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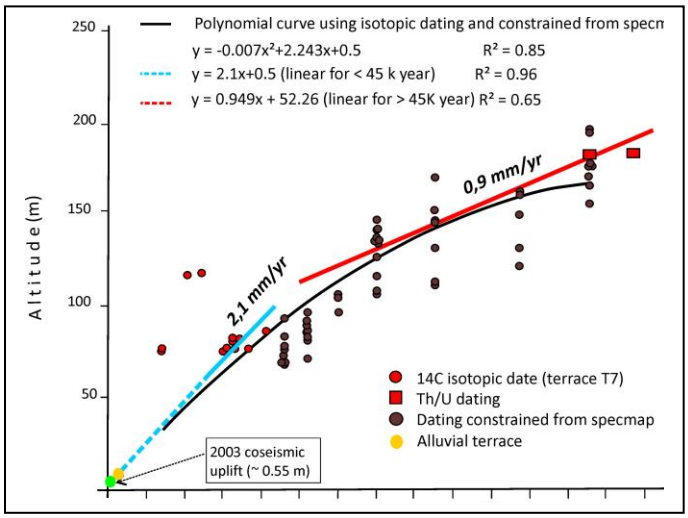
Active coastal thrusting and folding, and uplift rate of the Sahel Anticline and Zemmouri earthquake area (Tell Atlas, Algeria)

Maouche S[1], Meghraoui M[2], Morhange C[3], Belabbes S[4], Bouhadad Y[5], Haddoum H[6]

[1] CRAAG, Bouzareah-Alger, Algeria, said.maouche@gmail.com
[2] Institut de Physique du Globe, UMR 7516, Strasbourg, France
[3] CEREGE, Marseille, France
[4] UNITAR, Palais des Nations, Geneva 10, Switzerland
[5] CGS, Hussein-Dey, Alger, Algeria
[6] Faculté des Sciences de la Terre, USTHB, Alger, Algeria

Major uplifts of late Quaternary marine terraces are visible along the coastline of the Tell Atlas of Algeria located along the Africa–Eurasia convergent plate boundary. The active tectonics of this region is associated with large shallow earthquakes (M≥6.5), numerous thrust mechanisms and surface fault-related fold. We carried out a detailed leveling survey of late Pleistocene and Holocene marine notches in the Algiers region that experienced 0.50 m coastal uplift during the 2003 Zemmouri earthquake (Mw 6.8) [1].

East of Algiers, Holocene marine indicators show three pre-2003 main notch levels formed in the last 21.9 ka. Regarding the West of Algiers on the Sahel anticline, the leveling of uplifted marine terraces shows a distinct staircase morphology with successive notches that document the incremental folding uplift during the late Pleistocene and Holocene. The timing of successive uplifts related to past coseismic movements along this coastal region indicates episodic activity during the late Holocene. Modelling of surface deformation in the Zemmouri earthquake area implies a 50-km-long, 20-km-wide, NE–SW trending, SE dipping fault rupture and an average of 1.3 m coseismic slip at depth [2].



Further west, the 70-km-long Sahel fold is subdivided in 3 sub-segments and shows ~0.84– 1.2 mm/yr uplift rate in the last 120–140 ka. The homogeneous Holocene uplift of marine terraces and the anticline dimensions imply the possible occurrence of large earthquakes with Mw≥7 in the past.

The surface deformation and related successive uplifts are modelled to infer the size and characteristics of probable future earthquakes and their seismic hazard implications for the Algiers region.

Figure 1: Polynomial regression line highlighting two periods of uplift indicating 0.9 mm/year (red line) and 2.1 mm/year (blue line) post 45 ka and prior to 45 ka, respectively. In the absence of dated Holocene shorelines, the most recent coseismic uplift (yellow and green dots) helps in constraining the blue regression line.

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