

# Coseismic sea level change of southern Perú

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On the 23 of June of 2001, an 8.4-Mw magnitude earthquake struck Southern Perú causing severe damage on the built and natural environments. This earthquake caused a coseismic rupture zone of width  $\sim 100$ -km and  $\sim 200$ -300 km along the strike offshore of the Peruvian coast, between Ocoña ( Lat.  $16.45^\circ$  S, Lon.  $73.09^\circ$  W) and near Ilo (Lat.  $17.64^\circ$  S, Lon.  $71.31^\circ$  W). The U. of Harvard located the earthquake centroid at Lat.  $17.71^\circ$  S, Lon.  $72.71^\circ$  W, and 29.6 km depth. IGP, using local seismic network data, locates the hypocenter at Lat.  $16.462^\circ$  S, Lon.  $73.936^\circ$  W and 30.4 km of depth. The Harvard epicentroid is  $\sim 190$  km southeast from the IGP's epicenter. Short after the seismic event, we reoccupied the first order SIRGAS-GPS-NETWORK points of Camaná and Ilo with two Leica GPS receivers for 5-continuous days, sampling every 15 minutes. We used the GAMIT software to process these data and compared the results with the positions determined by SIRGAS for the 1998 reoccupation, with the following results: Camaná displacement: 0.42 cm S, 0.85 cm W, 0.84 cm subsidence, Ilo displacement: 0.07 cm N, 0.41 cm W, 16 cm subsidence [SIRGAS: Sistema de Referencia Geocéntrico para América del Sur – South American Geocentric Reference System]

The nearby Arequipa Continuous GPS recording station, at  $\sim 150$  km ESE of the epicenter, showed no episodic change in the deformation trend on any of the three geocentric coordinates between years 1998 and 2001, prior to the June 23 earthquake. For, it is reasonable to assume that the displacements determined at the Camaná- and Ilo-GPS stations were produced by the June 23, 2001, earthquake as a coseismic displacement. The horizontal displacement of Camaná and Ilo and the subsidence affected the position of the sea level. Significant beach land remains underwater after the earthquake. In fact, the Panamito Restaurant was destroyed and its foundation lies under water. A monument has been erected in memory of this special resort area. The Panamito restaurant's owner reported that before the tsunami, at a distance of 50-m offshore from the restaurant, the water level reached him slightly over the knee. At the time of the field inspection, he said that the water level reached as high as his chest. The man is about 1.8 m tall. We consider this report as a confirmation of the Camaná coseismic subsidence. Camaná has lost significant beach areas. The tsunami inundated the farmland along a drained lake as far inland as  $\sim 250$  m from the main city. Natural oceanic bars along seashore prevented the City of Camaná from a major catastrophe. The marine bars, also, precluded the development of a bore in the Camaná River. However, in the seashore resort, southeast of Camaná River delta, with

no marine barriers, the built environment was severely affected by the tsunami wave. Finally, it is found that the coseismic subsidence of the southern Perú is at variance with the continental regional uplift conclusion of the coastal region of southern Perú, based on neotectonic evidence.