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Active Tectonics of the Northeast Caribbean: Puerto Rico and the Virgin Islands

(Geology / Arts and Sciences)

Persistent earthquake swarms northeast of the Puerto Rico-Virgin Islands (PRVI) tectonic block have been recorded and documented for decades. The heightened seismicity typically lasts for days to weeks and consists primarily of hundreds of small events, but events up to magnitude 6 have been recorded. The active region is located on the forearc of the Puerto Rico trench north of the Virgin Islands. The cause of heightened seismicity in Northeastern PRVI is unclear; some suggestions have included a tear in the subducting North America plate and stress relief associated with subducted ridges, reflecting either asperities in the subduction process or re-activation of faults. Understanding the true cause of the seismic swarms, and thus regional tectonics, requires that new data be brought to bear, beyond the routine monitoring by island-based stations of the Puerto Rico Seismic Network (PRSN).

In 2005 and 2007, therefore, I deployed of ocean bottom seismographs (OBS), as part of a larger geophysical survey with researchers from the U.S. Geological Survey, the University of Puerto Rico, and three Spanish institutions. Data recorded on the seafloor are critical to understanding the nature of these seismic swarms by providing more rigorous constraints on earthquake locations, fault orientations, and relative motions across faults. I therefore have a valuable, unique dataset and a window of opportunity in which research funding, both to conduct additional field studies and to support graduate students, may be available, providing that data and results from the previous deployments are analyzed and presented quickly.

With this URC grant I propose to: 1) Make significant progress quickly on the data analysis from the 2005 & 2007 deployments, 2) jump start a current Baylor graduate student's dissertation research, 3) provide research experiences for undergraduates, 4) recruit potential graduate students from outside of Baylor by bringing them to the Baylor campus for an extended period to engage in research over the summer, and 5) provide fodder for an external research proposal and two publications.