



## **Crustal Deformation in the Southwestern Gulf of Mexico: Underthrusting of the Gulf of Mexico beneath Tehuantepec**

Gerardo Suarez (1) and Sergio Aguilar (2)

(1) Universidad Nacional Autónoma de México (UNAM), Instituto de Geofísica, Mexico D.F., Mexico (gersua@yahoo.com),

(2) Facultad de Ingeniería, UNAM, Mexico D.F.

An array of 45 broad band sensors were installed along the Isthmus of Tehuantepec in southeastern Mexico. This experiment, called VEOX, was implemented on August 2007 to March 2009. Data were registered continuously during the whole period. In order to search in the seismic records of the data obtained for crustal events in the Isthmus of Tehuantepec, To this purpose, an STA/LTA algorithm was designed to detect earthquakes with S-P times indicating they occurred close the seismic stations, at crustal or upper mantle depths. During the 18 months that the experiment lasted, about 40 crustal earthquakes were recorded in more than three stations, allowing us to determine a hypo central location. All earthquakes occurring at depths greater than 120 km, within the subjected slab, were discarded. The majority of this crustal or upper mantle activity occurred in the northern part of the Isthmus, along the coast of the Gulf of Mexico or just inland from it. No velocity model exists in the area. Therefore, we tested three different velocity models, including one obtained in an adjacent region and based on seismic refraction data. One of these three models rendered the more stable solutions and smaller errors in the hypocentral locations and was used as the local seismic velocity model. In order to improve the quality of the locations, we experimented using a double difference hypocentral algorithm (HYPODD). There was no noticeable improvement in the quality of the hypocenters using this technique. The best located events suggest a southwestern-dipping zone of seismic seismicity, deepening from the Gulf of Mexico towards the interior of the Isthmus of Tehuantepec. The focal mechanisms of the earthquakes indicate the maximum axis of compression (P axis) is oriented nearly horizontally and in a southwest-northeast direction. These mechanisms are similar to those observed for earthquakes previously studied in the region on the basis of teleseismic data, such as the Mw 6.9, 29 August 1959 Jalisco earthquake. This seismic activity suggests the basement of the Gulf of Mexico is being underthrust beneath the continent. Similar mechanisms of crust deformation are found in the Andes and in Panama, for example. This horizontal force oriented southwest-northeast is probably due to the subduction of an aseismic ridge in the Mexican subduction zone to the south.

This seismicity is important not only from a tectonic point of view but also from a seismic hazard approach. Some of the most important oil production and refining facilities of Mexico are located in this region.