



Right-lateral shear across Iran and kinematic change in the Arabia-Eurasia collision zone

M.B. Allen (1), M. Kheirkhah (2), and M. Emami (2)

(1) Department of Earth Sciences, University of Durham, Durham, DL1 3LE, UK (m.b.allen@durham.ac.uk), (2) Geological Survey of Iran, Azadi Square, Meraj Avenue, Tehran, Iran

New offset determinations for right-lateral strike-slip faults in Iran redefine the kinematics of the Arabia-Eurasia collision. A series of right-lateral strike-slip faults is present across Iran between 48° and 57° E. Fault strikes vary between NW-SE and NNW-SSE. Individual faults west of 53° E were active in the late Tertiary, but have limited evidence of activity. Faults east of 53° E are seismically active and/or have geomorphic evidence for Holocene slip. None of the faults affects the GPS-derived regional velocity field, indicating active slip rates are ≤ 2 mm/yr. We estimate overall slip on these faults from offset geological and geomorphic markers, based on observations from satellite imagery, digital topography, geology maps and our own fieldwork observations, and combine these results with published estimates for fault slip in the east of the study area. Total offset of the Takab, Soltanieh, Indes, Bid Hand, Qom, Kashan, Deh Shir, Anar, Daviran, Kuh Banan and Dehu faults is at least 270 km and possibly higher. Other faults (e.g. Rafsanjan) have unknown amounts of right-lateral slip. Collectively, these faults are inferred to have accommodated part of the Arabia-Eurasia convergence by two mechanisms: (1) anti-clockwise, vertical axis rotations; (2) strain partitioning with coeval NE-SW crustal thickening in the Turkish-Iranian plateau to produce $\gtrsim 350$ km of north-south plate convergence. The strike-slip faulting across Iran requires along-strike lengthening of the deformation zone. This was possible until the Pliocene, when the Afghan crust collided with the western margin of the Indian plate, thereby sealing off a free face at the eastern side of the Arabia-Eurasia collision zone. Continuing Arabia-Eurasia plate convergence had to be accommodated in new ways and new areas, leading to the present pattern of faulting from eastern Iran to western Turkey.