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Imprint of salt tectonics on subsidence patterns during rift to post-rift transition: The Central High Atlas case study

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During Mesozoic time, the extensional basin of the Central High Atlas in Morocco underwent two consecutive rifting events: Permo-Triassic and Early-Middle Jurassic in age. However, a review of the literature reveals that the precise timing of the Early-Middle Jurassic rift and post-rift transition varies depending of the analysed area. The discrepancy about rifting ages is associated with the general lack of normal faulting cutting post-Lower Jurassic strata and the presence of significant salt diapiric activity during Early and Middle Jurassic in the central part of the basin.

To evaluate the influence on subsidence patterns of the interaction between both extensional and salt tectonics, we present new subsidence data from diverse paleogeographic and tectonic settings of the Central High Atlas rift basin.

From the periphery of the basin, the Djebel Bou Dahar platform-basin system corresponds to a shallow carbonate platform developed on top of a basement high, controlled and bounded by normal faults. The results of the subsidence analysis show long-term and low-rate of tectonic and total subsidence (0.06 and 0.08 mmyr-1 respectively). The roughly parallel evolution of both total and tectonic subsidence curves indicates the tectonic influence of the platform-basin system, as corroborated by the syndepositional fault activity of the outcropping Sinemurian-Pliensbachian normal faults.

Contrarily, the rift axis is characterised by the presence of diapiric salt ridges and minibasins as in the Tazoult-Amezraï area and Imilchil diapiric province. Comparison between subsidence curves from the SE flank of the Tazoult salt wall and from Amezraï minibasin centre shows that, from Pliensbachian to Aalenian, the tectonic and total subsidence rates of the Amezraï minibasin (between 0.17-0.32 mmyr-1 and 0.38-0.98 mmyr-1) are two-fold their equivalent rates in the Tazoult salt wall. Amezraï minibasin values are in agreement with the values from Imilchil minibasins (tectonic and total subsidence up to 0.23 and 0.90 mmyr-1). Additionally, Imilchil minibasins record the migration of maximum subsidence rate through time.

Thus, the rift axis show subsidence rates one order of magnitude higher than rates from basin periphery, spatial and temporal migration of subsidence rate maxima and anomalous high subsidence amounts during post-rift phase. These characteristics point to a combination of normal fault extension and salt withdrawal from beneath the minibasin during the rifting, being the salt-related subsidence predominant during the post-rift and masking the expected subsidence pattern of a rift-post rift transition.

The comparison between the new subsidence curves from the Central High Atlas with other published works from the Atlas Tethyan domain reveals similar subsidence patterns and the close relationship between high subsidence rate episodes and salt diapirism in the entire Atlas system.

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