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The High Atlas Belt (Morocco): Alpine Transpression in the Northwestern African Margin

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The study of intracontinental mountain belts can provide new insights into plate boundaries evolution during plate convergence. A typical example of intracontinental belt is represented by the High Atlas of Morocco (Mattauer et al., 1977), formed inside the Africa plate during the Cenozoic convergence with the Europe plate. To the north, this belt is juxtaposed to two high plateaus (Moroccan Meseta and Oran Meseta) and the Middle Atlas belt. On the contrary, the southern boundary of the High Atlas is represented by the South Atlas Fault (SAF) (Jacobshagen, 1992 and references), along with the High Atlas is juxtaposed to the Anti Atlas Hercynian Belt (Sahara Platform).

The evolution of the High Atlas has been interpreted as inversion tectonic, with the reactivation of Mesozoic rift fault systems by thrust faults from the Cenozoic through present (Teixell et al., 2003 and references). Although many remarks in literature about the strike-slip nature of High Atlas-parallel faults, this model disregard a possible transpressive evolution for this belt.

A regional strike-slip faults, the SAF, was examined in the Tinerhir and Boumalne areas, where the mainly Liassic limestone cover of the High Atlas succession is juxtaposed to the Paleozoic of the Anti Atlas and unconformable Cretaceous, marking a transgression which can be observed uninterruptedly to the south for almost 300 km, from Er Rachidia to Hassi Mellah. In the study area the more evident structures are represented by steeply-dipping faults, associated to an asymmetrical fold system

showing subvertical axial planes and southward vergence. The fault planes are directed about ENE-WSW (∼N70˚), broadly parallel to the fold axes, and dip toward NNW. The same ENE-WSW trending characterises the steeply-dipping bedding in this area. The fault surfaces display down-dip slickenline lineations, with a top to the SSE sense of movement, associated to widespread oblique or horizontal strations that put in evidence an important strike slip component. This transpressive system deformed the Cretaceous and Tertiary formations; locally the Mio-Pliocene and also the Quaternary deposits are folded and faulted. The structure along the northern border of the High Atlas belt have been checked in the Midelt area, where the transpressive component appears very clearly; in this case the thrust vergence is toward NNW.

The structural analysis performed for this study provide binding data for the alpine history of the African plate palaeomargin. The High Atlas resulted a double vergence belt, characterized by strike-slip kinematics, suggesting transpressive processes for his tectonic evolution. Some indications about the displacement could be derived from the palaeogeographic restoration of regional blocks. In agreement with Michard et al. (1975), the Moroccan Meseta block, characterised, as the Sahara Platform, by an unconformable Cretaceous over the Paleozoic rocks, could have reached its current location by means of a dextral transpressive system. The original palaeogeographic location of the Moroccan Meseta block would then be placed west of the Sahara Platform. Absence of regional discontinuity between Moroccan Meseta and Middle Atlas domains, points to the restoration of the Middle Atlas Jurassic succession west of and in continuity with the High Atlas belt. The restoration of the transpressive displacement along the South Atlas Fault allows us to re-join the Cretaceous transgressions over the Paleozoic of the Moroccan Meseta and the Sahara Platform.

References

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