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Stratigraphy and depositional history of the Cretaceous carbonate successions in the Spil Mountain (Manisa, W Turkey)

Cemile Solak [a, *], Kemal Taslı [a], Bilal Sarı [b]

[a] Department of Geological Engineering, Mersin University, 33343 Mersin, Turkey
[b] Department of Geological Engineering, Dokuz Eylül University, İzmir, Turkey

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ABSTRACT

The Bornova Flysch Zone (western Turkey) consists of huge Mesozoic limestone and ophiolite blocks embedded into sheared siliciclastic sedimentary rocks of Maastrichtian–Paleocene age. The limestone blocks, which range in age from Late Triassic to Cretaceous, are considered to be olistoliths or deformed and sliced platform parts. In the Spil Mountain, two successions of Cretaceous carbonates are tectonostratigraphically differentiated: (1) a Lower Cretaceous and Campanian(?)–Maastrichtian relatively autochthonous succession showing sedimentary transition to the Bornova Flysch, and (2) a Cenomanian(?)–lower Campanian allochthonous succession overthrusted to the flysch. These successions represent separate parts of the same platform. The autochthonous succession bears Lower Cretaceous peritidal carbonates at its base and is named Unit 1. The succession is often composed of fenestral mudstone and algal wackestone microfacies. Unit 2 disconformably overlies Unit 1 and consists of platform-derived litho and bioclastic packstones of Campanian(?)–Maastrichtian age. This unit reveals a typical thinning and fining upward sequence, finally passing into pelagic wackestones of Unit 3. The two aforementioned units record a platform drowning event, which occurred rapidly based on the presence of planktonic foraminifera within matrix of basal breccia. Carbonate deposition ceased due to the input of siliciclastic sediments during the late Maastrichtian–Paleocene. The allochthonous succession consists of two vertically superimposed units: (1) Cenomanian(?)–Santonian rudistid limestones (Unit 4) deposited in restricted platform environments and (2) Santonian–lower Campanian pelagic limestones (Unit 5) indicating open platform to slope conditions. The Spil Mountain Cretaceous carbonate sequences are correlated with those in peri-Mediterranean platforms. They show close similarities to the Bey Dağları (western Taurides) carbonate sequences in stratigraphy and facies. Paleontological and sedimentological analyses and the microfacies enable us to reconstruct a paleoenvironment evolution and a facies model for the Spil Mountain carbonate deposits during the Cretaceous period.

1. Introduction

The Spil Mountain is situated in the southwestern part of the Bornova Flysch Zone (BFZ), which is a regional olistostrome-mélange belt (Fig. 1A). Mesozoic carbonate sequences in the Spil Mountain are interpreted by Erdoğan (1985, 1990a,b) and Erdoğan et al. (1990) as blocks, locally ranging up to 20 km across, derived from the Mesozoic platform carbonate sequence in the Karaburun Peninsula and Chios Island. On the contrary, Verdier (1963), Marengwa (1968) and Konuk (1977) considered them as *in situ* sequences, which were sliced and deformed. Recognition of their spatial setting and sequential relationships is important to understand their origins and the geologic evolution of the BFZ. Although detailed paleontological data regarding the ages of the carbonate sequences in the BFZ exist, studies related to their stratigraphy and facies characteristics are rare (Özer and İrtem, 1982). Because detailed stratigraphy and microfacies characteristics of the Spil Mountain carbonate rocks have not been known until now, it was not possible to make a correlation with the sedimentary rocks in the Karaburun Peninsula and the other carbonate sequences in the BFZ.

The purpose of this paper is to describe the different lithological units of the Spil Mountain Cretaceous successions by means of microfacies analysis, benthic-planktonic foraminifera, rudists, algae

* Corresponding author. Tel.: +90 536 984 43 39.
E-mail address: ceemiiilee@hotmail.com (C. Solak).

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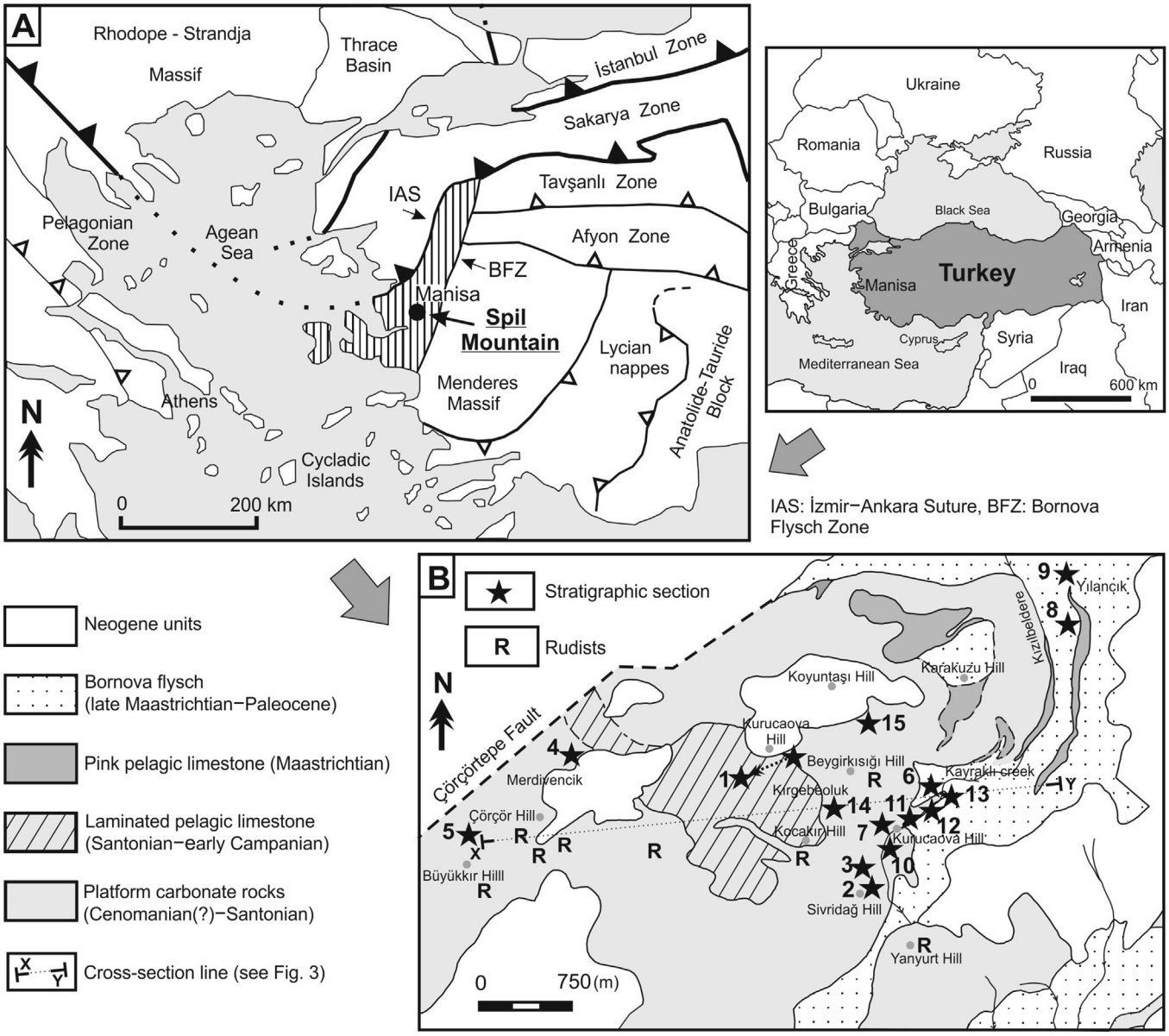

Fig. 1. A, Location map of the study area and the main tectonic units of western Anatolia and eastern Greece (after Görür and Tüysüz, 2001). B, Simplified geological map of the Spil Mountain (modified after Güngör, 1986) showing the location of the measured stratigraphic sections.

and cyanobacteria, and reconstruct the tectonic and sedimentary history of these strata. Correlations with other coeval Mediterranean platforms are also presented.

2. Geological setting

The BFZ, which is located between the Menderes Massif of the Anatolide–Tauride platform and the İzmir–Ankara Suture Zone, forms a 50–90 km wide and approximately 230 km long tectonic zone (Okay and Altıner, 2007) (Fig. 1A). This zone, which is located on the western end of the Anatolide–Tauride Block, includes a densely deformed matrix and blocks of Mesozoic limestone, mafic volcanic rocks, radiolarian cherts and serpentinites (Erdoğan, 1990a,b; Okay and Siyako, 1993). The matrix of the BFZ is composed of predominantly flysch-type sedimentary rocks, which consist of alternating sandstones and shales. These rocks include locally calcareous shales with planktonic foraminifera and micritic limestone lenses, suggesting Campanian–Paleocene (Konuk, 1977; Yağmurlu, 1980; Özer and İrtem, 1982; Erdoğan, 1990a) and late Maastrichtian–late Paleocene ages (Sarı, 2013).

Okay et al. (2012) differentiated two types of Mesozoic limestone blocks in the BFZ as platform and platform margin sequences. The platform limestones deposited in shallow marine environments are restricted to the İzmir-Manisa region in the southwestern part of the BFZ. Their age ranges from Triassic to Late Cretaceous (Özer and İrtem, 1982; Özer, 1989; Erdoğan, 1990a,b; Erdoğan et al., 1990; İşintek et al., 2000; Okay and Altıner, 2007). The platform margin sequences, which are known only from north of Manisa, are represented by Jurassic to Cretaceous pelagic limestones overlying Upper Triassic shallow marine carbonate rocks.

The Spil Mountain carbonate rocks occur in two successions differing tectonostratigraphically (Figs. 2 and 3). The relatively autochthonous succession shows a sedimentary transition from a sequence of platform carbonates to the Bornova Flysch. The