MEETINGS

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EARTH SCIENCE

A hurricane can dump a lot of rain ...

The large masses of warm, moist air that fuel hurricanes also prime those windstorms to drop a lot of precipitation in a short time, a phenomenon that residents of Puerto Rico experienced in spades when Hurricane Georges struck their island in 1998. Now, new hydrological analyses indicate just how much storm runoff and sediment washed into the surrounding waters in the wake of that storm.

In the course of a normal year, the 8,700-square-kilometer island of Puerto Rico gets about 1.6 meters of rain, says Matthew C. Larsen, a hydrologist with the U.S. Geological Survey in Reston, Va. That's about 14 billion cubic meters of precipitation. About 6 billion m^3 of that water recharges the island's aquifers, but the other 8 billion m^3 runs off the island in streams, carrying around 5.9 million metric tons of sediment.

In September 1998, however, Hurricane Georges swept over the island, dumping an islandwide average of 0.3 m of rain—more than 2 months' worth of precipitation in a mere 2 days. The deluge triggered landslides, flooding, and severe erosion. Data from flow meters in streams indicate that more than 1 billion m^3 of runoff reached the ocean in those 2 days, along with 2.4 million metric tons of sediment, says Larsen. That's about 40 percent of the average annual sediment load and amounts to about seven large dump truck loads of sediment from each square kilometer of the island. —S.P.

OCEANOGRAPHY

... and churn up big waves, too

As Hurricane Ivan approached the U.S. Gulf Coast last September, it passed right over an array of seafloor sensors. The network detected the largest wave ever measured by instruments—one that towered more than 27 meters from trough to crest.

The 50-kilometer-wide group of 14 instruments was deployed in May 2004 to measure currents on the ocean floor, says William J. Teague, an oceanographer at the Naval Research Laboratory at Bay St. Louis, Miss. Late on the evening of Sept. 15, Ivan—moving northward at a pace of about 18 kilometers per hour and packing winds of around 200 km/hr—swept across the array over a period of several hours.

The seafloor instruments were set up to take pressure data during 8.5-minute intervals every 8 hours. As it happened, no sensors were making measurements when the eye of the hurricane was directly overhead. However, sensors did record the passing of massive waves before and after the hurricane moved through the array. During one of the data-gathering intervals, waves that often reached heights of 20 m were passing over one sensor every 10 seconds, says Teague. The largest wave in that train measured 27.7 m from peak to trough.

Computer models suggest that the storm's strongest winds—those in the wall of the hurricane's eye—could have spawned waves up to 40 m high. —S.P.

INFECTIOUS DISEASES

Tracking down an emerging disease

By examining geographic patterns of outbreaks of a disfiguring skin disease in tropical nations, scientists are finding tentative clues about how the ailment spreads.

Known as Buruli ulcer, the disease is caused by *Mycobacterium ulcerans*, a microbe from the same group that causes tuberculosis and leprosy. Early symptoms of the illness include nodules beneath the skin. If untreated, skin inflammation leads to open sores that can eat into bone, ultimately requiring amputation, says M. Eric Benbow, an ecologist at Michigan State University in East Lansing.

No one yet knows how the disease spreads. One theory holds that bacteria on sediment suspended in the abundant bodies of water in tropical regions may get into scratches or open wounds and trigger infections. Another theory points to insect bites as the means of microbial transmission.

In 2004, Benbow and his colleagues studied environmental conditions at 12 sites near Accra, Ghana, and conducted a survey of animals there that might be involved in the bacterium's life cycle. In six of those locales, cases of Buruli ulcer are widespread; at the others, the disease is absent or nearly so.

Areas where the disease is endemic typically have slow-flowing or stagnant water with high concentrations of dissolved minerals, analyses showed. Lab tests indicated that several species of fish, snails, and insects are sometimes infected with the *M. ulcerans* bacterium, says Benbow.

These results don't favor one hypothesis of disease transmission over another. Next, the researchers plan to examine whether organisms that host the bacterium actually transmit the disease or are merely infected. —S.P.

SEISMOLOGY

Seismic noise can yield maps of Earth's crust

One way in which researchers can garner clues about Earth's inner structure is to analyze intense ground motions from earthquakes or test explosions. Now, scientists are realizing that the small, random, and nearly constant seismic waves that travel in all directions through Earth's crust also carry useful information.

Any seismic waves that travel between one point and another provide information about the intervening rocks, says Peter Gerstoft of the Scripps Institution of Oceanography in La Jolla, Calif. To prove that point, he and his colleagues looked at data on the minuscule ground motions in the 50-millihertz to 400-mHz frequency range that had been gathered by a 148-instrument network of seismometers in southern California. Most of those vibrations were probably caused by the motion of tides and pounding.

In the first step of their analysis, the researchers added up the ground motions that each seismometer collected over the course of a month, thereby converting the seismic noise into signals that were large enough to analyze. Then, the researchers used a mathematical technique to isolate the seismic waves that traveled directly between any two particular seismometers. By repeating this second step for each of the more than 10,000 paths linking the 148 seismometers, the scientists assembled an ultrasoundlike image of Earth's crust in the region.

The image clearly distinguishes between broad, sediment-rich areas where the seismic waves traveled at slower-than-average speeds, such as the Los Angeles Basin, and rockier regions, such as mountains, where the waves traveled more quickly. The San Andreas fault shows up plainly because porous sedimentary rocks lie on one side of that rupture and dense rocks lie on the other.

The new technique should enable geologists to collect data more cheaply and efficiently because they won't have to set off series of explosions or wait for a large earthquake to provide seismic signals, says Gerstoft. —S.P.