Awaran, Pakistan, earthquake of Mw 7.7 in Makran Accretionary Zone, 24 September 2013: focal-mechanism solution and tectonic implications

MonaLisa[1,2], M. Qasim Jan[3]

[1] COMSATS Institute of Information Technology (CIIT) Islamabad, Pakistan, monalisa@comsats.edu.pk
[2] Quaid-i-Azam University (QAU), Islamabad, Pakistan, lisa_qau@yahoo.com
yeatsr@geo.oregonstate.edu
[3] National Centre of Excellence in Geology (NCEG), University of Peshawar, Peshawar, Pakistan

On 24 September, 2013 an earthquake with focal depth of 10 km (by local observatory), identical magnitude (Mw 7.7) and sinistral focal mechanism solution, shook the town of Awaran and surrounding area in Makran Accretionary Zone (MAZ) in the province of Balochistan Pakistan. Named here as Awaran Earthquake (AE), it occurred in a remote and poorly accessible region of Balochistan. AE was followed by a major aftershock of Mw 7.2, occurred about 90 km NNE of Awaran on 28 September 2013. It took a death toll of about 826 (unofficially 1100) human lives and caused a widespread destruction in Awaran and surrounding area. Based on the information obtained from the print and electronic media (and for some areas from the field studies), an intensity of IX on MMI scale has been assigned to the epicenter of the main shock. The damages to construction and loss of lives occurred due to the poor construction of structures within 100 km of the main shock. About 90% of Awaran has been completely destroyed, and this damage was increased further after the occurrence of its largest aftershock. Fault-plane solutions of the main event and its largest aftershock on 28 September 2013 and the aftershock distribution suggest that the NNE-SSW-trending left-lateral strike-slip Awaran Fault (AF) is currently active. However, more fault-plane solutions of aftershocks data are required to confirm this contention. The emergence of an island about 200m long and 100m wide a few hours after the main shock in waters off the port town of Gwadar is the result of the formation of a mud volcano. Liquefaction of sand and mud layers may take place after an earthquake, but it takes a strong one to produce an island such as the island off Gwadar. The other possibility can be a rotational landslide, rather than a conical mud volcano, which moves along a rupture surface that is curved or concave. Further, the emission of methane gas is not an exception as the energy released by the seismic movement of these faults in MSZ activates inflammable gases in the seabed. The seabed near the Makran coast has vast deposits of gas hydrates, or frozen gas having large methane content. On the one hand, this event has released high seismic energy in NE-SW direction along the Chaman fault zone and MSZ, and on the other it has increased the tectonic stresses in the northern and SE directions, which may cause high seismicity in the near future. It is also worth noting that such a big event in the area has triggered many offshoots and splays of the larger faults (data to be presented separately). Thus the possibility of large earthquakes in the future, causing serious damage in the cities situated in the area cannot be excluded.

Cite as: MonaLisa, and Qasim Jan, M., 2014, Awaran, Pakistan, earthquake of Mw 7.7 in Makran Accretionary Zone, 24 September 2013: focal-mechanism solution and tectonic implications, in Montomoli C., et al., eds., proceedings for the 29th Himalaya-Karakoram-Tibet Workshop, Lucca, Italy.