Geophysical Research Abstracts
Vol. 17, EGU2015-1089-2, 2015
EGU General Assembly 2015

Determination of focal mechanisms of intermediate-magnitude earthquakes in Mexico, based on Greens functions calculated for a 3D Earth model

Félix Rodrigo Rodríguez Cardozo and Vala Hjörleifsdóttir
Instituto de Geofísica, Universidad Nacional Autónoma de México,Mexico City, Mexico (frodriguezcardozo@gmail.com)

One important ingredient in the study of the complex active tectonics in Mexico is the analysis of earthquake focal mechanisms, or the seismic moment tensor. They can be determined trough the calculation of Green functions and subsequent inversion for moment-tensor parameters. However, this calculation is gets progressively more difficult as the magnitude of the earthquakes decreases. Large earthquakes excite waves of longer periods that interact weakly with laterally heterogeneities in the crust. For these earthquakes, using 1D velocity models to compute the Greens fucntions works well. The opposite occurs for smaller and intermediate sized events, where the relatively shorter periods excited interact strongly with lateral heterogeneities in the crust and upper mantle and requires more specific or regional 3D models.

In this study, we calculate Greens functions for earthquakes in Mexico using a laterally heterogeneous seismic wave speed model, comprised of mantle model S362ANI (Kustowski et al 2008) and crustal model CRUST 2.0 (Bassin et al 1990). Subsequently, we invert the observed seismograms for the seismic moment tensor using a method developed by Liu et al (2004) an implemented by Óscar de La Vega (2014) for earthquakes in Mexico.

By following a brute force approach, in which we include all observed Rayleigh and Love waves of the Mexican National Seismic Network (Servicio Sismológico Naciona, SSN), we obtain reliable focal mechanisms for events that excite a considerable amount of low frequency waves (Mw > 4.8). However, we are not able to consistently estimate focal mechanisms for smaller events using this method, due to high noise levels in many of the records. Excluding the noisy records, or noisy parts of the records manually, requires interactive edition of the data, using an efficient tool for the editing.

Therefore, we developed a graphical user interface (GUI), based on python and the python library ObsPy, that allows the edition of observed and synthetic seismograms data such as signal filtering, choosing and disregarding traces and manual adjustment of time windows, to only include segments where the noise are excluded as much as possible. Subsequently, we invert for the seismic moment tensor of events of variable magnitude in the Mexican territory and compare the results to those obtained by other methods. In this presentation we introduce the software and present the results from the moment-tensor inversions.