

Mantle flow-induced crustal thinning in the area between the easternmost part of the Anatolian plate and the Arabian Foreland (E Turkey) deduced from the geological and geophysical data

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Abstract

Eastern Anatolia consisting of an amalgamation of fragments of oceanic and continental lithosphere is a current active intercontinental contractional zone that is still being squeezed and shortened between the Arabian and Eurasian plates. This collisional and contractional zone is being accompanied by the tectonic escape of most of the Anatolian plate to the west by major strike-slip faulting on the right-lateral North Anatolian Transform Fault Zone (NATFZ) and left-lateral East Anatolian Transform Fault Zone (EATFZ) which meet at Karlıova forming an east-pointing cusp. The present-day crust in the area between the easternmost part of the Anatolian plate and the Arabian Foreland gets thinner from north (ca 44 km) to south (ca 36 km) relative to its eastern (EAHP) and western sides (central Anatolian region). This thinner crustal area is characterized by shallow CPD (12–16 km), very low Pn velocities (<7.8 km/s) and high Sn attenuation which indicate partially molten to eroded mantle lid or occurrence of asthenospheric mantle beneath the crust. Northernmost margin of the Arabian Foreland in the south of the Bitlis–Pötürge metamorphic gap area is represented by moderate CPD (16–18 km) relative to its eastern and western sides, and low Pn velocities (8 km/s). We infer from the geophysical data that the lithospheric mantle gets thinner towards the Bitlis–Pötürge metamorphic gap area in the northern margin of the Arabian Foreland which has been most probably caused by mechanical removal of the lithospheric mantle during mantle invasion to the north following the slab breakoff beneath the Bitlis–Pötürge Suture Zone. Mantle flow-driven rapid extrusion and counterclockwise rotation of the Anatolian plate gave rise to stretching and hence crustal thinning in the area between the easternmost part of the Anatolian plate and the Arabian Foreland which is currently dominated by wrench tectonics.

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Keywords: Arabian foreland; Crust; Collision; Curie point depth; Mantle; E Turkey

1. Introduction

The Eastern Anatolian Contractional Province (EACP) including the Eastern Anatolian High Plateau (EAHP) and the Bitlis–Pötürge Thrust Zone (BPTZ) consists of an amalgamation of fragments of oceanic and continental crusts that squeezed and shortened between the Arabian and Eurasian plates. This contractional province is bounded by the Pontide Belt (PB) in the north and the arc-shaped Bitlis–Pötürge Suture Zone in the

south (Fig. 1, the inset location map). The contraction and thickening of the crust to ca 50–52 km (Dewey et al., 1986; Pearce et al., 1990) in the collisional zone has been accompanied by the tectonic escape of most of the Anatolian crustal block (Anatolian wedge in Dewey et al., 1986; Anatolian block in Lyberis et al., 1992; Anatolian plate in Yılmaz et al., 1998; Anatolian platelet in Koçyiğit et al., 2001) to the west–southwest towards the Aegean–Cyprean arc system by major strike-slip faulting on the right-lateral North Anatolian Transform Fault Zone (NATFZ) and left-lateral East Anatolian Transform Fault Zone (EATFZ) (Şengör, 1979; Şengör and Yılmaz, 1981; Şengör et al., 1985; Dewey et al., 1986 and references therein; Dilek and Moores, 1990; Tatar et al., 1996; Hubert-Ferrari et al.,

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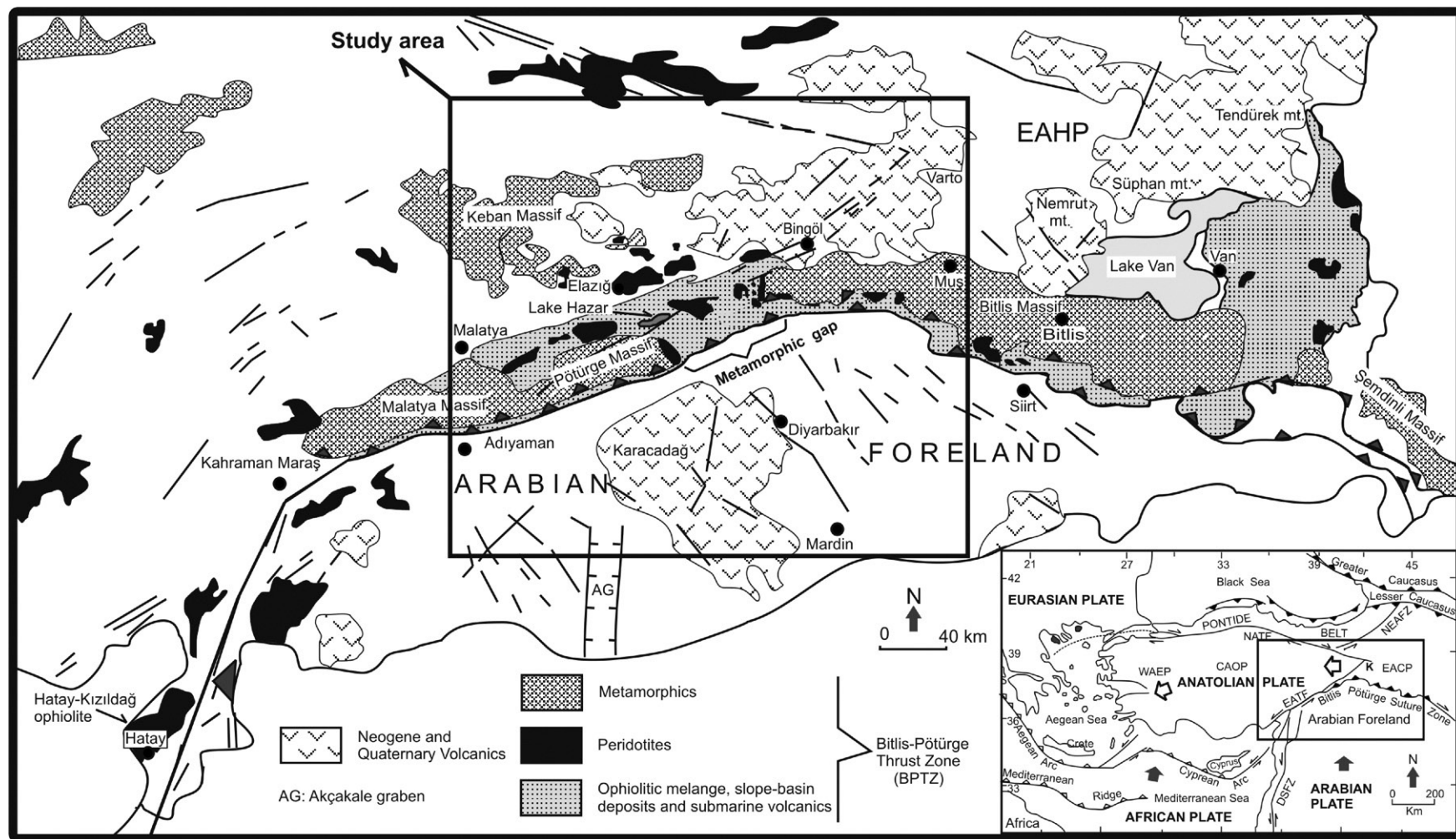


Fig. 1. Simplified geological map of the eastern Anatolian region (compiled from Bingöl, 1989) and the inset location map from Bozkurt (2001), EACP: Eastern Anatolian Contractural Province, EAHP: Eastern Anatolian High Plateau, CAOP: Central Anatolian Ova Province, WAEP: Western Anatolian Extensional Province.

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