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

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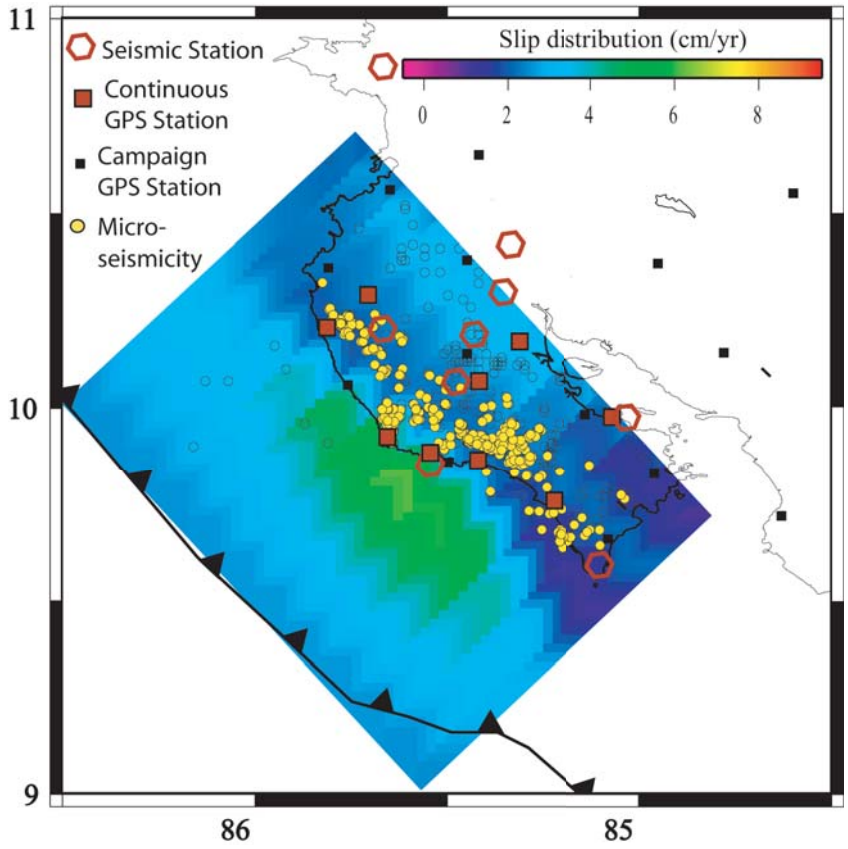

The 1999-2001 collaborative Costa Rica Seismogenic Zone Experiment (CRSEIZE) collected abundant seismic and geodetic data in the vicinity of the Nicoya Peninsula, Costa Rica. The data uncovered various modes of strain release along the subduction plate interface. Precise images of the up and down dip limits of geodetic locking and microseismicity indicate that the GPS-defined locked region extends to considerably shallower depth than the microseismicity. We interpret the up dip edge of geodetic locking as the frictional stability transition from stable sliding to stick-slip behavior. The geodetically-locked patch between the frictional transition and the deeper onset of interplate microseismicity marks the probable location of major moment release for a future large plate boundary earthquake. During the interseismic cycle, the plate interface down dip of the geodetically-locked patch either slips nearly continuously, or episodically in slow slip events that have been recorded in this region by an evolving continuous GPS (CGPS) network.

The Nicoya CGPS network is a joint effort shared by Costa Rica, Japan, and the U.S. and presently consists of nine stations. The network is currently being expanded to 12-15 stations. Surface and borehole seismometers are also being deployed to monitor seismic activity associated with strain transients. The physical processes responsible for strain transients are not well understood, and detection and study of their behavior at several locations is important. 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 seismogenic zone enabling high-resolution study of plate boundary strain and seismic processes.