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Sedimentologic and paleoenvironmental constraints on the structural evolution of the southern Tethyian margin in Tunisia during the Lower Cretaceous

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During the Lower Cretaceous, the paleogeographical framework of southern Tethyian margin in Tunisia was represented by three main domains: a continental and stable platform to the south, an open marine basin to the north and a transition zone in Central Tunisia represented by carbonate and mixed platforms. Our study deals with the evolution of this transition zone during the Albian transgression which is represented by the Hameïma and Fahdène Formations that overly the Aptian carbonate shelf.

Exhaustive ammonite collections allowed defining a regional biozonation, to establish the earliest Albian age of the Hameïma Formation. The biostratigraphic information provides evidence for a sedimentary hiatus of most of the Middle Albian, and emphasizes the diachronism of the Late Albian transgression. Detailed study of facies and biotic assemblages led to recognising the environmental evolution, to identify discontinuities, to define sequences and to correlate them throughout the studied area, based on biostratigraphy. The studied succession can be divided into five third-order depositional sequences. The first two sequences (SA1, SA2) correspond to mixed, clastic-carbonate, shelf deposits, and are separated from each other by karstified exposure surfaces. They can be subdivided into minor depositional sequences that can be correlated regionally. The three overlying sequences (SA3 to SA5) were deposited in open marine environments. For each sequence the submarine erosional surfaces (sequence boundaries) are followed by carbonate Lowstand Systems Tracts (LST) with benthic faunas. The LSTs are overlain by dark shales, whithin which the maximum flooding surfaces are locally marked by pyritous or phosphatic ammonites. At that time, Central Tunisia was a gently northward-dipping ramp, submitted to very low energy deposition, although moderate shelf currents were active. The Albian transgression provoked the drowning of the Aptian to earliest Albian platform, and the south or south-eastward backstepping of the shelf facies.

Synsedimentary tectonic deformation began around the Aptian-Albian boundary and increased in extent and intensity throughout the Early Albian, before culminating in the Middle Albian, marked by a sedimentary hiatus. This local deformation phase was probably caused by halocinetic movements, which usually precede diapir uplift, but needs to be seen in a regional context. The end of the South Atlantic Ocean opening caused tectonic instability in the region, with rifting propagating between the African Saharian and Ethiopian shields, before eventually causing continental break up and opening of the Central Atlantic Ocean.