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The eastern Black Sea-Caucasus region during the Cretaceous: New evidence to constrain its tectonic evolution



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ABSTRACT

We report new observations in the eastern Black Sea-Caucasus region that allow reconstructing the evolution of the Neotethys in the Cretaceous. At that time, the Neotethys oceanic plate was subducting northward below the continental Eurasia plate. Based on the analysis of the obducted ophiolites that crop out throughout Lesser Caucasus and East Anatolides, we show that a spreading center (AESA basin) existed within the Neotethys, between Middle Jurassic and Early Cretaceous. Later, the spreading center was carried into the subduction with the Neotethys plate. We argue that the subduction of the spreading center opened a slab window that allowed asthenospheric material to move upward, in effect thermally and mechanically weakening the otherwise strong Eurasia upper plate. The local weakness zone favored the opening of the Black Sea back-arc basins. Later, in the Late Cretaceous, the AESA basin obducted onto the Taurides–Anatolides–South Armenia Microplate (TASAM), which then collided with Eurasia along a single suture zone (AESA suture).

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1. Introduction

The Black Sea and Caucasus regions (Fig. 1) have a complex geological history (Adamia et al., 1981, 2011;

Barrier and Vrielynck, 2008; Dercourt et al., 1986; Finetti et al., 1988; Khain, 1974; Nikishin et al., 1998, 2015; Robinson et al., 1996; Saintot and Angelier, 2002; Saintot et al., 2006; Stampfli et al., 2001; Stephenson and Schellart, 2010; Zonenshain and Le Pichon, 1986), which is well attested to by their contrasting topography: while the Black Sea is a 2245-m-deep “marine” basin, the Caucasus is a mountain belt with peaks as high as 5642 m (in the

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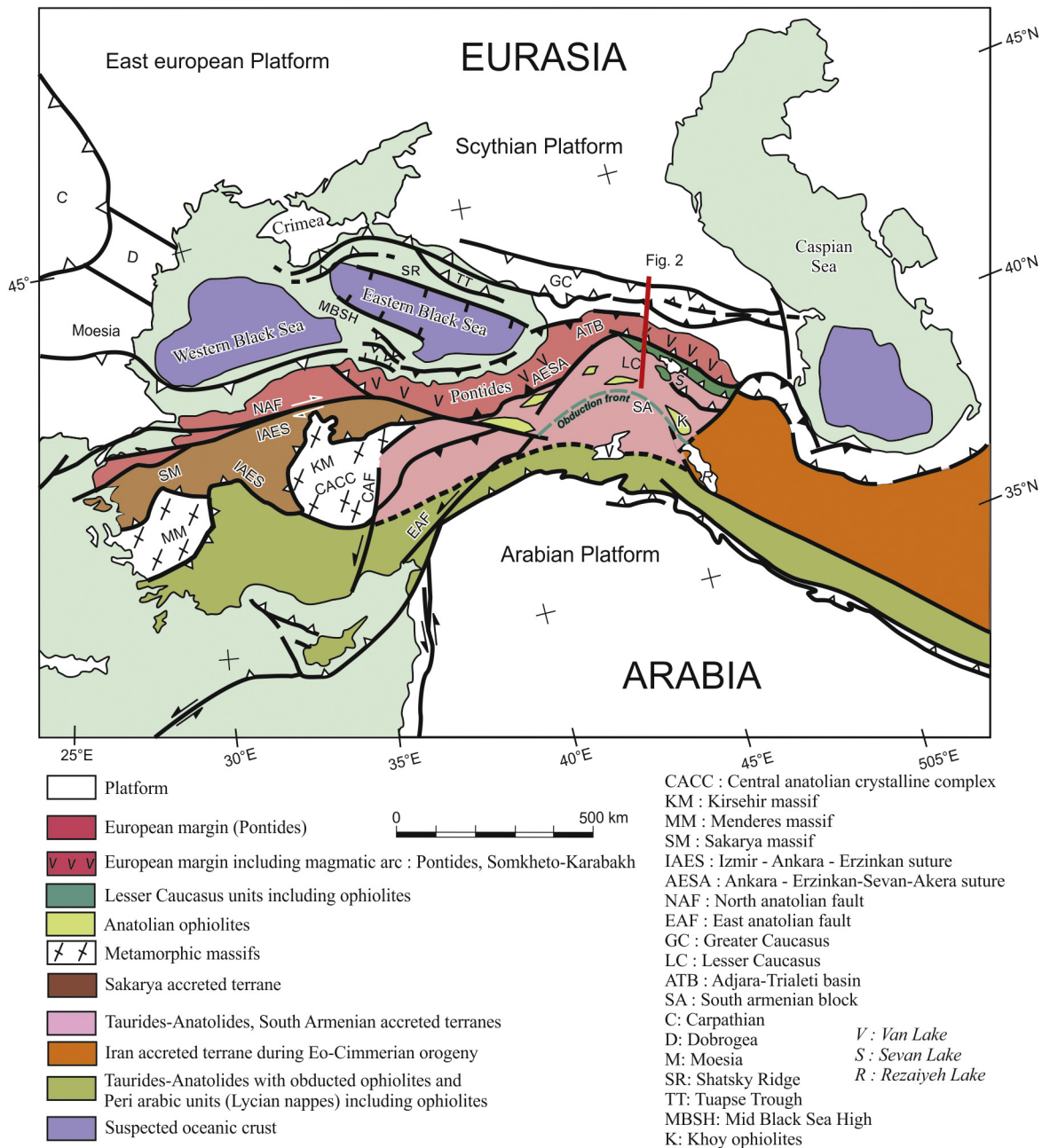


Fig. 1. Structural sketch map of the Black Sea-Caucasus region in the general framework of the Middle East. Modified from Sosson et al., 2010.

Greater Caucasus). This makes the region overall a landmark feature of Eurasia (Forte et al., 2010, 2013; Mosar et al., 2010; Ross et al., 1974; Starostenko et al., 2004). The Black Sea and Caucasus belong to the Alpine belt (s.l.) and their formation is related to the closure of the Neotethys Ocean (Barrier and Vrielynck, 2008; Dercourt et al., 1986; Stephenson and Schellart, 2010; Zonenshain and Le Pichon, 1986). The northward subduction of the Neotethys oceanic plate under the Eurasian continental plate is attested to by the arc-type magmatic products that

are found on the Eurasian southern margin from Moesia in the west to the Lesser Caucasus in the east, passing through Crimea and Pontides (Fig. 1; Adamia et al., 1981; Lordkipanidze et al., 1989; Meijers et al., 2010; Okay and Nikishin, 2015; Robinson et al., 1996). Subduction started in the Middle Jurassic. The Neotethys oceanic plate was entirely subducted from Late Cretaceous to Early Paleocene in the east (region of Lesser Caucasus; Hässig et al., 2015; Rolland et al., 2012; Sosson et al., 2010) and from Paleocene to Eocene in the west (region of Pontides;

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