



## **Tectonic styles in the Marrakech High Atlas (Morocco) with emphasis on the role of heritage and mechanical stratigraphy.**

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The mechanical stratigraphy is consistently recognised as the main factor controlling the tectonic styles in fold-thrust belts. In particular, the location and thickness of weak and stiff layers within a tectono-stratigraphic pile dictate both the position of décollement levels and ramp-flat geometries. In turn, these factors exert a direct control on the folding styles. Due to a complex geological history, the Marrakech High Atlas presents a great variety of tectono-stratigraphic piles. The aim of this contribution is to show how these contrasted behaviours explain the variety of observed structures.

The Marrakech High Atlas is situated south of Marrakech between the Western and Central High Atlas. Compared to other segments of the orogen, it is characterized by the abundance of Paleozoic and older rocks. From a general point of view, it is acknowledged that the High Atlas developed on the site of Triassic-Lower Liassic rift basins subsequently supplied with Lower to Middle Jurassic carbonates from the Tethys in the Central and Eastern High Atlas and from the Atlantic in the Western High Atlas. Between these two regions, the Marrakech High Atlas is a domain where the Jurassic cover is lacking and the Triassic syn-rift sediments are thinner or even absent. During the Cenomanian and Turonian, a general transgression led to the development of a carbonate platform covering the whole Atlas domain and its margins: the Anti-Atlas to the south and the Moroccan Meseta to the north. Then during the Upper

Cretaceous-Paleogene, the sedimentation is dominantly continental or lacustrine with some marine incursions during the Eocene. By the Oligocene, continental deposits resulted from the progressive erosion of the chain. So that the mechanical stratigraphy is strongly different from one place to the other. However, five main mechanical units can be identified: (1) a rigid Panafrican crystalline basement (2) a Paleozoic cover, which is globally incompetent (except for the Lower Cambrian) and comprises efficient décollement levels within the Viséan “flyschs” (3) a Triassic syn-rift sequence, which remains coupled to its substratum (either the basement or the Paleozoic series) and exhibits a décollement level situated at the top of basaltic lava flows (4) a Cretaceous-Paleogene sequence characterized by a major décollement level within the Senonian evaporitic beds (5) the Mio Pliocene flexural sequence.

We will illustrate and discuss different aspects of the tectonic style with a particular emphasis on the following points:

- The Senonian décollement exists everywhere. However, in the Ouarzazate basin it controls the development of a spectacular imbricate fan propagating quite far south of the South Atlas Front whereas elsewhere (Souss and Haouz basin) it is only activated as a secondary décollement favoring the formation of “rabbit ears” structures along the steep limbs of Paleozoic-cored anticlines.
- The Viséan décollement level favors the northward propagation of the deformation in the eastern part of the Haouz basin.
- The contrast between the basement blocks bounded by steep reverse faults and the Paleozoic beds, which are folded together with the Meso-Cenozoic cover, can be used to explain the main structural features of the chain.