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OSU researchers hope to predict earthquakes

Saturday, August 05, 2006

Mike Lafferty
THE COLUMBUS DISPATCH

Ohio State scientists have shown that it might be possible to use satellites to predict earthquakes.

"That is our dream," said Shin-Chan Han, a research scientist in the OSU School of Earth Sciences, whose research on the subject was published this week in the journal Science.

Han studied satellite data of the December 2004 killer earthquake near Sumatra. He said the data showed that it might be possible to measure changes in Earth's crust before a temblor strikes.

For the first time, Han, Michael Bevis and C.K. Shum, colleagues at Ohio State, along with scientists at the University of California, used satellite sensors to measure changes caused by the 9.2 magnitude quake.

Such large quakes contain so much energy that they can rock Earth on its axis. The Sumatran quake also spawned a massive tidal wave that resulted in the deaths of an estimated 250,000 people in Indonesia, India, Sri Lanka and Thailand.

Han used data from NASA's two Gravity Recovery and Climate Experiment, or GRACE, satellites, which sense changes in gravity.

That can help them learn about the planet's structure and to gauge how fast glacial ice and polar ice sheets are changing — key information in climate studies.

Every object has gravity and scientists have known since Newton's time that the density of an object affects its gravity.

When the two NASA satellites pass over a point on Earth, gravity pulls them closer together or allows them to move farther apart depending on the density of the natural feature.

These changes, amounting to less than a millimeter, are detected, allowing researchers to measure density and other surface characteristics.

When the satellites pass over a mountain, for example, they sense more gravity. The GRACE instruments are so sensitive that they detect changes in gravity resulting from tides as well as the seasonal ebb and flow of large rivers.

"The only way we detected the Sumatran earthquake was that it was the largest to occur (after the launch of the satellites)," said Richard Gross, a geophysicist working on the GRACE team at the Jet Propulsion Laboratory in Pasadena, Calif.

The quake pushed up the seafloor by more than 10 feet over thousands of square miles. It rearranged and compressed rock as deep as 400 miles, enough to alter gravity in the region.

Han compared gravity measurements along an 800-mile rupture in the bedrock in the Indian Ocean off Sumatra before and after the earthquake.

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He delved further when he noticed increases in density on one side of the quake's fault line and decreases on the other side.

To confirm the findings, global seismic data were used in an earthquake model developed at the University of California.

NASA plans to upgrade the capabilities of the satellites, improvements that would allow Han to hone the remote-sensing techniques to detect quakes above magnitude 7.

As enticing as orbiting detectors might be, Michael Hansen, director of the Ohio Earthquake Network, said quakes often have unique signatures that could foil the most-sophisticated sensors.

Several years ago, U.S. Geological Survey scientists studied part of the San Andreas Fault near Parkfield, Calif., hoping to learn enough to predict a quake.

"The earthquake didn't happen when it was supposed to," Hansen said.

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