1ST CONFERENCE OF THE ARABIAN JOURNAL OF GEOSCIENCES (CAJG)
12–15 NOVEMBER 2018, HAMMAMET, TUNISIA

Springer
SPRINGER NATURE

The Albian-Cenomanian transition in Central Tunisia: insights from Jebel Mrhila

Etienne Jaillard[1], Jean-Louis Latil[1,2] and Naser Raisossadat[3]

[1] ISTerre-IRD, Grenoble Alpes University, CS 40700, 38058 Grenoble cedex 9 France
[2] GREGB, Le Maupas, 05300 Lazer, France
[3] Dept Geology, Faculty of Sciences, University of Birjand, PO Box 79/615, Birjand, Iran
Etienne.Jaillard@Univ-Grenoble-Alpes.fr

Abstract. Three sections of the Albian-Cenomanian boundary have been studied in Jebel Mrhila of Central Tunisia. The Upper Albian succession directly overlies Aptian dolomites, exhibits two depositional sequences and belongs to the *M. fallax* (?) to *S. africana* zones. The top of the Upper Albian series is eroded by a major discontinuity reflecting a major sea level drop. Deposition resumed in earliest Cenomanian times (*N. carcitanense* and *S. schlueteri* subzones) with two sequences of condensed sandy marls and dolomites, both capped by phosphate layers, which are overlain by thick outer shelf marls (Early Cenomanian). Comparison with other areas suggests that during the Albian-Cenomanian transition, northern Central Tunisia acted as a bypass zone between the emergent southern areas and the northern basinal domain.

Keywords: Albian-Cenomanian transition, sedimentology, ammonites, Tunisia.

1 Introduction

The Albian stage is one of the longest of Mesozoic times and records many oceanographic and geodynamic events. It is, however, still poorly known in the Tethyan region, probably because of its monotonous and clayey lithology.

Central Tunisia offers opportunities to study this period, since it offers good exposures and fossiliferous successions. This work is focused on the Albian-Cenomanian transition in Jebel Mrhila and its comparison with other areas of Central Tunisia.

2 Geological background

During the Cretaceous, Tunisia is part of the South-Tethyan margin, which deepens northward. In this framework, Central Tunisia represents the transition from a little subsiding, southern platform domain recording frequent emergence periods, to a subsiding, northern, outer shelf to basin domain. Albian deposits are represented by the carbonated Hameima Fm of earliest Albian age [1], overlain by the marly Fahdene Fm of Early Albian to Cenomanian age [2].

In Jebel Mrhila, the Albian succession directly overlies the Aptian dolomites, and the Albian-Cenomanian boundary is roughly represented by a laterally extensive sandy dolomite bed. Three sections have been studied in Jebel Mrhila, from sedimentological and biostratigraphical points of view.

3 Results

3.1 Sedimentology

Five sedimentary discontinuities have been identified (Fig. 1). The first discontinuity (D1) is the brecciated, karstified and mineralized surface of the Aptian dolomite, which corresponds to the long-lasting post-Aptian emergence period. D2 is a scoured erosional surface overlain by sandy carbonates containing reworked lithoclasts. D3 either is marked by an erosional surface at the base of a coarsely sandy dolomitic bed, or underlies sandy dolomitic marl bearing reworked pebbles. D4 and D5 are marked by mineralized surfaces (hard-grounds) at the top of massive beds, that are overlain by a bioturbated, glauconite- and phosphate-rich marl bed. The hard-grounds are interpreted as hiatuses, while the phosphate levels indicate condensed sedimentation interpreted as a transgressive surface.

These discontinuities define transgressive-regressive, depositional sequences (Fig. 1). The first one (S1) is made of glauconite-rich, laminated/rippled calcareous sandstones grading upward into dolostone capped by algal laminae. S2 is a thinning up series of shaly marl with thin calcareous beds. The fauna evolves upward from benthic to pelagic (ammonites), expressing a deepening upward trend. S3 begins with dolomitic sandstone rich in phosphate and glauconite, containing open marine fauna, and ends up with massive beds of sandy dolomite. S4 comprises bioturbated phosphate-rich marl (D4) overlain by sea urchin bearing marl, and capped by a bed of sandy dolomite, locally laminated and rippled. S5 begins with a bioturbated phosphate-rich marl bed (D5) overlain by a thick series of Lower Cenomanian marl [3].

3.2 Ammonite biostratigraphy

Although the standard Albian-Cenomanian boundary is defined by planktic foraminifera, we shall use ammonite zones in the following discussion.

S2 yielded numerous ammonites that allow to identify the Late Albian *Mortoniceras (Subschloenbachia) rostratum* and *Mortoniceras (Subschloenbachia) perinflatum* zones. The *Mortoniceras (Mortoniceras) fallax* Zone may be present in S1. At the top of the sequence, the disappearance of specimens of the *Mortoniceras* genus suggests the *Stoliczkaiella (Shumarinaia) africana* Zone, which contains the standard Albian-Cenomanian boundary.

S3 contains heteromorph ammonites, and its upper part yielded a species of the *Mantelliceras* genus. This led us to ascribe its lower part to the *Neostlingoceras carcitanense* Subzone and its upper part to the *Sharpeiceras schlueteri* Subzone, both of earliest Cenomanian age. Specimens of *Mantelliceras* from S4 and from the base of S5 indicate the *Sharpeiceras schlueteri* Subzone.

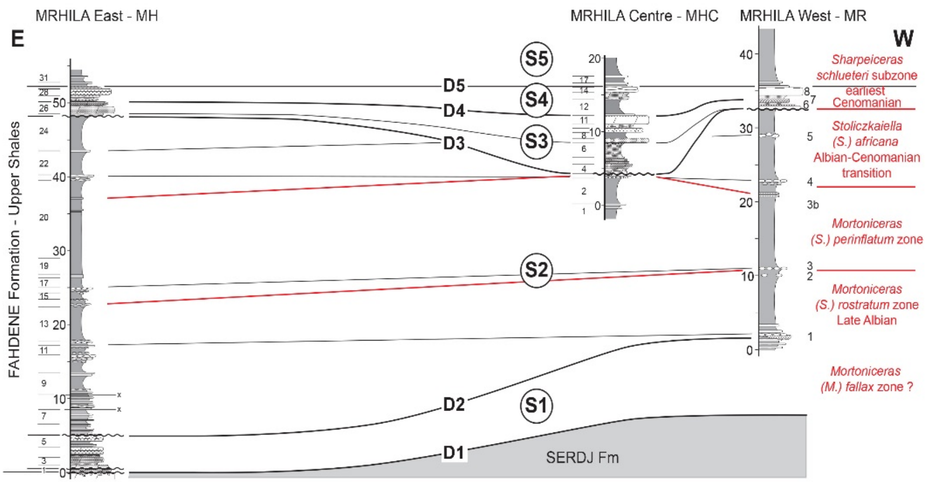

Fig. 1. The Albian-Cenomanian transition in Jebel Mrhila.

4 Discussion

East of Jebel Mrhila (Jebel Zaouïa), oyster-bearing marl directly overlies the Aptian dolomites, and are overlain by rudistid-rich limestone. Southwest of Jebel Mrhila (Jebel Selloum), the top of the Late Albian marl exhibits emergence features [4, 5], and is overlain by high energy, coarse bioclastic calcarenites, interpreted as tidal, shelf margin deposits [5]. In both cases, ammonites [5] indicate that these deposits are coeval with our S5, thus evidencing a hiatus of lowermost Cenomanian deposits (our S3 and S4).

West of Jebel Mrhila (Jebel Semmama), the Late Albian marl is overlain by variably thick, cross bedded bioclastic limestones [4], interpreted as channelized [5]. Their top yielded latest Albian foraminifera and ammonites [5]. Northwest of Jevel Mrhila (Oued Azreg), the Late Albian marls are scoured by scattered, shallow channels infilled by phosphate-rich deposits of earliest Cenomanian age, interpreted as shelf margin wedge deposits [6], and coeval with our S3 and S4. Farther NW (Oued Zerga), the Albian-Cenomanian transition is marked by thickening-, then thinning-upward alternations of marl and limestone (80 m) rich in ammonites and radiolarians, and containing scarce rudistids [7]. The base of these alternations marks a noticeable shallowing of the environment and is interpreted as a sequence boundary of terminal Albian age. The transition from thickening- to thinning-upward trends may represent a sequence boundary.

These comparisons show that earliest Cenomanian (S3 and S4) deposits are only preserved in Jebel Mrhila and NW of it. To the East and South, Early Cenomanian beds directly overly either Aptian dolomite (E), or Late Albian marls (S). Moreover, earliest Cenomanian deposits are thin (< 10 m) and preserved mainly in channels in Jebel Mrhila and in Oued Azreg, while they are thicker (≈ 50 m) and not channelized farther NW. This suggests that (1) the Albian-Cenomanian transition is marked by a drastic sea level drop, which triggered the emergence and erosion of southern Central Tunisia, while channels were caved in northern Central Tunisia, which acted as a NW-deepening bypass zone between emergent and basin zones, (2) in the earliest Cenomanian, incipient sea level rise was associated with significant marine currents (upwellings ?), which favored deposition of condensed phosphate-rich layers in northern Central Tunisia, and (3) in the Early Cenomanian, sea level was high enough to allow deposition of outer shelf marls in northern Central Tunisia, and high energy, locally channelized shoreline deposits farther South.

5 Conclusions

Sedimentological and biostratigraphic studies of the Albian-Cenomanian transition in Jebel Mrhila, allow to propose that (1) this transition is marked by a significant sea level drop, (2) during low sea level, northern Central Tunisia acted as a bypass zone between emergent zones to the E and S, and basin zones to the W and N, and (3) sea level rise allowed deposition first (earliest Cenomanian), of condensed phosphate-rich beds in channels of the bypass zone, and then, of outer shelf marls in the bypass zone and shoreline deposits in the previously emergent southern areas (Early Cenomanian).

References

1. Chihaoui, A. et al.: Stratigraphy of the Hameima and Lower Fahdene formations in the Tajerouine area (Northern Tunisia). Journal of African Earth Sciences 58, 387-399 (2010)
2. Burollet, P.F.: Contribution à l'étude stratigraphique de la Tunisie Centrale. Ann. Mines Géologie 18, 350 p., Tunis (1956)
3. Pervinquière, L.: Etude géologique de la Tunisie centrale. de Rudeval Publ., Paris (1903)
4. Bismuth, H. et al.: Etude sédimentologique et biostratigraphique du Crétacé moyen et supérieur du Djebel Semmama (Tunisie du Centre Nord). Cretaceous Research 3, 171-185 (1982)
5. Philip, J. et al.: Organisation et évolution sédimentaires d'une marge de plate-forme carbonatée : l'Albien-Cénomanien de Tunisie centrale Géologie Méditerranéenne 15, 155-169 (1989)
6. Robaszynski, F. et al.: Sequence stratigraphy in a distal environment: The Cenomanian of the Kalaat Senan region (Central Tunisia). Bull. Centres Rech. Explor-Prod. Elf-Aquitaine 17, 395-433 (1993)
7. Jaillard, E. et al.: Albian sedimentation in the Tadjerouine area. Géologie Alpine, série Colloques Excursions 5, 105-124 (2005)