8th International Conference on Seismology & Earthquake Engineering
11-13 Nov. 2019, Tehran, Iran

THE SEISMOTECTONICS OF CENTRAL ALBORZ

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Keywords: Iran, Central Alborz, Seismotectonics, Focal mechanism, Seismicity, Faults

Central Alborz in northern Iran lies between the rigid aseismic South Caspian Basin and Central Iran, and host many large cities among them the megacity of Tehran. Previous studies have shown Central Alborz has a low rate of strain rate, especially around Tehran city (Vernant et al., 2004). The low strain rate has been further distributed between several large active faults. The low seismicity, large recurrence time of earthquakes, a large number of active faults and sparse seismic networks are the main obstacles to study the seismotectonics of the region. This in turn led to conflicting views on either the sense of direction of some faults or on the activity of some of the suggested active faults. There are several precise seismotectonic studies in Tehran region but they are for small regions, performed over short periods and does not cover the whole Central Alborz. To overcome some of the mentioned obstacles, we have compiled a new catalog of earthquakes and focal mechanisms for Central Alborz by compiling waveforms of all permanent and temporary seismic networks in the region over the period of 1996-2019. By combining the data from all the networks, we have improved the azimuthal coverage and decreased the possibility of systematic location biases caused by deviations of the assumed travel time model from the true Earth. By expanding the time period of our catalog, we have increased the number of well-located events and focal mechanisms by as much as possible. We first located all events using manually picked Pg and Sg arrival times and then applied a multiple-event relocation analysis to precisely relocate some of the seismic clusters. Figure 1 shows single-event location of 490 events. By visual inspection of waveforms, we made sure that the selected events are not related to explosions. The selected events have Pg azimuthal gap smaller than 180 degrees. Figure 2 shows 60 focal mechanism solutions derived using first polarity method. To obtain the focal mechanism solutions, we face the problem of temporal polarity change of short period stations of IRSC seismic networks. We have overcome this problem by calibrating the polarities using larger events and also using teleseismic events. The seismicity map (Figure 1) shows that the seismicity is mostly concentrated in the east of Central Alborz along Mosha, Firuzkuh, and Astaneh faults. Our focal mechanism solutions indicate a mostly left-lateral strike-slip mechanism. Unlike Firuzkuh and Astaneh faults, the seismicity along Mosha fault is more disperse, implying the fault is connected to a myriad of subsidiary faults. Seismicity along the so-called Garmsar fault is mostly limited to the segment south of Kavir Kuh and it seems that the eastern part of the Garmsar fault is related to the front of the salt glacier and is not an active fault. We detect a rather disperse and disconnected alignment of seismic events along Hableh Rud valley. The disconnected seismicity along the Hableh Rud is much correlated with the salt extrusions in the region. Events along the lineament have either thrust or strike-slip sense of motion.

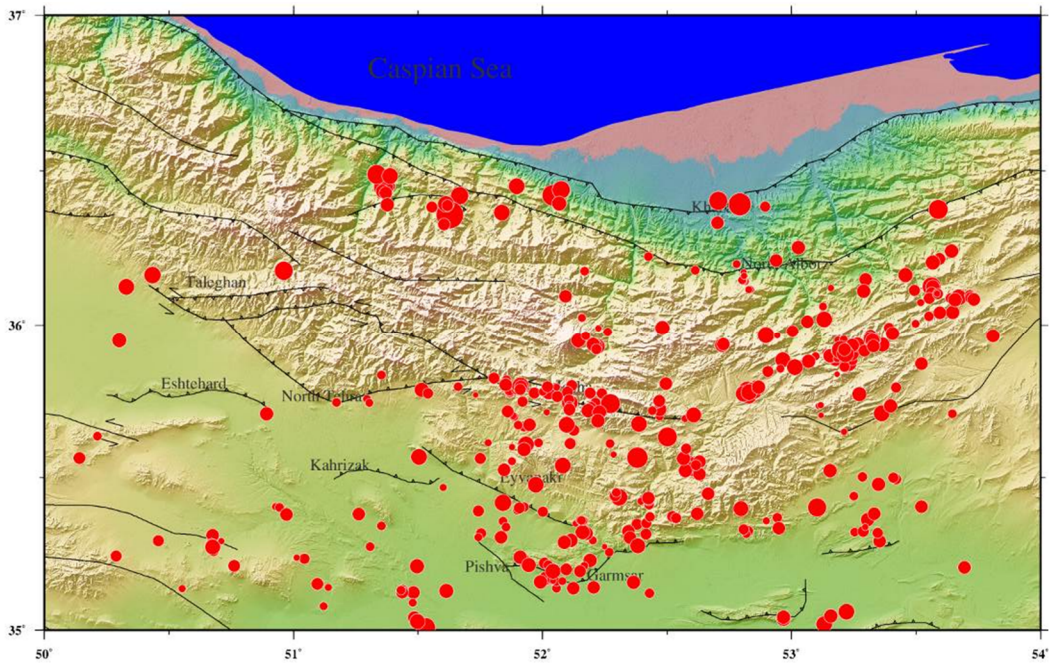

Figure 1. Seismicity around Tehran by the permanent and temporary network. Red circles are selected earthquakes whose accuracy is estimated better than 5 km with a gap less than 180°.

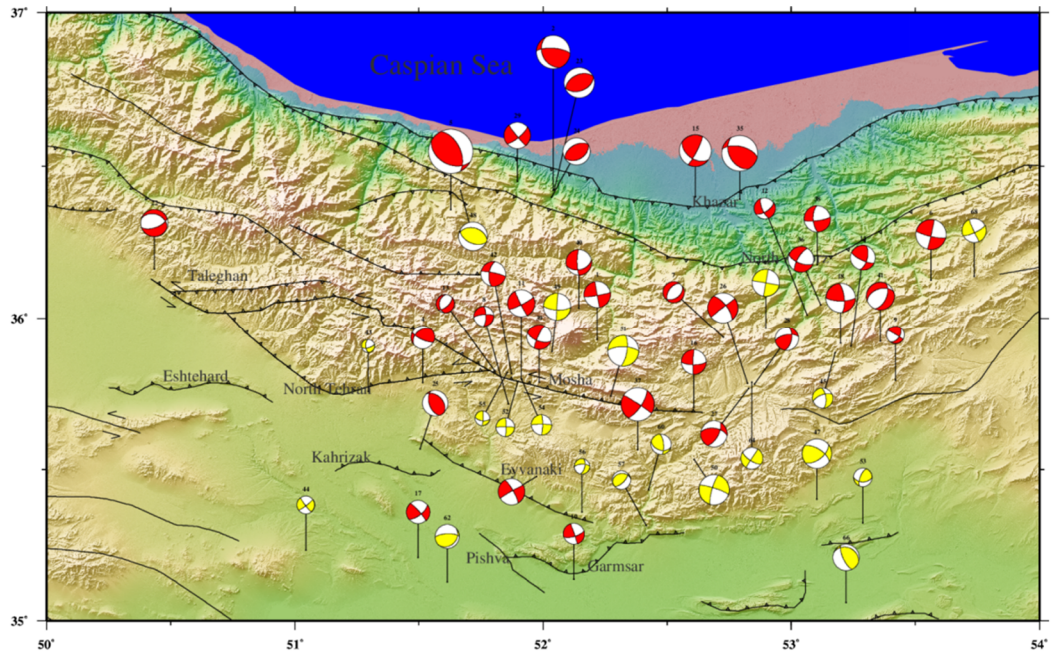

Figure 2. Map of the focal mechanisms. The red balloons are the most reliable mechanisms. Most mechanisms show left-lateral strike–slip and reverse.

REFERENCES

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