

Fadil, A., Vernant, P., McClusky, S., Reilinger, R., Gomez, F., Sari, D. B., Mourabit, T., Feigl, K., and Barazangi, M., *Active tectonics of the western Mediterranean: Geodetic evidence for roll back of a delaminated subcontinental lithospheric slab beneath the Rif Mountains, Morocco*. *Geology*, 34(7), 529-532, 2006.

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Abstract:

Surface deformation in Morocco derived from five years of GPS survey observations of a 22-station network, four continuously recording GPS stations, and four IGS stations in Iberia indicate roughly southward motion (~3 mm/yr) of the Rif Mountains, Morocco relative to stable Africa. Motion of the Rif is approximately normal to the direction of Africa-Eurasia relative motion, which is predominantly strike slip, and results in shortening of the Rif and subsequent crustal extension of the adjacent Alboran Sea region. The sense, and the N-S asymmetry of the observed deformation (i.e., no evidence for north-directed shortening in the Betic Mountains north of the Alboran Sea) cannot be easily explained in terms of crustal plate interactions suggesting that dynamic processes below the crust are driving the recent geologic evolution of the western Mediterranean. The model that best fits the observations involves delamination and southward roll back of the African lithospheric mantle under the Alboran and Rif domains.

Figure 3. Profile 1 and profile 2 (locations in Fig. 2). A and D: Component of velocities and 1s uncertainties along the direction of plate motion (normal to profile). B and E: Component of velocities and 1s uncertainties normal to the direction of plate motion (i.e., parallel to profiles). Interseismic deformation predicted by elastic block models is shown for three main hypothesized plate boundaries (red—Klitgord and Schouten, 1986; green—Bird, 2003; blue—Gutscher, 2004; see Fig. 1 for geometry). Thick pink line with thin black line in the center is for a model with a central Rif block (see Fig. 4 for geometry). C and F: Topography and interpretative cross section along profiles 1 and 2. LVA—low-velocity and high-attenuation anomaly (Calvert et al., 2000; Seber et al., 1996); CC—continental crust; LM—lithospheric mantle; OC—oceanic crust.

