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Seismic and Geodetic Monitoring of the Nicoya, Costa Rica, Seismic Gap

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Abstract

The Nicoya segment of the Middle America Trench has been recognized as a mature seismic gap with potential to generate a large earthquake in the near future (it ruptured with large earthquakes in 1853, 1900 and 1950). Low level of background seismicity and fast crustal deformation of the forearc are indicatives of strong coupling along the plate interface. Given its high seismic potential, the available data and especially the fact that the Nicoya peninsula extends over large part of the rupture area, this gap was selected as one of the two sites for a MARGINS-SEIZE experiment.

With the goal of documenting the evolution of loading and stress release along this seismic gap, an international effort involving several institutions from Costa Rica, the United States and Japan is being carried out for over a decade in the region. This effort involves the installation of temporary and permanent seismic and geodetic networks. The seismic network includes short period, broad band and strong motion instruments. The seismic monitoring has provided valuable information on the geometry and characteristics of the plate interface. The geodetic network includes temporary and permanent GPS stations as well as surface and borehole tiltmeters. The geodetic networks have helped quantify the extend and degree of coupling. A continuously recording, three-station GPS network on the Nicoya Peninsula, Costa Rica, recorded what we believe is the first slow slip event observed along the plate interface of the Costa Rica subduction zone. We will present results from these monitoring networks. Collaborative international efforts are focused on expanding these seismic and geodetic networks to provide improved resolution of future creep events, to enhanced understanding of the mechanical behavior of the Nicoya subduction segment of the Middle American Trench and possibly capture the next large earthquake and its potential precursor deformation.