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PATTERN OF SEISMICITY AROUND ZAGROS MAIN RECENT FAULT

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The Main Zagros Recent Fault (MRF) is the post Pliocene surface expression of the Arabia - Central Iran suture in west and northwest Iran (Braud, J. and Ricou, L.-E., 1972). The fault is constituted by several strike-slip segments with left-hand stepping arrangement and transtensional to transpressional mechanisms in with respect to their strike (Tchalenko & Braud, 1974). Earthquakes with strike-slip, normal and reverses mechanisms have occurred along the fault, while there is no convincing seismotectonic explanation for the occurrence of these seismic events due to large uncertainties in their location. Also, it is ambiguous if all the observed seismicity is directly related to the MRF? We combined data from the Iran-China temporary seismic network (Figure 1) with data from other permanent networks to relocate 197 events in four seismic clusters by HDC multiple event relocation method (Jordan & Sverdrup, 1981) (Figure 2). The events were relocated with absolute epicentral error of less than 5 km. We found that the largest concentration of seismicity and the larger portion of the events locate within or very close to the fault overlapping/stepping areas (Figure 2). The coexistence of the different focal mechanisms are related to the structural complexities resulted by local changes in geometry and arrangement of the fault zone. The MRF is rather steeply dipping NE and its associated earthquake cloud (if precisely relocated) should tightly cover the surface trace of the fault. However, our relocated epicenters are widely distributed along some part of the fault (Figure 2). Moreover, our seismicity map shows some linear trends which are not concordant with the MRF trend. On the other hand, the fault map of the area, which was revised through geological/geomorphic analyses of satellite images and digital terrain models, reveals similar structural pattern as the seismicity (Figure 3). These observation imply seismic reactivation of a network of minor faults in interaction with the MRF. We suggest that the pattern of seismicity in the Kangavar – Kamyaran structural bend is related to a fault network at the SW border of the Central Iranian micro-block (Figure 4). These faults have seismologicaly been reactivated around the restraining bend of the MRF, where the Central Iranian border in northern side of the MRF is buttressed against the southern fault block. Active accumulation of elastic strain and the presence of a network of active faults around the MRF, especially in the SW edge of Central Iran, would affect the pattern of seismic zoning and has important implications in the assessment of seismic hazard of the region.

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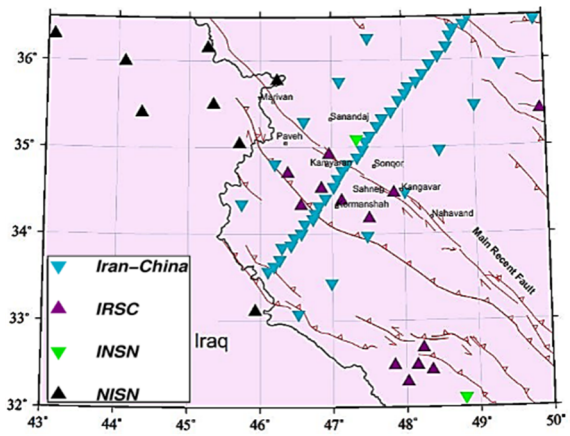

Figure 1. The location of seismic stations are denoted by triangles. Blue triangles show Iran-China stations, purple triangles show IRSC stations, green triangles show INSN stations and black triangles show NISN (Iraq) stations.

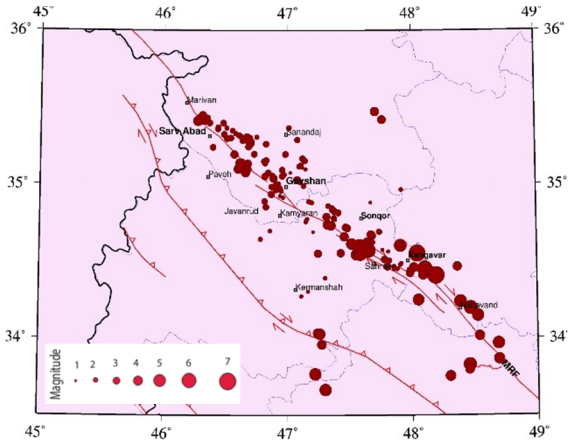

Figure 2. The location of 310 events that happened from September 2013 to October 2014 in MRF (red circles). The 197 events with magnitude greater than two and azimuthal gap less than 180˚ have been chosen for Relocation.

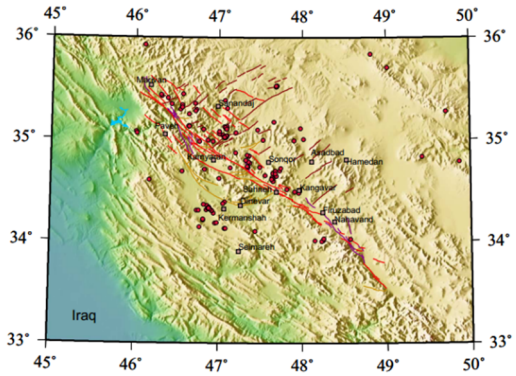

Figure 3. Similarity between the pattern of the mapped faults (red solid lines) and the seismicity (only events with magnitudes larger than 2 and azimputal gap less than 180˚ are shown) implies seismic reactivation of a network of minor faults in interaction with the MRF.

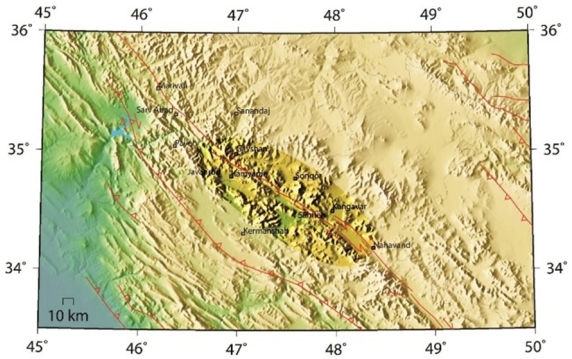

Figure 4. The location of bending structure and seismic cloud near center of MRF. The mapped faults have seismologicaly been reactivated around the restraining bend of the MRF, where the Central Iranian border in northern side of the MRF is buttressed against the southern fault block.