Purdue researchers studied Haitian fault; warned of potential for a large earthquake (w/ Video)

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(PhysOrg.com) -- The potential for large earthquakes in Haiti and the Dominican Republic was forecast by a model of the northeastern Caribbean created by a team of experts.

Eric Calais, a professor of geophysics at Purdue University, led the research team that is the only group utilizing advanced measurement equipment along the Enriquillo and Septentrional faults in Haiti and the Dominican Republic. A numerical model of the forces building up beneath the Earth's surface suggested the potential for a magnitude 7.2 earthquake in Haiti and a magnitude 7.5 earthquake in the Dominican Republic, Calais said. The results were published in a 2008 paper in *Geophysical Journal International*.

"We can't predict when an earthquake will happen, but we can provide likely scenarios. We spoke with government officials to warn of the potential for large earthquakes in the country and to recommend ways to prepare," Calais said. "Unfortunately, our recommendations were not implemented in part because the earthquake hit too soon. Large earthquakes don't happen very often, and that is a good thing, but the bad thing is that we tend to forget about them. This is true for developing countries and rich countries alike. Haiti faces many difficulties and it is hard for this to be addressed when there are few resources and such urgent and pressing problems as hunger in the streets and a volatile political environment."

On Tuesday (Jan. 12) Haiti was struck by a magnitude 7.0 earthquake.

The National Science Foundation-funded study used data recorded by 30 GPS antennas mounted in the ground around fault lines in the northeastern Caribbean to analyze the motion of the faults and surrounding area for five years.

The GPS equipment used can measure surface movement as small as the thickness of a fishing line.

Andrew Freed, a collaborator on the project and Purdue associate professor of earth and atmospheric sciences, said this movement represents deformation of the Earth's crust and the buildup of energy that could be released as an earthquake.

"When the Earth's crust is put under stress, it deforms," Freed said. "Like a rubber band, the crust can only take so much stress before it breaks, causing an earthquake."

The Enriquillo fault is part of the boundary between two tectonic plates - the Caribbean Plate and the North American Plate - slowly rubbing against each other as they move in opposite directions. The team determined that the tectonic plates were moving apart at a rate of 2 centimeters per year and putting tremendous strain on the fault, he said.

"These movements happen slowly, and the strain accumulates over hundreds of years," Freed said. "If the stored energy is released in a single event, as happened in Haiti, it can have a tremendous and devastating impact."

The team used the GPS data and the historical record to create a model of strain accumulation for the area. The model allowed the researchers to evaluate the potential for, and possible magnitude of, present-day

earthquakes in the area, he said.

Calais is now assembling a team to go to the earthquake site to measure the aftershocks and postseismic response of the area surrounding the fault.

"There will likely be aftershocks for a number of weeks that will provide a great deal of information, and surface displacements following the earthquake tell us a lot about the mechanical properties of the Earth's crust, which help us to better understand seismic potential," Calais said. "Hopefully we can transfer this experience and knowledge to faults in other areas of the world."

Calais, who last visited Haiti a year and half ago, said the level of destruction in the city was not surprising because of poor construction and development on unstable, steep slopes.

"The hotel where I regularly stayed collapsed and there is nothing left," he said. "I'm extremely worried about the people. I've tried to reach friends and colleagues there and am eager to hear from them and learn that they are safe.

Provided by Purdue University