



## **Quaternary slip-rates in the Kopet Dagh Mountains, NE Iran**

**E. Shabanian** (1,2), L. Siame (1), O. Bellier (1), L. Benedetti (1), M.-R. Abbassi (2)

(1) Université Paul Cézanne (Aix-Marseille III) - CEREGE, Europôle Méditerranéen de l'Arbois, BP 80, 13545 Aix-en-Provence cedex 04, FRANCE, (2) International Institute of Earthquake Engineering and Seismology, Tehran, IRAN (Ismael@cerege.fr)

This paper presents a morphotectonic study aiming at quantifying active tectonics in the Kopet Dagh mountain range (NE Iran). The Kopet Dagh, which belongs to the Alpine-Himalayan belt, was folded during the Late Alpine orogeny and separates the Eurasian plate (Turan platform) to the North from the Iranian blocks and Arabian plate to the South. In Iran, the Kopet Dagh fault system is constituted by active NNW-trending, and right-lateral strike-slip faults; among them the Baghan and Quchan faults being the major ones. Since the nineteenth century, the Kopet Dagh region has experienced at least 12 large earthquakes with magnitude ranging from 6.5 to 7.5. The Baghan and Quchan major regional faults are responsible for at least 6 of these large earthquakes (Quchan earthquakes: 1851, 1871-1872, 1893, 1895; Baghan earthquake: 1929). The combined observation of large Quaternary offsets and occurrence of major destructive earthquakes during the last two centuries, suggest that those faults may be the major seismic sources in NE Iran. To better assess their seismic hazards, it is necessary to extend their study to time scales averaging out several earthquake cycles. One of our main objectives is thus to determine the long term slip rates characterizing the regional Baghan and Quchan faults. Along each fault, cumulative offsets of geomorphic markers were estimated using DEMs, kinematic differential GPS, high resolution satellite images, and fieldwork observations. The ages of the offset markers were determined using in situ produced  $^{36}\text{Cl}$  (cosmic ray exposure dating). Along the Baghan Fault, alluvial fans have cumulated roughly 1 km of right-lateral horizontal displacement during the last 300 kyr, suggesting a slip rate of roughly 3 mm/yr. Among other geomorphic evidences of Quaternary activity, the Quchan Fault offsets by 330 m an alluvial fan dated at 100 kyr, suggesting a slip rate of about 4 mm/yr. When consid-

ering both studied faults, it appears that the regional strike-slip fault system should account for about 7 mm/yr which is in reasonable agreement with the regional slip rates derived from both geodetic (Vernant et al. 2004 - *Geophys. J. Int.*, 157, 381-398) and block modelling (Reilinger et al. 2006 – *Journ. of Geophys. Res.*, 111, B05411). Assuming that the derived geomorphic rates are constant over geological time scales, and considering the largest observed geological offsets (~11 and 14 km of total geological offset for the Baghan and the Quchan faults, respectively), we estimate that the strike-slip faulting along the Baghan and Quchan faults may have started roughly 3.5-4.0 Myr ago.