



New morphotectonics constraints on the present-day kinematics of the Rif region, Morocco

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We present results of a geomorphological and morphotectonic analysis of the Rif. Our study area encompasses a region running from the eastern border of the Rif up to the Atlantic coast to the west, and including the southwestern foreland of the range. We show that the present day kinematics of the Rif is characterized by active deformations along the Trougout and Nekor faults in the North-East. DEMs of offset drainage features (streams, fluvial terraces) allow determining a normal-left-lateral motion along the Trougout fault and a left-lateral motion along the Nekor fault. Along its southern front, the Rif is characterized by thrusting associated with the E-W trending Jabal Zalagh structure. Uplifted marine terraces near the Al Hoceima Bay are consistent with the present-day localized transtension seen in the morphology in the north-eastern Rif (Rastarf). U/Th dating of shells yield an average uplift rate of 0.34 ± 0.02 mm/yr from 330.000 years and a minimum uplift of 0.1 ± 0.05 mm/yr during the past 59.000 years. On the other hand, no active uplift is observed along the Atlantic coast. We also observed strong incisions features (abandoned strath terraces, perched valleys) everywhere inside the northern Rif suggesting that active faulting in the Rif is also associated with uplift of the range. These new morphotectonics constraints are consistent with the GPS measurements showing a south-westwards overall motion of most of the Rif belt with respect to stable Africa.