in western Oregon summarized the expected weather and provided officials refresher training on how to obtain current rainfall and flooding information via the Internet.

Oregon provided state forestry and geology experts and industry mineral representatives to assess landslide and debris-flow potentials.

Several landslides did impact Oregon roads. The southbound lanes of Interstate 5 near the California border were lost in a landslide, shutting the freeway down for several hours and rerouting both directions of traffic to the northbound lanes. Several sections of Highway 101 were closed by landslides.

Reno, Nev., received the brunt of these storms as well, and flooding was predicted to approach 1986 record levels for the Truckee River in Reno and Steamboat Creek.

As New Year's Eve approached, forecasters worked side by side with city and county emergency officials around the clock, providing current forecasts and updates in person.

Jane Hollingsworth, Reno meteorologist in charge, said forecasters began calling police, emergency operations centers, water masters and county officials directly as soon as the forecast office and California-Nevada River Forecast Center determined significant flooding could impact downtown Reno and Carson City.

"This enabled proactive measures to be taken to mitigate impacts. And while the near-record flooding caused a great deal of damage, no lives were lost nor injuries reported within Nevada," Hollingsworth said.

GOES

continued from page 1

and other environmental activity in South America. GOES-N would take the GOES-10 spot at 135 degrees west off the U.S. Pacific coast. The shifts would be made in October, but are contingent upon a successful GOES-N launch and the continued smooth operation of GOES-12 in the east over the Atlantic Ocean.

"Moving GOES provides the opportunity to improve the quality and quantity of data available to our South American partners to help limit the effects of natural disasters through better prediction and improve energy and water resource management. It will also improve overall economic development. All are key elements of GEOSS," said NOAA Administrator Vice Adm. Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.).

NOAA's two operational GOES spacecraft provide continuous environmental observations of North, Central and South America and surrounding oceans. The satellites supply data important for fast and accurate weather forecasts and warnings, detecting solar storm activity, relaying distress signals from emergency beacons, monitoring the oceans and scanning the landscape for the latest drought and flood conditions.

NASA's Goddard Space Flight Center manages the design, development and launch of NOAA satellites.

The launch of GOES-N, the first spacecraft in the new GOES-N/O/P series, will bring several key improvements to NOAA's satellite program.

Because its power system will collect and store more power from the sun than past satellites, GOES-N will not be hampered by the long spring and fall eclipse seasons, which lessened solar radiation, and by outages that result in blind spots in the data.

GOES-N will feature a highly stable pointing platform, which will improve the performance of the satellite's imager that takes pictures of storms on Earth, and its sounder instruments, which measure temperature, moisture and ozone, as well as its X-ray imager, which measures solar activity.

"The solar X-ray imager is to space weather forecasting what satellite imagery is to hurricane forecasting," said Ernie Hildner, director of NOAA's Space Environment Center in Boulder, Colo.

GOES-N will also have a new dedicated broadcast capability to be used by NOAA's Emergency Managers Weather Information Network and a new digital weather facsimile capability for higher quality transmissions of data and products.

"The solar X-ray imager is to space weather forecasting what satellite imagery is to hurricane forecasting," said Ernie Hildner, director of NOAA's Space Environment Center in Boulder, Colo. "It is helping to improve forecasts and warnings for solar disturbances, protecting billions of dollars worth of commercial and government assets in space and on the ground and lessening the brunt of power surges for the satellite-based electronics and communications industry."

Hildner said the solar X-ray imager aboard GOES-N, designed by Lockheed Martin, is more than twice as sensitive as the imager on the GOES-12 spacecraft, so it can detect fainter features important to space weather, such as coronal waves. These are important to forecasts of major geomagnetic storms caused by coronal mass ejections. Because the GOES-N solar imager is about twice as "sharp" as the GOES-12 imager, it will be able to locate flares more precisely, which is important to solar radiation storm forecasts.

"After a record-breaking and deadly 2005 hurricane season, our forecasters welcome this insurance that real-time GOES data and images will remain accessible when and where we need them," said Max Mayfield, director of NOAA's National Hurricane Center in Miami, Fla. "It's not only helpful for forecasters, but for people in harm's way of these approaching storms.

"GOES-N's more stable satellite platform pointing system will improve image navigation by reducing the number of incorrectly navigated images—cases where a feature in one image jumps to another position in a subsequent image. Increased consistency between images should allow more accurate hurricane tracking."

The satellite will also provide data for oceanographic circulation models and ecological forecasts from NOAA's National Ocean Service.

"These models and forecasts are essential for accurate water level predictions, which increase shipping safety, for predicting the distribution of pollutants, which increases our ability to effectively respond to them, and for predicting where hazardous conditions may occur due to flooding, rip currents or harmful algal blooms," said Margaret Davidson, director of the Ocean Service's Coastal Services Center in Charleston, S.C.

"With lives and property always in jeopardy during severe weather events, having GOES-N available to step in means NOAA will always be prepared to issue timely forecasts and warnings," Lautenbacher said.

Schinn

continued from page 3

on the ability of NOAA Weather Service forecast offices to provide timely, life-saving weather forcasts," said Richard Vogt, director of the Radar Operations Center. "The metal cables have deteriorated over the years, so radar data was not reliably delivered to forecast offices during severe weather, exactly the time the data is needed most. Larry's project not only fixed the problem, but he made overall radar communications better by finding and fixing other problems in the course of implementing the project," Vogt said.

"Larry maximized team productivity through leadership and innovation without unplanned or unscheduled NEXRAD radar outages," said John R. Reed, chief of the center's Engineering Branch. "He contained costs, while exceeding deployment goals established for this vital project."

"An interruption of radar data can cause up to five minutes of critical delay in getting the data into the hands of the forecasting team—critical when issuing severe weather or tornado warnings for aviation and public safety," said Sallie Ahlert, a communications engineer in the radar center's Engineering Branch. "In addition, the new optical fiber lines vastly reduce field maintenance staff's time spent on troubleshooting the failure-prone metal cables."

The project was not without challenges and a bit of adventure. During a survey at one site, one of the installers reached into a cable hand-hold to check an existing cable. A five-foot bull snake escaped from the hole by slipping up the installer's shirt sleeve, slithering inside his shirt and exiting at his collar. "That was exciting," Schinn said with a grin. "When our man went back to do the actual installation, he was universally referred to as 'the snake man.'"

At another site, installers found that an existing conduit was blocked. "When we finally dug up the conduit and cut into the pipe at the blocked point, we found a rat's nest of wire from the original installation," Schinn said. "The site always had communication problems that no one could figure out. Once we found five times more wire crammed into the pipe blocking everything up, the cause of past problems became obvious."

Schinn is proud of his accomplishments, but shares credit with all those involved. "I don't deserve the recognition; everybody does," Schinn said. "The Radar Operations Center engineering change proposal team I had was terrific and the site people were great."

Originally from Minnesota, Schinn earned a Bachelor of Science degree in engineering sciences from Arizona State University. He lived in Phoenix and New York before coming to Norman in 2000 to work as a contractor with the Radar Operations Center.

He has worked with the NEXRAD system since 1989, when he worked for the contractor that built and installed the radars. Before that, he worked on the navigation systems of Trident submarines as a systems manager.

Schinn convinced NOAA management that considerable time and money could be saved by implementing the NEXRAD cable project with in-house resources. This included surveying sites ahead of actual installations.

"When the surveys were completed, he managed the overall deployment effort so that 65 installations were completed within three months, within budget and schedule," Ahlert said.

The end result of the work done by Schinn's team was a very satisfied customer.

Lockett

continued from page 3

surge runs begin 48 hours before forecast landfall along the Gulf Coast. Lockett received a number of commendations from the meteorological and emergency management communities for her efforts to produce real-time storm surge height information before hurricane landfalls.

When not dealing with impending storms, Lockett also compares observed high water marks with SLOSH model predictions for selected storms in the past. In 2004, she worked on Charley, Frances, Ivan and Jeanne for use by FEMA for its post-hurricane assessment reports.

When her work leader retired in 2005, Lockett took on many additional activities to support the efforts of the Storm Surge Group and to ensure an effective transition for the group's new leader.

When asked about advice she might share with younger people, Lockett said, "It's important for you to feel comfortable with what you are doing. If you're not comfortable doing it, find something else. I found something I really enjoy, and if you enjoy doing it, you don't mind going to work," she said.

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