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New Geophysical and Geological Evidence of Recent Active Faulting in the Dhar Doum area, Western Coastal Morocco

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New field investigations in the area between Sidi Allal Tazi, Moulay Bouselham and Larache (North Western Coastal Morocco) revealed the existence of important neotectonic features. Field research was undertaken in order: (1) to look for an eventual continuation onshore of the southern front of the accretionary wedge of the Gulf of Cadiz and (2) to choose potential sites for new seismic monitoring stations.
We present here, for the first time at our knowledge, the recent activity of the Dhar Doum fault (DDF) which is a N90 to N110 striking and northward dipping reverse fault. It's observed from the interior of the continent to the shore line and it offsets both Mio-Pliocene and recent quaternary formations. We believe that the DDF active fault plays an important role in recent seismic activity of the north-western Morocco.
Combining results form high resolution 2D electric resistivity tomography and high resolution seismic refraction tomography; we have found new evidence for active faulting in the Dhar Doum area. Qualitative interpretation of the inverted resistivity and seismic refraction data reveals the presence of two thrust faults that are interpreted to cut the topographic surface, thus displacing the most recent sedimentary deposits. Furthermore, one of these seismically imaged faults strongly correlated with the Dhar Doum fault that was initially discovered on the basis of field observation and geological mapping. The steepening at the surface and the flattening with depth of the fault is likely to indicate an important strike slip component associated with a major reverse one. If extended offshore in an E-W direction, the Dhar Doum fault would fall in the continuation of the southernmost deformational front of the Cadiz oceanic accretionary prism and connects it with, what we believe is the present day still active Rif front: the Souk Larbaa - Lalla Zahra - Dhar Doum fault. The thickening of the growth strata composing the uppermost Plio-Quaternary formations suggest that the neotectonic activities may have started by the end of the Pliocene and have continued up to date. Overall, we believe that the originality of this work is the delineation of active faulting in the study area that may have pronounced effects on the seismic hazard analysis of the whole coastal Rif foredeep basin. Also, this study provides the preliminary analysis for comprehensive much involved seismic studies in the future integrating paleoseismicity trenching, GPS investigation and so on.

Keywords: Active tectonics, Rif front, Cadiz accretionary wedge, Dhar Doum Fault, Coastal Hazards.