

Isabel: A Forecast Chronicle

—By Frank C. Lepore

Saturday, Sept. 6, 2003
9 a.m. Eastern Daylight Time

Hurricane specialists at NOAA's National Hurricane Center in Miami, Fla., are adept at multi-tasking. At this hour, duty forecaster Lixion Avila has one eye on the calendar, the other on three color-enhanced satellite images.

Other hurricane specialists look over his shoulder, kibitzing on the wording of the public advisory Avila types on a computer terminal.

Sept. 6 is only four days shy of the Atlantic hurricane season's midpoint—climatologically the day of greatest frequency for Atlantic hurricanes and tropical storms. It is

a busy time in a season expected to produce above-average levels of storm activity.

Hurricane Fabian and Tropical Storm Henri pirouette over the open Atlantic. In the eastern Pacific, Tropical Storm Kevin makes less dramatic moves.

Each storm is visible to NOAA's Geostationary Operational Environmental Satellite or its European counterpart, METEOSAT, and can be displayed to weather forecasters as a repetitive sequence of images. A storm's life is reduced to an animation that provides a good estimate of its direction and intensity.

Along with this activity, forecast-

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NOAA Recovers Sophisticated Sonar Lost at Sea

—By Jim Milbury

In September, a NOAA-led team aboard the *R/V Shearwater* recovered a sophisticated sonar that had been lost off the coast of southern California in August.

The portable sonar, which can be temporarily mounted to a metal pipe below a ship, inexplicably broke off the NOAA Ship *David Starr Jordan* in over 250 feet of water 100 miles offshore during a NOAA Fisheries cruise in search of white abalone.

The sonar, no bigger than a five-gallon bucket, is a scarce and highly specialized piece of equipment with a price tag of \$228,000, used for research off California and Antarctica by NOAA, the National Science Foundation and others.

The loss effectively ended the abalone research four days early.

"We were stunned and in shock," said California State University associate professor Rikk Kvitek, the operator of the multibeam sonar.

"It was unbelievable," said John Wagner, senior biological technician from NOAA's Southwest Fisheries Science Center in La Jolla, Calif. "Everyone was just depressed."

Initial assessments of the chances of recovering the sonar were not optimistic.

There were no large oceanographic research vessels normally

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Andy Newman for NOAA

In a television interview, National Hurricane Center director Max Mayfield uses a GOES satellite image to illustrate Hurricane Isabel's approach to North Carolina's Outer Banks Sept. 16.

Lost Sonar

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used for high sea operations available to return to the site. The depth of the sonar was also far deeper than NOAA's standard operating limits for diving. Financial resources at the end of the fiscal year were scarce. And even if the sonar was found and retrieved, there was no guarantee it would still be operational.

"Despite the challenges, we all thought we had to try," said Melissa Neuman, one of the NOAA southwest region scientists and *de facto* coordinator for the overall recovery project for the sonar.

Neuman was soon on the phone, mediating conference calls with as many as 12 participants at a time, including scientists, divers, engineers and lawyers.

The first bit of positive news came from the Channel Islands National Marine Sanctuary in Santa Barbara, Calif., operated by NOAA's National Ocean Service. The sanctuary had recently commissioned the *R/V Shearwater*, a 62-foot catamaran. Although

designed for marine research and diving operations around the picturesque Channel Islands, the boat could be used in other coastal areas as well.

"We're all part of NOAA and we all work together," said Channel Islands sanctuary manager Chris Mobley. "This was a great opportunity to work with NOAA Fisheries and also a great opportunity for our crew to learn about remote operating vehicle and technical diving operations."

The next hurdle was finding divers with the expertise to swim as deep as 275 feet, a difficult dive even for experienced divers.

Fortunately, the Southwest Fisheries Science Center was already working on another diving project with just such a group, the Cambrian Foundation, which is dedicated to research, education, preservation and exploration of the aquatic realm.

Cambrian Foundation divers donated their time, equipment and expertise to help in the recovery.

The final piece of the puzzle fell into place when the California Department of Fish and Game provided support craft as a safety

precaution when the divers were in the water.

On Sept. 6, *Shearwater* departed Ventura Harbor with an anxious but optimistic group of scientists and divers. At 1:30 p.m., the crew put the ROV in the water where the last positional data were received from the sonar.

Ten minutes later the control room erupted in cheers with "high fives" everywhere. The ROV found the sonar within 15 feet of the estimated location, sitting on a bed of sand.

Shearwater's captain, Luman Moody, held *Shearwater* in position over the sonar, countering deteriorating wind and current conditions while keeping the 300 feet of tether line attached to the ROV away from the propellers as the divers entered the water.

"The *Shearwater* was able to do this because it was really designed to have a lot of capabilities and abilities you would normally find on a larger oceanographic ship," said Mobley. "We like to call it a big boat in a small package."

The divers with their bulky tanks and gauges descended to the sonar following the tether line of the ROV. Within two minutes the divers were on the bottom. It took only another four minutes to send the sonar to the surface in an inflatable bag. The entire dive took less than an hour.

The moment of truth came when Kvitek powered up the salvaged sonar in his Cal State laboratory in Monterey Bay and found it to be operational.

"We're very proud of how the vessel operated and how each of the teams worked together," said Dana Wilkes, the National Marine Sanctuary Program's marine and aviation operations coordinator. "It was the quality of the people out there that allowed us to meet each challenge satisfactorily and overcome them." ☺



John Sukhil/Calif. Dept. of Fish & Game

Divers prepare to descend to recover an expensive sonar lost off the coast of southern California, as the NOAA R/V Shearwater stands by.



Janet Ward/NOAA

Donald Holtzer.

The Employee of the Month Is Donald Holtzer

—By Dane Konop

When that most insidious of chain e-mail messages, the Sobig.f worm, struck in mid-August, some of the largest Internet providers nearly shut down under a barrage of millions of bogus messages. Even though message traffic at NOAA quadrupled, NOAA e-mail users barely noticed, thanks in large part to the efforts of NOAA's Messaging Operations Center in Silver Spring, Md., led by the October Employee of the Month, Donald Holtzer.

But it was not an easy fix. Holtzer and his four-person staff worked around the clock on two occasions, locating and manually removing infected messages sent to NOAA before an automated patch could be applied to the mail system.

"The Messaging Operations Center is the organization that runs the boxes that talk to the outside world," said Gary L. Falk, director of the Information Technology Center, which includes the

Messaging Operations Center.

Without the quick-fix efforts of the Messaging Operations Center, Falk said, "we wouldn't have been able to get e-mail in or out or communicate across the organization. A lot of the way we do business and communicate, do disaster preparedness or anything else is through e-mail."

Had the Sobig.f worm struck during a hurricane, it could have a catastrophic impact on NOAA's ability to get out hurricane forecasts and warnings to the public.

Holtzer was the right man in the right place at the right time to defend NOAA from Sobig.f.

But except for happenstance, he might instead have been playing trombone.

Holtzer, a Washington, D.C., native who grew up in North Carolina, earned a degree in music from the prestigious Peabody Conservatory of Music in Baltimore in 1982.

"I took lessons from someone in the Chicago Symphony and got a masters degree from Roosevelt University, also in music," Holtzer said. "I was trying to get a job playing in a professional symphony orchestra."

At about the same time, Holtzer's uncle bought an information technology business and recruited members of his family to work there, including Holtzer.

"I was a starving musician. So I decided to go to work for him," Holtzer said.

He worked there for nine years, occasionally playing orchestra gigs, before coming to NOAA ten years ago.

"I started out working on a desktop data base management system," he said, in the computer division of what was then the Office of Administration, before becoming the "postmaster at noaa.gov." Again, Holtzer was at *continued on page 8*



Marc Pulliam/NOAA

Lauraleen O'Connor.

The Team Member of the Month Is Lauraleen O'Connor

—By John Leslie

Lauraleen O'Connor, the NOAA Team Member of the Month for October, remembers the story well. On Tuesday, June 17 of this year, she broke her left arm. If that wasn't bad enough, O'Connor, a contractor with Mitretek Systems of Falls Church, Va., had signed up to volunteer at the busy NOAA Fish Fry—the next day.

"At the time, I didn't even know my arm was broken, but I knew something was wrong when I was cleaning the crab legs," she said. Right after the Fish Fry ended, O'Connor drove herself to the emergency room and came out with a cast covering everything except her finger tips.

Her colleagues say the episode is typical of O'Connor's work ethic in her job, setting the environmental requirements for the next generation of NOAA's geostationary and polar-orbiting satellites, called the Geostationary Environment Satellite System Series R, GOES-R for *continued on page 8*

Focus On...



Ellan Taylor/NOAA

Speakers at the dedication ceremony for the new NOAA weather office in the Yap State of the Federated States of Micronesia were (left to right) John Mooteb, deputy assistant secretary, Pohnpei Office of Environment and Sustainable Development; Ceasar Hadley, meteorologist in charge, Pohnpei weather Office; David Aranug, meteorologist in charge, Yap weather office; Genevieve Miller, meteorologist in charge, Guam forecast office; Yap Gov. Robert Ruecho; R. Jeff LaDouce, director, National Weather Service Pacific region; and Tom Hushek, deputy chief of mission, U.S. Embassy.



Ellan Taylor/NOAA

Residents of Kaday Village welcome the new NOAA weather office on the island State of Yap with a traditional Yapese dance.

New Weather Office Opens in Yap State

—By Delores Clark

What do ancient stone coins, manta rays and betelnuts have in common with weather forecasting?

They are all products of the Yap State of the Federated States of Micronesia, where the newest NOAA weather office was dedicated Sept. 17.

The afternoon-long dedication ceremony resembled a luau, replete with native dancers wearing flower leis and colorful costumes and tables laden with roast pig, lobsters and local delicacies.

The village of Milew presented the weather office with a large stone coin once used as currency in ancient Yap in payment for good weather forecasts in the future.

More than 300 people attended the festivities and toured the new office.

Yap is one of four island states in the Federated States of Micronesia, which stretches across almost 2,000 miles, four time zones and the international dateline in the Pacific Ocean just north of the equator and nine hours west of Hawaii.

This part of the Pacific is known for the high number of tropical storms that develop each year—28 on average.

Following World War II, Yap and other Micronesian islands became part of a United Nations trusteeship administered by the United States until gaining sovereignty in 1979. In 1986, the Federated States of Micronesia

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entered into a compact of free association with the United States, which provides for weather forecast services from NOAA.

The Yap office is one of 10 NOAA Weather Service offices in the Pacific, including two others in the Federated States of Micronesia.

The weather offices in Micronesia are operated around the clock by NOAA's National Weather Service and staffed with country nationals, who are employed by their respective governments through a NOAA-administered reimbursable contract, a unique arrangement for the Weather Service.

The offices are responsible for collecting surface and upper air observations, issuing local adaptive forecasts and warnings and disseminating typhoon, high surf, tsunami and other severe weather warnings to the public. The Weather Service provides technical oversight of the operations.

The facility on Yap replaces one built in the 1950's and operated by the then U.S. Weather Bureau.

With a facade designed to resemble a traditional Yapese structure, the building embodies many safety and energy saving features including reinforced concrete walls, typhoon shutters, a covered back-up generator and redundant air conditioning systems.

"Construction materials are environmentally sensitive and sustainable," said David Aranug, meteorologist in charge of the Yap office. "The builders used non-toxic paints and sealants. Multiple light levels and energy efficient bulbs were selected for indoor lighting, and the external lighting is directed downward to prevent night-sky light pollution. Windows are designed to allow most spaces to be day-lit, if desired. Native plants and landscaping were selected for the grounds," Aranug said.

Another feature of the unique weather forecasting compact with Yap is a university training program designed to place fully trained local nationals as meteorologists at each Micronesian weather office.

Aranug is the first graduate of this program. He received his degree from the University of Hawaii and trained at the Guam forecast office prior to assuming the top position at Yap in 1999.

Life is simple in Yap. There are no traffic lights. There is a weekly newspaper, one television station, which airs two-week old programming from noon until midnight, one AM radio station and two FM stations that play music and report community news.

"In the absence of major media, disseminating weather information is a challenge," Aranug said. "But we work closely with the disaster management office and our village chiefs to get the word out. Having our new office up and running with the upgraded communications will make a big difference when the next storm hits."

Yap Gov. Robert Ruecho said, "We are grateful to have this facility in our community and will rest easier when the next typhoon threatens, knowing that we have the best technology and trained meteorologists available." ☺



Ellan Taylor/NOAA

Kaday Village dancers perform the traditional Micronesian bamboo dance.



Ellan Taylor/NOAA

A petite dancer enjoys the festivities.

Isabel

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ers monitor another area of disturbed weather further east in the Atlantic. The mass of clouds, some 3,200 miles southeast of Miami, shows signs of significant organization. When satellite analyses indicate winds of 39 mph, Avila starts advisory #1 on a storm called "Isabel."

The advisory notes that Isabel is moving westward at 22 mph, bearing 270 degrees, with sustained winds of 39 mph gusting to 50 mph. The forecast indicates the threat of a more powerful storm in the days to come.

Sunday, Sept. 7, 11 a.m. EDT

The storm named Isabel becomes the fourth hurricane of the season. Still some 1,610 miles east of the Leeward Islands, Hurricane Isabel now has sustained winds of 75 mph. Hurricane specialist Stacy Stewart has the day shift. His advisory #7 notes Isabel is growing, but over the open ocean, posing no threat to land.

Monday, Sept. 8, 11 p.m. EDT

Traveling over very warm water in the central Atlantic, and with atmospheric conditions ripe for development, Isabel explodes into a major hurricane with sustained winds of 115 mph radiating about 35 miles from its center. Isabel is now a category 3 hurricane on the 1 to 5 Saffir-Simpson hurricane scale. As a "cat 3," Isabel becomes the second major hurricane of the 2003 season. Churning some 1,265 miles east of the Leeward Islands, Isabel is moving to the west-northwest at 14 mph.

Stewart's advisory #18 cautions, "Isabel could become a category 4 later today or Tuesday."

Tuesday, Sept. 9, 11 a.m. EDT

Isabel's course is centered 980

miles east of the northern end of the Leeward Islands. The storm is moving steadily along a west-northwest course at 14 mph. Its sustained winds have increased, as forecast, to 135 mph with higher gusts. Isabel is now a cat 4.

The situation elicits concerned comments by assembled forecasters about the destructive effects a cat 4 can cause: Storm surges 13 to 18 feet above normal. Extensive wall failures with some complete roof structure failures on small residences. Shrubs, trees and signs blown down. Destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes cut by rising water three to five hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 feet above sea level flooded. Massive evacuation of residential areas as far inland as six miles.

Such a storm bringing winds of that force some 45 miles from its center would be a disaster if it made landfall.

Wednesday, Sept. 10, 11 a.m. EDT

"Isabel a category 4 hurricane while continuing to move westward," reads the headline for the 11 a.m. advisory. It is an ominous trend.

Isabel had turned westward late Tuesday, and is maintaining its westward course.

Although Isabel is some 750 miles east of the northern Leeward Islands, if one made allowances for the forecast error—the average difference between the storm's forecasted position and its actual position 120 hours into the future—south Florida would fall under the outer fringe of the "cone of uncertainty" and the hurricane's possible path.

"There is nothing like doing your job, and simultaneously worrying about your family and

home," sighs one hurricane center staffer.

Thursday, Sept. 11, 11 a.m. EDT

Forecasters eagerly read the morning's data developments for clues to the storm's intended target.

With sustained winds of 150 mph, now 535 miles east-northeast of the northern Leeward Islands, Isabel's trajectory looks as if the storm's taking aim at south Florida. The hurricane, however, is more than five days away from the Miami area. Any forecast at this time range is far from certain.

Forecaster Richard Pasch headlines advisory #22, "Extremely dangerous Hurricane Isabel continues moving westward." This time, there is no kibitzing.

Friday, Sept. 12, 11 a.m. EDT

Isabel continues its tack westward, but the storm is edging closer, now a scant 370 miles east-northeast of the northern Leeward Islands. Winds have ratcheted-up to 160 mph, an extremely dangerous cat 5. Isabel's hurricane force winds now extend some 70 miles from center.

Advisory #27 also reports that NOAA and U.S. Air Force Reserve "Hurricane Hunter" aircraft will begin their surveillance flights around the hurricane this afternoon, providing data critical for initializing NOAA's Environmental Modeling Center numerical models.

Saturday, Sept. 13, 5 p.m. EDT

Since Isabel had earlier weakened slightly, hurricane specialist Stewart's advisory #31 reads, "Isabel strengthens back into a category 5 hurricane. Air Force Reserve and NOAA Hurricane Hunters confirm."

Isabel is 375 miles northeast of San Juan, Puerto Rico, with winds
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Isabel

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nearly 160 mph. Hurricane-force winds extend 90 miles from its center. Isabel's satellite portrait shows a huge, menacing eye.

Sunday, Sept. 14, 5 a.m. EDT

Advisory #35 reads, "Dangerous Isabel remains just below category 5 strength."

At the upper end of the Saffir-Simpson hurricane intensity scale, the distinction in destructive potential between 155- and 160-mph winds is only academic.

Isabel's hurricane force winds now extend outward 100 miles from center. Isabel is getting bigger, with the potential to inflict damage over a larger area.

Isabel's trajectory has changed, with the storm now moving more north-northwest.

While the Turks and Caicos Islands, Bahamas and south Florida are spared, the Atlantic seaboard appears the intended target.

Monday, Sept. 15, 11 a.m. EDT

Hurricane specialist James Franklin's forecast reflects a slowing in Isabel's forward speed and a lessening of its intensity. A turn to the northwest is expected over the next 24 hours. Now 505 miles east of Nassau, Isabel has sustained winds of 140 mph 115 miles from center. Large ocean swells and surf conditions are affecting the Greater and Lesser Antilles and the Bahamas.

Advisory #42 reads, "Hurricane watch issued as Isabel moves to the north-northwest." A "watch" means hurricane conditions are generally possible within 36 hours.

Franklin reports that Isabel has made its move, taking aim at the North Carolina-Virginia coasts.

Isabel is now 660 miles south-southeast of Cape Hatteras, moving to the north-northwest at 8 mph.

With sustained winds of 105 mph, Hurricane Isabel is now a lot weaker, but still dangerous. A category 2 storm is likely to hit North Carolina's Outer Banks.

Wednesday, Sept. 17, 5 p.m. EDT

"Large Hurricane Isabel closing in on the coast. All preparations to protect life and property should be rushed to completion," Franklin writes in advisory #47.

Now located 315 miles south-southeast of Cape Hatteras, Isabel has increased its forward speed to 14 mph. Peak winds are near 105 mph, and hurricane force winds extend 115 miles from the center.

When a storm hits a coast head-on, the storm surge can push tides seven to 11 feet above normal levels. Battering waves and surge cause the greatest damage to the fragile coastline and beachfront buildings.

Thursday, Sept. 18, 11 p.m. EDT

"Eyewall of Isabel coming ashore on the North Carolina Outer Banks," hurricane specialists Franklin and Stewart write in advisory #51.

A hurricane warning is now in effect from Cape Fear, N.C., to Chincoteague, Va. Sustained winds

of 100 mph are expected. Hatteras, N.C., reports a wind gust of 79 mph, with 85 mph winds at Ocracoke Island, N.C.

A storm surge of five to eight feet is expected near and to the north of the point of landfall.

Near-record tide levels are expected in portions of Chesapeake Bay and its tributaries, causing major damage.

Epilogue

A hurricane, even a category 2 hurricane, can produce casualties and damage far beyond its immediate landfall. Isabel's large size—several hundred miles wide—brought tropical storm force winds as far north as Pennsylvania.

At least eight deaths were attributed directly and six deaths indirectly to Isabel.

Some six million homes and business from North Carolina's Outer Banks to New York were without power for days.

Damage estimates range from \$1 billion to \$2 billion.

Without the advance forecasts of the storm, which gave residents in Isabel's path plenty of time to prepare, the toll on lives and property clearly could have been much worse. ☹



Dane Konop/NOAA

Isabel caused extensive flooding of the Potomac River and other Chesapeake Bay tributaries.

Holtzer

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the right place at the right time.

"That's when government basically started using the Internet," Holtzer said. "I took over managing the Web server there." He then moved to the NOAA mail hub, set up so that the various types of e-mail systems then operating within NOAA could communicate with each other.

Later, working with the newly formed Messaging Configuration Board, he was part of the push to a single, NOAA-wide messaging system.

Holtzer continued with his music on the side, once taking a month off from work in 1998 to tour with an orchestra in Germany. On tour, he met his wife, Julia, also a musician. They now live in Bristol, Va., with son Andreas.

As the manager of the Messaging Operations Center, Holtzer said he now spends his time working with the various server operators, making sure NOAA's e-mail system runs smoothly.

"We tell them how to configure their mail servers to work within the NOAA infrastructure," he said. "And when they have a problem, they call us up and ask for help—queues filling up, mailboxes filling up, servers breaking down for one reason or another."

Holtzer is now working on something new for the NOAA e-mail community—an enterprise calendar system, due to debut in January, that will allow employees to coordinate schedules and plan meetings and other group activities electronically and NOAA-wide.

In the meantime, although he isn't quitting his day job anytime soon, Holtzer hasn't given up on trombone. He next plays Nov. 1 with the Jewish Community Center of Greater Washington Orchestra in Rockville, Md. ☺

O'Connor

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short, and the National Polar-Orbiting Environmental Satellite System, or NPOESS, which will merge the existing satellite systems of NOAA, the Defense Department and NASA into a single program.

"No matter the challenge, Lauraleen lets nothing stand in her way of doing what's necessary to make our operations successful," said Gary Davis, director of the Office of Systems Development for NOAA's Satellite and Information Service.

Working at a top government science agency was hardly what O'Connor expected to do while growing up in the San Francisco Bay area.

When she graduated from San Francisco State University with a degree in liberal arts and elementary education, O'Connor had her sights set on a long career in the classroom. But she realized early on that teaching young children wasn't her calling, and joined the Air Force. That move sent her to the University of Utah, where she earned a B.S. degree in meteorology.

Connor's first assignment in the Air Force was as a staff weather officer to the U.S. Army's Third Armored Division and a forecaster for the helicopter flight operations. A few years later, she earned an M.S. degree in atmospheric science from Colorado State University and went on to work for the Air Force Combat Climatology Center at Scott Air Force Base in Illinois.

As an Air Force meteorologist, O'Connor had assignments at the Pentagon and in Germany. After 21 years of service, she retired from the Air Force in 2000. Her final Air Force assignment was as the liaison officer at the NPOESS Integrated Program Office.

Now, as the executive secretary

for the NPOESS Joint Agency Requirements Group and the NPOESS Senior Users Advisory Group, O'Connor is busy coordinating the complex data-gathering requirements of the advanced satellite system.

"The tricky part is making sure the NPOESS instruments meet the various environmental observation needs of all the agencies involved, including some European communities," O'Connor said.

The information NPOESS collects from space will be fed into a database that respective agencies can access and understand. When NPOESS is deployed in 2018, officials expect it to increase the timeliness and accuracy of severe weather event forecasts and reduce the potential loss of human life and property resulting from severe weather.

Additionally, the system's advanced microwave imagery and sounding data products are expected to improve the prediction of ocean surface wind speeds and direction.

"What I enjoy most about my job is that it will lead to an improvement in the weather products, which will make a difference in the day-to-day lives of people around the world," O'Connor said. ☺

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