Analysis of strike-slip tectonics in extensional systems: the case of the Moroccan Atlas system

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The intracontinental belt of the High Atlas is an aborted rift system along NW Africa, which formed during the Mesozoic break-up of Pangaea and was inverted during the Alpine Orogeny. Although the inversion and orogeny build-up have been extensively studied, the Triassic to Jurassic rifting, synchronous to the opening of the Atlantic and the Tethys, is still poorly understood. True orthogonal rifting is proposed to occur in the Triassic to Early Jurassic, while the end of rifting is controversial and believed to be controlled by oblique extension. Restoration of the Atlantic-Tethys triple junction suggests sinistral motion between Iberia and Africa being active during the Middle Jurassic, which reactivated pre-existing NE-SW trending Hercynian weaknesses in transtension mode. This led to the formation of a series of pull-apart basins involving the basement and localised volcanic activity.

The Atlas system is an excellent field analogue to analyse the role of strike-slip tectonics in extensional systems, especially in the early stages of rifting. Despite the late Cenozoic (Alpine) inversion, the well-exposed syn-rift structures and sediments have been weakly affected by the broad contractional event.

Our study aims to investigate the kinematic and geometry of the oblique rifting phase, the strain variation lengthwise in the Atlas rift system, the relationship between the orthogonal rift structures, the strike-slip structures, and the synchronous volcanism. In this contribution, we will highlight the fieldwork results, which we used to constrain the restoration of the rift system, quantify extension vs. transtension, and produce a conceptual model of how strike-slip tectonics can influence the early stages of a rift system.