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Stratigraphical and sedimentary characters of Late Cretaceous formations outcropping in central and southern Tunisia, Tethyan southern margin

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ABSTRACT

The main goals of our approach are to identify some local to global events in relation with tectonic instabilities and/or sea-level changes, occurring during the deposition of Cenomanian-Coniacian carbonate series in Tunisia. Several sections surveyed in Central-Southern Tunisia, along a North-South transect extending from Sidi Bouzid to Gafsa area, show that the Cenomanian-Coniacian series include rudist-rich facies associated to other shallow marine to deeper deposits.

Detailed sedimentological studies supported by new biostratigraphical data (provided by H. Bismuth, oral comm.), have allowed to add more precisions on the lithostratigraphical stacking and thus on the Central Tunisia Stratigraphic Chart. Some carbonate members such as the Middle Turonian Bireno and the Late Turonian-Coniacian Douleb have been identified in certain localities for the first time. Indeed, these members were never described before at Jebel el Kébar and Jebel Meloussi.

In the Sidi Bouzid area, especially at Jebel el Kébar, the Cenomanian-Coniacian carbonate members are characterized by frequent and rapid changes, related to the existence of highs (horsts, probably) and depressed depositional domains (grabens, probably), which formed during the deposition of the two lower Units of the Middle Turonian Bireno Member. Above, the Late Turonian to Coniacian deposits, have tended to seal the irregular paleotopography affected, at least locally, by Middle Turonian extensional tectonic movements. They could be related, in contrast, to a drowning linked to a sea level rise.

Similar events were described abroad during Late Turonian times; a partial drowning of carbonate platforms was already identified in other localities of the African Tethyan margin.

However, the global drowning corresponding to the C/T event was not identified in the present study, although previous works have described this event North of the studied sector. As demonstrated in other localities, a global eustatic event could be locally interrupted by tectonic events, which could mask the eustatic message and leave their record in the deposit cycle.

1. Introduction

Cenomanian-Turonian rudist-rich facies are well represented in the Southern Tethyan margin, especially in Central and Southern Tunisia (Masse and Philip, 1981; Philip, 1985; Skelton and Gili, 1991; Abdallah et al., 2000; Dercourt et al., 2000; Philip and Floquet, 2000; Philip, 2003; Scott, 2003; Skelton, 2003, Fig. 1). The distribution of the rudist-rich carbonates exhibits abrupt vertical and lateral changes, which coincide with the succession of major events occurring from Cenomanian to Turonian times.

In Tunisia, previous works (Masse and Philip, 1981; Philip, 1985; Razgallah et al., 1994; Abdallah et al., 2000; Philip and Floquet, 2000) described rudist-rich facies in Cenomanian-Turonian carbonate members, particularly within the Uppermost Cenomanian-Lowermost Turonian carbonates (called Gattar Member; Fig. 2). In addition, in terms of sequence stratigraphy, the rudist-rich Gattar carbonates constitute the upper part of a transgressive-regressive cycle starting with pelagic carbonates rich in ammonites and planktonic foraminifera (Razgallah et al., 1994).

These pelagic carbonates within the Gattar Member constitute a lateral equivalent of the Late Cenomanian-Early Turonian black-shales (called Bahloul Formation). These latter, which were studied North of our studied area, in a deeper environment

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corresponding to an outer-ramp setting, constitute an expression of the global Cenomanian-Turonian transgressive event (Caron et al., 2006; Zagrarni et al., 2008; Negra et al., 2011).

The Middle Turonian carbonates (called Bireno Member; Fig. 2) were interpreted as shoal rimmed platform carbonates (Marie et al., 1984; Negra et al., 1994; Negra et al., 2002; Troudi et al., 2002; Zagrarni et al., 2003, 2008).

Our recent studies using a detailed sedimentological and biostratigraphical approach based on a logging of the Cenomanian-Coniacian series, starting from the Sidi Bouzid area, have focused on the subdivision of this series into members, units and eventually cycles. These latter have to be compared to those identified in the Southern Tethyan margin and abroad.

According to regional correlations, the Cenomanian-Turonian platform carbonates show lateral variations in thickness, facies compositions and geometry. All these changes could be governed by varied processes, which could be local such as the paleogeographical setting and contemporaneous tectonic activities, or global, implying climatic variations, sea level changes and/or tectonic movements.

On the whole, the main objectives of this paper are therefore: 1) to provide sedimentological data about the main facies deposited during the Cenomanian-Coniacian interval; 2) to better understand the lateral changes of facies at a local to a regional scale; 3) to focus on the main factors controlling these facies changes.

2. Geographic and geological setting

The Cenomanian-Coniacian carbonates widely crop out in the Sidi Bouzid-Gafsa area, which is located in Central and Southern Tunisia (Southern Tethyan margin).

Central Tunisia is included in the "Tunisian Central Atlas" characterized by the deposition, during the Cretaceous, of shallow marine platform facies, generally affected by extensional tectonic movements responsible for the occurrence of horsts, grabens and/or half grabens and locally tilted blocks (Chihi et al., 1984; Ben Ayed, 1986; El Euchi, 1993; Bouaziz et al., 2002). To the South, the "Tunisian Southern Atlas" includes the "Gafsa trough" grading

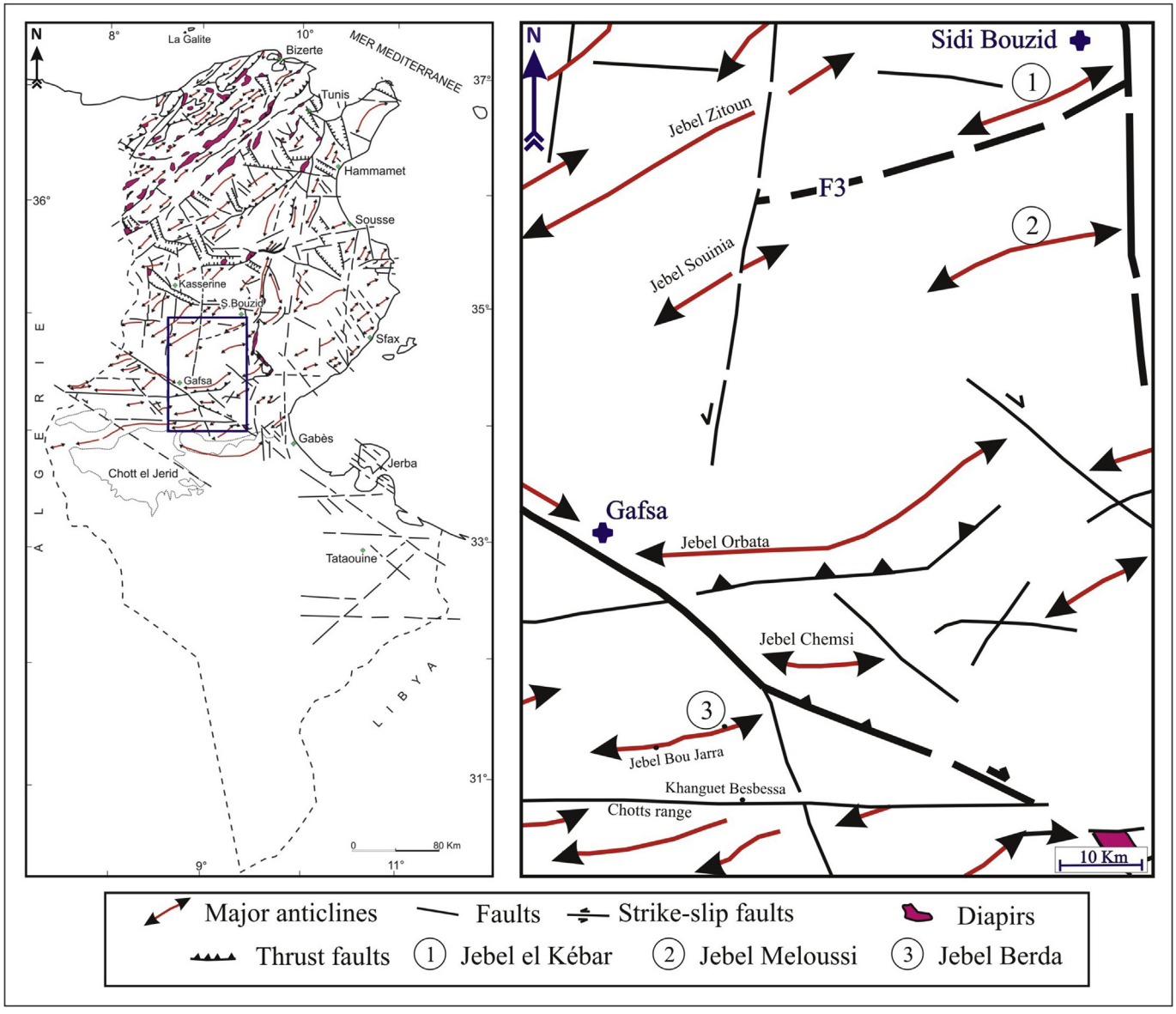

Fig. 1. Structural setting of Central and Southern Tunisia on the simplified structural map of Tunisia (Bouaziz et al., 2002; modified).