Geophysical Research Abstracts
Vol. 14, EGU2012-7059, 2012
EGU General Assembly 2012

The role of block rotations and oroclinal bending in Iran during the Cenozoic Arabia-Eurasia shortening

F. Cifelli (1), M. Mattei (1), H. Alimohammadian (2), J. Sabouri (2), H. Rashid (2), and M. Ghassemi (2)

(1) Università degli Studi Roma Tre, Scienze Geologiche, Rome, Italy (cifelli@uniroma3.it), (2) Geological Survey of Iran, Azadi Square, Meraj Avenue, 13185-1494, Tehran, Iran

Shortening related to the Arabia-Eurasia convergence in the Cenozoic has been – and is at present being – taken up mainly by displacements in the Zagros, Alborz, and Kopeh Dag thrust-and-fold belts of Iran, whereas the intervening, fault-bounded crustal blocks of Central Iran (Yazd, Tabas and Lut blocks) show little internal deformation.

Central Iran is separated from the Alborz belt by NE–SW left-lateral strike-slip and thrust faults (e.g., the Great Kavir fault), whereas N–S right-lateral strike-slip faults define the boundary between the Tabas and Lut blocks within Central Iran (e.g., the Neyband fault). Based on structural and seismological data, it has been proposed that NE–SW left-lateral and N–S right-lateral faults can accommodate the NNE–SSW Arabia-Eurasia convergence if they are allowed to rotate clockwise (CW) and counterclockwise (CCW), respectively.

A rotating-fault deformation model predicts that the intervening fault-bounded rigid blocks should rotate accordingly. To test this hypothesis, paleomagnetic sampling was carried out on Oligocene-Miocene sediments from different areas of Central Iran (Torud, Jandaq, Anarak, Tabas, Yazd, Bafq, Ferdows), dominated by right-lateral and left-lateral strike slip faults activity, and along the southeastern margin of the Alborz Mts. (Bastam, Tall, Gardaneye-Ahovan, Momenabad Abdolabad), where left lateral and thrust faults prevail.

Large counterclockwise (CCW) rotations (20°–35°) have been measured in the Tabas and Yazd blocks, characterized by the presence of N-S to NNW-SSE trending, right-lateral strike-slip faults. This structural domain is bounded to the north by the ENE-WSW oriented Great Kavir-Doruneh left-lateral strike-slip fault system. North of this fault paleomagnetic data show a different behaviour, with no or small CW rotation about vertical axis during the late Tertiary. In particular a small amount of CW rotation has been measured in the Jandaq and Torud area, to the north of the Great Kavir fault and in the Tal anticline, which also show a very minor amount of CW rotations.

Paleomagnetic data from the southeastern margin of Alborz Mts. have been collected in 3 different areas. In the Gardaneye-Ahovan structure, we have measured paleomagnetic directions that are not statistically distinct from the north, suggesting that this structure has not rotated since Middle-Late Miocene. Conversely in paleomagnetic sites collected in the Upper Red Fm. from the Bastam and Abdolabad areas we have measured CCW rotations. Comparison of these results with previous paleomagnetic data suggests that the eastern arm of the Alborz Mts. Arc, which is WSW-ENE oriented rotated CCW since middle-late Miocene whereas the western arm of the Alborz Mts. rotated CW during the same time interval. The angle between the orientation of tectonic structures in western and southern Alborz is almost corresponding with the difference in vertical axis rotations measured by paleomagnetic data. These data are fully compatible with an orocline mechanism of the Alborz Mts., and suggest that the arcuate shape of this orogen has been acquired during its deformation.