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The effect of deep-seated transverse faults on structural evolution of west-central alborz mountains

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Alborz Mountains, situated in central portion of Alpine-Himalayan System, forms a composite orogenic belt and suffered shortening and uplift during Tersiary (Alpide events) (Alavi 1996). Almost all the shortening in the belt were governed by reverse movement towards both north and south and along major thrust faults. Hangingwall antiforms and footwall synforms are accompanying these faults. In west-central part of the range, these differences in movement direction of the thrusts cause the heights region and harsh topography in the belt. Volcano-sedimentary rocks of Eocene Karaj Tuff comprise all outcrops in southern parts, while Paleozoic and Mesozoic rocks crop out in northern parts. Structural geometry of the thrusts demonstrates that in southern parts of the range, they are thin, their spacing varies and is up to few kilometers, and they all moving towards south. Geometry of these thrusts is quite similar to geometry of leading imbricate fans (McClay 1992). Within the sheets small imbricate which form rejoining and diverging imbricates were also seen. In northern parts, however, thrust sheets are thicker, steeper dip, and more spaced. Their movement directions are almost all to north. In central parts, thrust faults with movement directions both to south and north were accommodated. These major thrusts which show characteristics of basin-bounding faults are accompanied by back thrusts on the hangingwall. These back thrusts rejoin main thrust and cause thrusting of older rocks in a pop-up structure fashion. The amount of inversion movement along these basin-bound faults is less than that of thrusting on their back thrusts. This characteristic which is common on inverted basins (Coney *et al*. 1996) demonstrate that these back thrusts were developed during contractional phase in an inversion tectonic regime. Further imbrications of the faults and as footwall short-cut thrusts caused development of imbricate thrust sheets toward south.

Detail analysis on geometry and kinematics of the faults show that their kinematics changes along the strike from typical thrusts to right and/or left thrusts through rotation of the fault segments. Such changes in kinematics of the thrusts were also caused passive rotation of thrust-related folds. These structural complexities are interpreted as result of interaction between the Alborz range and Caspian Basin in late Tertiary. It is widely believed that the Caspian Basin has moved south westward from late Miocene and during Late Alpide orogenic events (Axen et al. 2001, Jackson et al. 2002). This causes oblique left lateral compression of the range (Allen et al. 2003) and, as a result, reactivation of deep-seated transverse basement faults. These basement faults are assumed to have north-south trending parallel to the Afro-Arabian basement lineament (Hessami, et al. 2001). The reactivation of these deep-seated transverse faults initiate development of redial shear fault lineaments on the cover and also caused change in kinematics of the existed thrust faults and passive rotation of the thrust-related folds. These fault reactivations is also interpreted to be responsible for the neo-tectonics activity and recent earthquake with left thrust mechanism.

The westward movement of the Caspian Basin from Late Miocene made a basis for compressional and thrusting tectonics to be substituted by transpressional tectonic regime in the west-central Alborz Mountains. The very low values of measured strain on samples across the range indicate that this tectonic regime is of the thin-skinned one and deformation is mainly accommodate by displacement along the faults.

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