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Active folding and thrusting in North Africa: A framework for a seismotectonic model of the Atlas Mountains

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Large earthquakes in the Atlas Mountains of North Africa are often generated on thrust or reverse faults. For inland faults, surface ruptures and long–term active tectonics appear as a thrust escarpment and fold-related faulting visible in the field and using remote sensing images, or measured using space-borne geodesy (GPS or INSAR). For coastal faults, major uplifts of late Quaternary marine terraces and folding with steplike morphology are exposed indicating the incremental development of coastal active deformation. We have investigated the similarities and differences between different active fault-related folding along the Africa - Eurasia convergent plate boundary. These active structures are seismogenic and the striking case studies are the 1960 Agadir (Mw 5.9), the 1954 Orleansville (Mw 6.7), the 1980 El Asnam (Mw 7.3), the 1992 Gafsa (Mw 5.3), the 1999 Ain Temouchent (Mw 6.0), and the 2003 Zemmouri (Mw 6.8) earthquakes. From paleoseismic investigations the El Asnam active fold shows 0.6 to 1.0 mm/yr uplift rate. West of Algiers on the Sahel anticline, the levelling of uplifted successive coastal benches and notches document the incremental folding uplift with $\sim$ 0.84 – 1.2 mm/yr uplift rate in the last 120-140 ka. The relatively fast folding growth during late Pleistocene and Holocene in the Atlas Mountains attests for the significance of earthquake activity and the importance of convergent movements between Africa and Eurasia in the Western Mediterranean. This work is prepared in the framework of the UNESCO (SIDA) - IGCP Project 601 “Seismotectonics and Seismic Hazards in Africa”.