Geophysical Research Abstracts
Vol. 14, EGU2012-3638, 2012
EGU General Assembly 2012

Revisiting the November 27, 1945 Makran (Mw=8.2) interplate earthquake

Z. Zarifi (1) and M. Raeesi (2)

(1) Dept. of Earth Sciences, Uppsala University, Uppsala, Sweden (zoya.zarifi@geo.uu.se), (2) Dept. of Earth Science, Bergen University, Bergen, Norway (mohammad.raeesi@geo.uib.no)

Makran Subduction Zone (MSZ) in southern Iran and southwestern Pakistan is a zone of convergence, where the remnant oceanic crust of Arabian plate is subducting beneath the Eurasian plate with a rate of less than 30 mm/yr. The November 27, 1945 earthquake (Mw=8.2) in eastern section of Makran followed by a tsunami, at some points 15 meters high. More than 4000 victims and widespread devastation along the coastal area of Pakistan, Iran, Oman and India are reported for this earthquake.

We have collected the old seismograms of the 1945 earthquake and its largest following earthquake (August 5, 1947, Mw=7.3) from a number of stations around the globe. Using ISS data, we relocated these two events. We used the teleseismic body-waveform inversion code of Kikuchi and Kanamori to determine the slip distribution of these two earthquakes for the first time. The results show that the extent of rupture of the 1945 earthquake is larger than what previously had been approximated in other studies. The slip distribution suggests two distinct sets of asperities with different behavior in the west close to Pasni and in the east close to Ormara. The highest slip was obtained for an area between these two cities which shows geological evidence of rapid uplift.

To associate this behavior with the structure of slab interface we studied the TPGA (Trench Parallel Free-air Gravity Anomaly) and TPBA (Trench Parallel Bouguer Anomaly) in MSZ. The results of TPGA does not show the expected phenomenon, which is the correlation of asperities with the area of highly negative TPGA. However, TPBA can make correlation between the observed slip distribution and the structure of slab interface.

Using the topography and gravity profiles perpendicular to trench and along the MSZ, we could observe the segmentation in the slab interface. This confirms that we barely expect that the whole interface releases energy in one single megathrust earthquake. Current seismicity in MSZ, although sparse, can fairly good confirm signals of a mature cycle of earthquake to the west of the rupture area of the 1945 event. These evidences include distribution of extensional earthquakes at intermediate depths and compressional events in the overriding plate. Revisiting the 1945 earthquake can provide lessons for understanding the behavior of MSZ and its future large events.