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Collaborative Research: Seismic, Aseismic, and Slow Transient Deformation at the Costa Rica Seismogenic Zone

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Investigator(s) Timothy Dixon

tdixon@rsmas.miami.edu(Principal Investigator)

Sponsor University of Miami Rosenstiel School of

Marine&Atmospheric Sci

4600 Rickenbacker Causeway

Key Biscayne, FL 33149 305/361-4800

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Abstract

A network of continuous GPS and six seismometers is being developed to monitor transient strain and seismic events above the subducting slab on the Nicoya Peninsula, northern Costa Rica. This will allow investigation of a number of seismogenic zone processes. One of the most exciting recent discoveries in the solid earth sciences is the occurrence of silent slip or aseismic creep events at subduction zones. The physical processes responsible for these events are not well understood; detection and study of their behavior

at several locations is important. Aseismic creep episodes have been observed prior to the occurrence of large earthquakes and therefore may have important implications for earthquake hazard. Creep episodes perturb the surrounding stress field and their occurrence at the down dip edge of the seismogenic zone could bring the megathrust closer to failure. These stress increases are small, however if the fault is close to failure aseismic creep could trigger a large earthquake. Relative to other subduction zones, Nicoya has a big advantage for this type of project: the peninsula is quite close to the trench. Instruments deployed here are essentially perched directly over the locked part of the plate boundary, enabling high-resolution study of plate boundary strain and seismic processes. The correlation between deep episodic creep and low frequency tremor, recently uncovered at the Cascadia subduction zone, could be significant in deciphering the key physical processes. The project is an international collaboration with scientists from Costa Rica, Germany, Japan and the United States.

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