Cretaceous Research 66 (2016) 177–193

Contents lists available at ScienceDirect

Cretaceous Research

journal homepage: www.elsevier.com/locate/CretRes

Recognition of massive Upper Cretaceous carbonate bodies as olistoliths using rudist bivalves as internal bedding indicators (Campanian Merfeg Formation, Central Tunisia)

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ARTICLE INFO

Article history:
Received 4 March 2016
Received in revised form
10 June 2016
Accepted in revised form 10 June 2016
Available online 14 June 2016

Keywords:
Olistoliths
Rudist limestones
Late Cretaceous
Tunisia

ABSTRACT

The Merfeg Formation (upper Campanian) of Central Tunisia crops out around the southwestern periclinal termination of Jebel el Kébar, near Sidi Bouzid. At its base is a massively bedded unit of locally dolomitized, sparsely fossiliferous micritic to microbioclastic limestone that contains several discrete, plurimetric mound-like bodies (lithosomes) of micritic limestone containing locally abundant rudists and corals. The lithosomes are separated laterally from one another by megabreccias and conglomerates containing clasts of similar lithology and are overlain, with sharp contact, by onlapping argillaceous pelagic limestones, within which are intercalated at least two more, somewhat thinner rudist/coral limestone units. This complex of facies is laterally equivalent to thicker, deep platform limestones of the Abiod Formation to the north and east, and to restricted carbonate platform facies of the Berda Formation to the south and west. The lithosomes have previously been interpreted as *in situ* downslope mud-mounds that became capped by rudist and coral formations, cemented, and then surrounded by erosively emplaced debris flows. However, our detailed studies of rudist orientations imply variable and in some cases relatively high angles of bedding within the lithosomes with respect to the regional dip of the host strata. Such steep inclinations of internal bedding are unlikely to have been primary. Accordingly, we propose an alternative interpretation that the lithosomes were platform-derived olistoliths, emplaced along with the associated debris flow deposits. Micritic beds, neighbouring the olistoliths are of variable thickness and contain rare large inoceramids and randomly oriented rudists, as well as locally developed microbioclastic beds with planar and small-scale swaley cross stratification. These micritic and microbioclastic beds are, by contrast, interpreted as primary (i.e., non-olistostromal) slope deposits. Whether the proposed catastrophic collapses of the original platform margin were induced by sea-level fall or seismically triggered (or a combination of the two) remains uncertain.

1. Introduction

A notable feature of the expansive epeiric seas of the Cretaceous Period was episodic progradation of vast carbonate platforms or ramps into neighbouring basins in low to mid-palaeolatitudes (Simo et al., 1993; Skelton, 2003). According to basin configuration and dynamic geological context, the flanking slopes of these platforms or ramps varied from being gentle (frequently less than 3°) to relatively steep (in excess of 10°), hence potentially unstable, especially where accentuated by syn-depositional faulting (Ross and Skelton, 1993). Slope deposits could thus incorporate localized carbonate bodies, hereafter referred to as lithosomes, of either autochthonous or allochthonous origin (e.g., Rosales et al., 1995; Graziano, 2001; Korbar et al., 2001; Moro and Ćosović, 2013 and others cited below); and in some cases distinguishing between the two can be problematical (e.g., Trevisani and Cestari, 2007).

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http://dx.doi.org/10.1016/j.cretres.2016.06.003
0195-6671/

During the Late Cretaceous to Eocene interval, tectonic plate movements gave rise to instabilities that affected platforms and ramps widely around the Mediterranean Tethyan region, and which led, in combination with relative sea-level changes, to various forms of mass transport on their margins and slopes. Examples have been described from northern Syria (Al-Riyami and Robertson, 2000), around the Adriatic margins (Croatia, Korbar et al., 2001; Friuli Basin, Ogata et al., 2014; Maiella platform margin, Mutti, Davoli, Tinterri, and Zavala, 1996, and Stössel, 1999; Apulia, Gargano-Murge region, Borgomano and Philip, 1989, Pieri and Laviano, 1989, and Borgomano, 2000, and the Salento Peninsula, Bosellini and Parente, 1994), in the southern Alps (Doglioni and Bosellini, 1987) and the northern calcareous Alps in Austria (Sanders and Pons, 1999), and in central Tunisia (Negra, 2003).

The response of carbonate deposits to these instabilities was related to their degree of lithification. During tectonic and/or seismic activity, early lithified carbonates deposited on platform and/or distally steepened ramp margins commonly disintegrated into olistoliths and blocks, susceptible to sliding and gravity transportation. Proximally, however, olistoliths may not be clearly distinguishable from autochthonous carbonate lithosomes, particularly where massive, homogeneous bedding and highly bioturbated lithologies may make the recognition of bedding dislocation and rotation difficult. The well exposed and continuous outcrops of the Campanian Merfeg rudist-rich carbonates in Jebel el Kébar (Central Tunisia) provide an instructive example for investigation of this problem.

Jebel el Kébar is located 10 km south of Sidi Bouzid town (Fig. 1A) and it has attracted considerable interest because of the presence of impressively large, mound-like micritic lithosomes that contain locally abundant rudists, corals and associated biota (Khessibi, 1978; Negra, 1984; M'Rabet et al., 1986; Negra, 1987; Negra and Philip, 1987; Negra et al., 1995; Negra and Gili, 2004). These rudist/coral-bearing lithosomes are situated stratigraphically at the base of the upper Campanian Merfeg Formation, the outcrop of which in Jebel el Kébar is limited to the southwestern periclinal closure of the anticline (Fig. 1B), especially along the vertical to overturned SE limb of the fold (Fig. 1C).

Previous studies of the rudist/coral-bearing lithosomes (cited above) established their lithological character, palaeontological content and stratigraphical position, and devoted special attention to their diagenesis (see also Negra and Loreau, 1988). These studies demonstrated that the lithosomes had undergone early lithification and had been partly eroded and surrounded by megabreccias and conglomerates during the Late Cretaceous. According to the

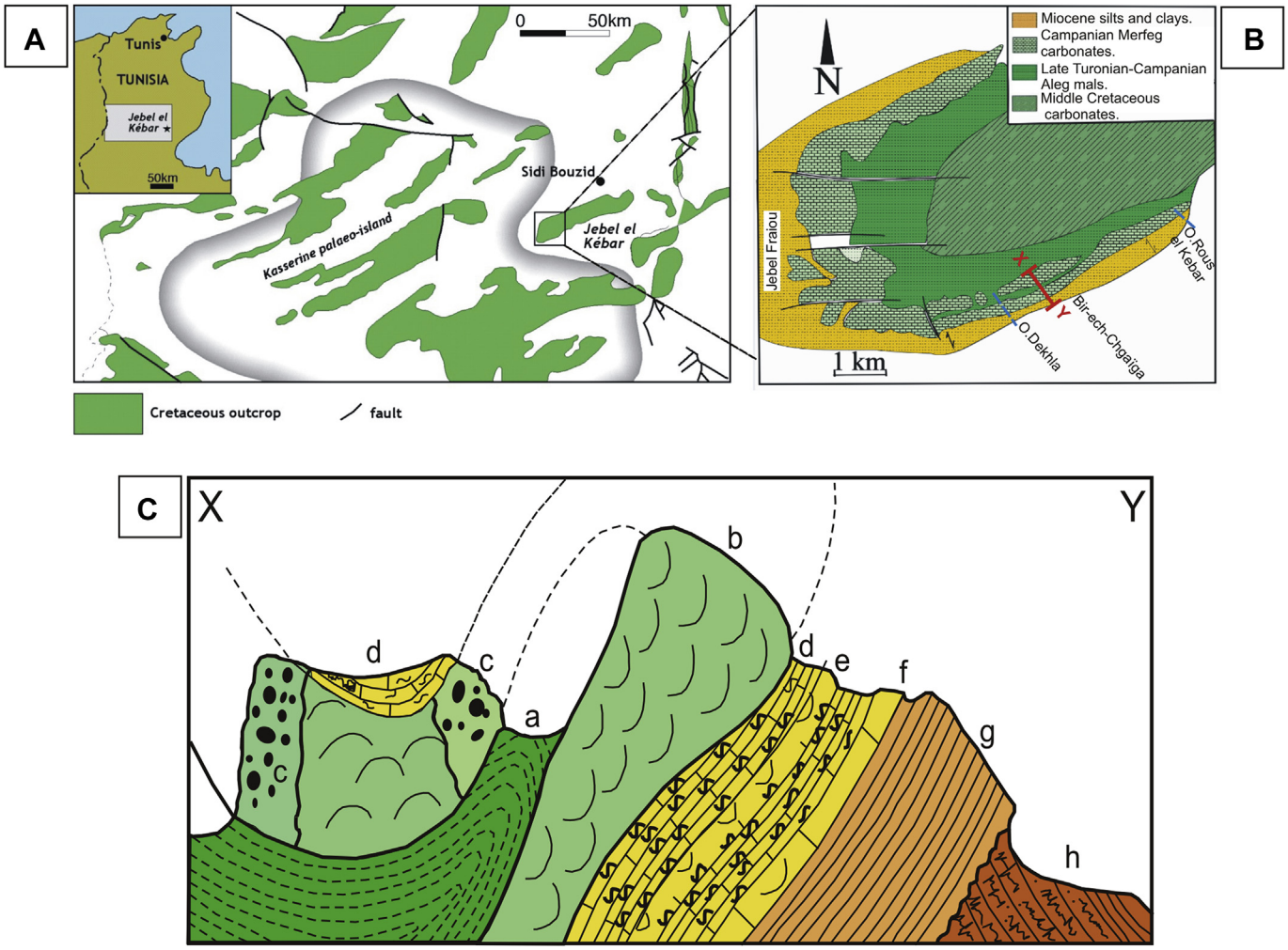

Fig. 1. (A) Location map, showing general situation and Campanian palaeogeographical context of strata in the Jebel el Kébar anticline. (B) Geological map of SW periclinal termination of Jebel el Kébar. (C) Diagrammatic section across SE limb of anticline and subsidiary syncline at Bir-ech-Chgaïga (section line X–Y in (B)).