

Tectonic features of active faults and seismicity in the Tehran basin, Iran

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Tehran, capital of Iran, is located at the pediment zone block area of the Alborz Mountains chain, (which form part of the Alps-Himalayan Orogenic Zone) at the abrupt topographic boundary between the mountain range and the northern border of the central Kavir Desert. The urban area of this megacity is located near seismically active faults in the north, (Tchalenko et al., 1974). The presence of diverse faults with evidence of internal post-Pleistocene deformation in this zone confirms its vulnerability to further destructive earthquakes, because the Tehran region has not experienced any major destructive earthquakes at least since 1830, therefore it is necessary to study the active tectonics and evaluating fault seismicity to detect the active faults. The border between the Alborz Mountain and the Tehran's piedmont (northern part of Tehran City) is marked by the North Tehran Fault dividing the Eocene rock formation from the alluvial units of different ages (Early Pleistocene to the recent alluvium).

In this study, we focus on the deformation features of active faults developed in the Tehran basin, based on the deformation features of active faults developed in the Tehran basin, based on the interpretations of aerial photographs, perspective view of DEM, Google Earth and satellite imageries, geomorphic indices, seismic data and field investigations. Field investigations guided by the interpreted results of images and analysis of geophysical data reveal that the active faults are mainly developed along the topographical boundary between the mountains and basin, which are characterized by the deformational feature of oblique thrusts with horizontal displacement component. The faults mainly strike E-W to ENE-WSW (?) and dip to north with varied angles between $\sim 25^\circ$ and 85° . Locally, the faults are characterized by left-lateral strike-slip topographical features, with systematic left lateral offset or deflection of valleys and streams. The faults cut the terrace risers and alluvial fans which are inferred to be formed in the late Quaternary and Holocene, indicating the current activity of these faults. Seismic data also show that the many historical earthquakes and many micro-earthquakes occurred in the study region, consistent with our results. Our results show that the active faults in the Tehran region are the potential source of large earthquakes and may require further more study for accessing the seismic hazard in the densely populated urban regions around the Tehran city, Iran.

Keywords: Tehran, Alborz Mountains chain, Kavir Desert, geomorphic indices, index of relative active tectonics (IRAT)

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