SEISMICITY IN THE LURESTAN ARC OF SIMPLY FOLDED ZONE

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The Zagros is a unique example of young seismically-active fold-and-thrust belt located in south-western Iran. Observation of earthquake faulting in Zagros can provide valuable information about early stages of fold-and-thrust belt formation elsewhere on the continents. Earthquakes in Zagros are rarely connected to surface rupture and thus all studies on earthquake faulting are related to seismological and InSar studies of moderate-sized events.

Based on the style of deformation, Zagros has been divided into Imbricated Zone and Simply Folded Belt. The region bounded by High Zagros Fault (HFZ) and Mountain Front Fault (MFF) is named as Simply Folded Belt, SFB, (Falcon 1969; Berberian 1995) and hosts broad semi-symmetric and large-amplitude anticlines. Based on sinuous shape of MFF, the SFB is divided to Fars and Lurestan arcs and Dezful Embayment. Geological evidences indicate that the thick sedimentary cover of the Zagros is overlain on a thick layer of salt layer called Hormuz salt layer of Cambrian age. The lower half of the sedimentary column is made of mostly competent layer and has the potential of producing moderate-sized earthquakes.

One of the main issues in Zagros is the extent that basement and the thick sedimentary layer participate in the observed seismicity. Answering to this question is not easy because precise depth determination of focal depth within the range 10 to 15 km with the data from sparse regional networks is impossible. Nissen et al. (2011) suggested a vertical separation of the seismicity in Zagros, implying that all moderate-sized events especially those in SFB happens in the competent segment of sedimentary layer and all the aftershocks happens in the basement as a consequence of stress triggering. The centriod depths calculated for the main events in the studied cluster all lies in the sedimentary layer (shallower than 12 km) in contrast to the focal depth distribution of the aftershocks which fall almost exclusively inside the basement.

During 22-24 Nov. 2013, five magnitude ~5 Mw events hit a region close to Qasre-Shirin city in the western end of Lurestan arc. The moderate events and 284 aftershocks were recorded by broad band Iran-China temporary network which has been already installed on Oct. 2013. Institute for Advanced Studies (IASBS), Academy of Sciences of China and Geological Survey of Iran has jointly installed Iran-China network in NW of Iran. The seismic stations of the temporary network along with phase readings from nearby seismic stations from Iraq permanent network have provided us an exceptional opportunity to locate precisely both main events and their aftershocks. About 15 stations at epicentral distances less than 150 km including one station with epicentral distance in the range of 15-25 km recorded the cluster. The average Pg azimuthal gap of the located events is less than 100 degree. We have used waveforms recorded by Iran-China network to obtain precise moment tensor solution and centeriod depths for the five moderate events.

Our results show a seismic cluster of about 30 km long and 15 km width. We could observe a clear migration of the moderate events from NNW to SSE of seismic cluster. Moment tensor solution of the five moderate events indicate an almost pure thrust mechanism with strike, dip and rake in the range of 325° to 10°, 23° -39° and 77° -118°, respectively. All five main events lies in the east of the cluster, and thus favor the low angle east dipping fault plane (i.e., , dip in the range of 23° -39°) as the causative fault plane. The calculated centeriod and focal depth of all the moderate events are about 14 km.

The focal depth of the moderate events is still in the range of bottom of sedimentary column or the top of the basement. Therefore, because of the lack of knowledge of sedimentary column thickness still we can not say if rupturing of basement has been involved in the seismic events. In order to resolve this problem we will calculate high frequency receiver functions of the very nearby stations to find the intra-crustal layers such as the bottom of sedimentary basin. To minimize errors related to adopted earth model, we will compare the S-P phase reading from our nearby stations with the calculated receiver functions. One should note that the time axis on not migrated receiver functions is S-P time.

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