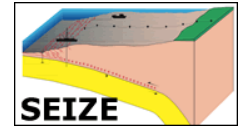


Slow Slip and Tremor Detected at the Northern Costa Rica Seismogenic Zone



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We recorded a slow slip event accompanied by seismic tremor in May 2007 on a GPS and seismic network installed on the Nicoya Peninsula, Costa Rica. A maximum of about 1 cm of surface displacement was observed over a period of about 30 days, corresponding to a maximum of 10 cm of slip on the plate boundary. A constrained inversion using a simple dislocation model and the limited available data indicates a slip patch down-dip from the shallow locked patch observed by earlier campaign GPS data [Norabuena et al., 2004], in a region of abundant microseismicity. While we have modeled this event as a simple dislocation, there is a strong hint that slip actually migrated northwesterly with time. Seismic tremor was observed near the start of this event, but not throughout its ~thirty day period. An important aspect of Costa Rica tremor that differentiates it from tremor occurring in other locations is its relatively short extent compared with the duration of the slow slip event and its location within the seismogenic zone. Tremor in both Cascadia and SW Japan is reported as typically occurring 75% of the time during slow slip events and it occurs at the down dip edge of the seismogenic zone. Tremor duration in Costa Rica rarely exceeded 20% of the time during the 2007 slow slip event. While we do not as yet have an explanation for these differences, we note that they may represent a fundamental difference in tremor activity between subduction zones with different characteristics. We located tremor bursts using an envelope cross-correlation and earth quake location method. The figure shows tremor bursts (green dots) located during the 30 day period of the May 2007 slow slip event. The approximate region of GPS determined maximum slip in the slow slip event is superimposed on this map as a red circle. Although there is some overlap in locations, the tremor appears to concentrate to the northwest of maximum slip in the slow slip event, i.e., where we infer the slip event to have migrated based on the sparse GPS data.

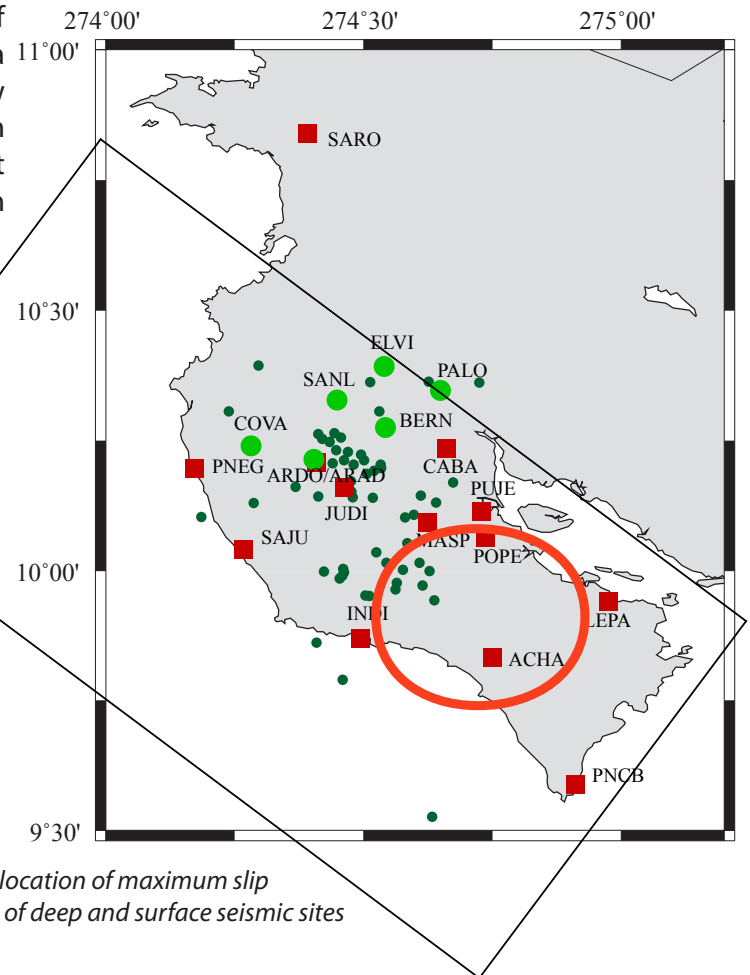


Figure: Tremor locations (small green dots) between May 17 and June 4, 2007. The box indicates the horizontal projection of the fault plane assumed in inversion of the GPS data for slip during the May 2007 slow slip event. The red circle estimates the location of maximum slip (up to 9 cm) during this event. Red squares represent the location of deep and surface seismic sites and large green dots borehole seismic stations.