Rapid response science missions assess potential for another major Haiti earthquake

February 23 2010

To help assess the potential threat of more large earthquakes in Haiti and nearby areas, scientists at The University of Texas at Austin's Institute for Geophysics are co-leading three expeditions to the country with colleagues from Purdue University, Lamont-Doherty Earth Observatory, the U.S. Geological Survey and five other institutions.

Rapid response missions can be critical for assessing future risks because a fault can continue to displace the ground for weeks and months after a large earthquake. At the same time, natural weathering processes and human activities can erase valuable geologic evidence.

The goal of the Haiti missions, researchers say, is to understand which segments of the earthquake fault ruptured during the Jan. 12 quake and how much fault movement and uplift of coastal features occurred in locations along or near the fault.

- Expedition 1: Eric Calais of Purdue University led the first expedition, which has ended, collecting Global Positioning System (GPS) data to determine how land moved as a result of the earthquake. A second team participating in the expedition, led by Paul Mann of the Institute for Geophysics and Rich Koehler of the Alaska Division of Geological & Geophysical Surveys, used a helicopter and fieldwork to search for signs of ruptures-cracks at the surface along the main trace of the suspected earthquake fault. They found no signs of surface

rupture but evidence for lateral spreading and liquefaction-a phenomenon in which soils behave like a liquid instead of a solid. Earthquakes most likely caused by the same fault and resulting in the same kind of lateral spreading and liquefaction destroyed the Jamaican capital of Kingston in 1692 and 1907. Funding was provided by the Rapid Response Research Program of the National Science Foundation (NSF).

- Expedition 2: The second expedition, beginning Feb. 24, will for the first time use a scientific research vessel to examine the underwater effects of the quake. Chief scientist for the expedition is Cecilia McHugh at the City University of New York and Lamont-Doherty Earth Observatory with co-chief scientists Sean Gulick of the Institute for Geophysics and Milene Cormier of the University of Missouri. For two weeks, a team onboard the RV Endeavor will use sonar to map shifted sediments on the seafloor and seismic sensors to examine faults beneath the seafloor. The scientists hope to solve a mystery about how the earthquake unleashed a tsunami that killed seven people and to explain why corals along the coast have now been uplifted above sea level. The 185-foot Endeavor is owned by the NSF and operated by the University of Rhode Island. Funding is provided by the NSF and The University of Texas at Austin's Jackson School of Geosciences.

- Expedition 3: The third expedition, led by Fred Taylor of the Institute for Geophysics, will focus on large coral heads exposed by coastal uplift during the earthquake. Taylor will use a specialized chainsaw to collect the now dead coral for study of its tree ring-like structure to reveal clues on recent uplift and previous uplifts extending back hundreds of years. He will be assisted by Mann along with Rich Briggs and Carol Prentice of the U.S. Geological Survey (USGS). The Jackson School of

Geosciences and USGS are jointly funding the coral study.

The Jackson School places a special emphasis on mounting rapid response missions to the scenes of geo-hazards, supporting previous missions after the earthquake and tsunami in the Solomon Islands (2007) and Hurricane Ike along the Texas Gulf Coast (2008). Few academic organizations have the infrastructure, equipment and expertise to mount a large field expedition on a few weeks' notice, yet they can yield valuable insights to prepare communities for future hazards.

"We expect a whole raft of studies about the Haiti earthquake coming out based on remote sensing data from satellites and airplanes," said Sean Gulick of the Institute for Geophysics. "But there's no substitute for getting on the ground and in the water to look directly at its immediate effects."

While collecting information that can save lives in the near future is a top priority of the expeditions, the scientists are also working to help cultivate local earthquake expertise. Two Haitian scientists have been invited to participate-Nicole Dieudonne, a representative of the Haitian Bureau of Mines and Energy, and Steeven Smyithe, a student from the State University of Haiti.

"We're trying to engage the Haitian science community," said Mann, who will return to Haiti for the second expedition. "They can help us communicate better with Haitian policy makers and people about the geology behind this devastating earthquake and about the risks going forward."

In 2008, Mann, Calais and colleagues presented a paper at the Caribbean Conference forecasting a 7.2 magnitude earthquake in the area of Haiti, Jamaica and the Dominican Republic. The forecast was based on an integration of geologic information on the Enriquillo-Plantain Garden

fault zone with GPS data collected in the region. David Manaker, Calais and colleagues published an article on the same topic in *Geophysical Journal International*.

Provided by University of Texas at Austin