



Tertiary stress field evolution in Sistan (Eastern Iran)

Jentzer Michael (1), Fournier Marc (1), Agard Philippe (1), and Omrani Jafar (2)

(1) Sorbonne Universités, UPMC Univ Paris 06, CNRS, Institut des Sciences de la Terre de Paris (iSTeP), 4 place Jussieu 75005 Paris, France, (2) Geological Survey of Iran

The Sistan orogenic belt in eastern Iran, near the boundary with Afghanistan, results from the closure of a branch of the Neo-Tethys: the Sistan Ocean. It was divided by Tirrul et al. (1983) in five main units: the Lut (1) and Afghan (2) continental blocks where basement is exposed; the Neh (3) and Ratuk (4) complexes which display ophiolitic rocks weakly and highly (HP-BT) metamorphosed, respectively, and the Sefidabeh basin lying over these complexes and interpreted as a fore-arc basin. Sistan is bordered by the Makran and Zagros (formed by the closure of the Neo-Tethys) to the south and by the Kopet Dagh (formed by the closure of Paleo-Tethys) to the North.

The aim of this study is to fill the gap between preliminary studies about the overall structure of the Sistan Suture Zone and recent investigations of active tectonics in the region (e.g., Walker et al., 2004 and 2006 a and b). Questions herein addressed are: (1) how are stresses transferred throughout Iran from the Zagros to the Sistan belts? (2) Did the Zagros, Makran and Sistan belts evolve independently through time, or were they mechanically coupled?

In order to answer these questions, we have determined paleostress evolution in the Sistan, using a direct inversion method for 42 microtectonic sites in almost all lithologies of the Neh complex and the Sefidabeh basin. We find three successive directions of compression: (1) 87°N for the oldest deformation stage dated of the Late Miocene, (2) 59°N for the intermediate stage probably dated of the Early Pliocene, and (3) 26°N for the youngest stage dated of the Plio-Quaternary. A counterclockwise rotation of about 60° of the main stress (σ_1) in less than 10 Ma is therefore documented in Sistan.

These same three stages of deformation were also documented by several microtectonic studies in Iran, especially in Makran and Zagros. The direction of the youngest compression is very homogeneous indicating that the mountain belts and continental blocks of Iran are presently mechanically coupled and shortened in the Arabia Eurasia collision zone. The counterclockwise rotation of compression, from Miocene to Present, documented everywhere in Iran is probably related to the rotation of the Arabia-Eurasia direction of convergence. However, the amount of rotation is higher in Central Iran than in South Iran, suggesting a progressive mechanical coupling from Miocene to Present.

Tirrul, R., Bell, I.R., Griffis, R.J., Camp, V.E., 1983. The Sistan suture zone of eastern Iran. *Geol. Soc. America Bull.*, 94, 134-150.

Walker, R., Jackson, J., 2004. Active tectonics and late Cenozoic strain distribution in central and eastern Iran. *Tectonics* 23, doi:10.1029/2003TC001529

Walker, R.T., 2006 a. A remote sensing study of active folding and faulting in southern Kerman province, S.E. Iran. *J. Struct. Geol.* 28, 654–668. doi:10.1016/j.jsg.2005.12.014

Walker, R.T., Khatib, M.M., 2006 b. Active faulting in the Birjand region of NE Iran. *Tectonics* 25, doi:10.1029/2005TC001871