# Diapiric Control on Jurassic Carbonate Systems, High-Atlas Basin, Morocco

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## Abstract

Carbonate platforms developed on a diapiric substrate form important passive margin hydrocarbon reservoirs. Much of our present understanding of these systems comes from subsurface data. In an effort to gain new insights of these carbonate and mixed carbonate-clastic systems we have undertaken an integrated structural and sedimentological study of Lower to Middle Jurassic carbonate platform and basin deposition across c. 6000 km2 of the Moroccan High Atlas. This scale of observation is similar in area to a large offshore seismic dataset, and provides a natural laboratory where new understanding of syn- to post-rift diapiric carbonate platforms can be gained. The Atlas intracontinental basin initiated during the Triassic, contemporaneously with Atlantic rifting. A thick continental sequence, dominated by sandstone, shales and evaporites accumulated in multiple tectonic sub-basins. The first regionally extensive Sinemurian carbonate platform developed during thermal subsidence. During the Early Pliensbachian, renewed normal and strike-slip faulting and deformation occurred. The deformation triggered the diapirism of Triassic shales and evaporites. The diapirism impacted on the dynamics and geometries of Pliensbachian carbonate platform systems, and Toarcian-Aalenian mixed siliciclastic/carbonate systems. The ensuing Late Aalenian – Bajocian period was a relatively stable tectonic phase, so that a second extensive carbonate platform developed across the whole Atlas Basin. Diapirism was limited during these times. There was renewed diapirism from the latest Bajocian until the Late Jurassic. This occurred in relation to a new phase of deformation and magmatic intrusions along the crustal faults that also control the location of diapiric ridges. The synsedimentary diapirism had a major influence on the location and geometry of the marine-carbonate and later continental-siliciclastic sequences, that characterize this final stage of the intracontinental basin. Our outcrop studies reveal a close relationship between diapirism and sedimentation, with significantly different responses depending on the type of sedimentary system: carbonate, siliciclastic or mixed. The scale of our work allows us to place locally detailed observations of carbonate platform systems within a regional framework developed at the scale of large 3D seismic surveys. As such, the results of this study are of direct applicability of offshore exploration efforts.

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