

Beauchamp, W., Allmendinger, R., Barazangi, M., Demnati, A., El Alji, M., and Dahmani, M.,  
*Inversion tectonics and the evolution of the High Atlas Mountains, Morocco, based on a  
geological-geophysical transect.* Tectonics, 18, 163-184, 1999.

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**Abstract:**

The High Atlas Mountains of North Africa were formed over a major intracontinental rift system that had extended from what is now the Atlantic margin of Morocco to the Mediterranean coast of Tunisia. The Atlas rift system began in the Triassic and was active through the Jurassic. The inversion phase of the Atlas rift system began in the Early Cretaceous and extended into the present. The major uplift phase occurred between 30 and 20 Ma (Oligocene-Miocene) and corresponds to the Alpine orogenic event. The uplift and inversion of the Atlas rift system resulted in a shortening of the rift basin by a minimum of 36 km. A restoration of the deformed cross section indicates the original Atlas rift basin was approximately 113 km wide, comparable to the width of the present-day Red Sea. Synrift and postrift sedimentary rocks were uplifted by the reactivation of synrift normal faults, with further shortening along newly formed thin-skinned thrust faults. Structures formed by the reactivation of synrift faults resulted in structures with different geometries than those created by newly formed fault-bend and fault-propagation faults. Shortening across the High Atlas Mountains involved a partitioning of strain, with the greatest magnitude of shortening occurring along the margins of the High Atlas Mountains.

**Figure 15.** Schematic cross sections showing the tectonic history of (a) the Atlas synrift phase, (b) the postrift phase, and (c) the final uplift and inversion of the Atlas rift system to form the present-day Atlas mountains. Two regional pin lines are shown which are the equivalent to those in Plate 1 (line a) and (line b). The distance between these pin lines after restoration is approximately 140 km (a), which yields the original width of the Atlas rift system. Subsidence during the Late Jurassic to Tertiary is also shown (b). Convergence between the African and Iberian plates in the Tertiary (Miocene-Oligocene) resulted in the inversion of the Atlas rift basin by bivergent thrusting along the rift margins at shallow crustal levels over short distances (~10-14 km). Significantly less shortening in the interior of the mountain belt indicates shortening is being achieved at middle to lower crustal levels (c).

