

High Atlas Morphology: Insight from the Drainage Pattern

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The High Atlas is a linear intracontinental mountain range, around 600 km in length, orientated approximately ENE-WSW. Its width ranges from 50 km to around 100 km. The mean elevation in the axial part of the chain is 2200 m with peaks above 4000 m. This results from uplift related both to lithospheric-scale thermal doming, mostly parallel to the trend of the chain, and to weak crustal thickening during Cenozoic times. A striking feature of the morphology of the High Atlas is the occurrence of both transverse and longitudinal drainage characterized by deep fluvial incision of more than 1000 m in the axial zone of the chain. Most of the transverse component of the drainage appears to postdate the longitudinal component as shown by the occurrence of recent or incipient captures. The longitudinal drainage is inherited from an early stage of organization controlled by the tectonic structures in the post-Paleozoic cover that developed during upper crustal folding and thrusting. Rapid amplification of N-S regional slope by ~1000 m of thermal uplift triggers: (i) incision of the longitudinal drainage and (ii) processes of internal drainage capture by transverse streams creating a new organization of the drainage system toward the regional slope. Such evolution from a longitudinal to a transverse-dominated drainage network may also represent a common way of fluvial network development in mountain belts where the amplification of the regional slope simply results from long-lived lithospheric convergence, not from asthenospheric uplift.