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Geochemical and Pb–Sr–Nd isotopic composition of the ultrapotassic volcanic rocks from the extension-related Çamardı-Ulukışla basin, Niğde Province, Central Anatolia, Turkey

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Abstract

Major, trace element and Sr–Nd–Pb isotope data are presented for the ultrapotassic lavas and dykes from the Late Cretaceous-Early Tertiary Ulukışla Basin in the Central Anatolia. All samples have geochemical characteristics belonging to Group III ultrapotassic rocks (Foley, S.F., Venturelli, G., Green, D.H., Toscani, L., 1987, The ultrapotassic rocks: characteristics, classification and constraints for petrogenetic models, Earth Science Reviews, 24, 81–134.). These rocks have unusually high contents of large-ion-lithophile elements (LILE) (e.g. Ba up to 5900 ppm, K_2O up to 8 wt% in lava and 10 wt% in dykes). Negative Nb and Ti anomalies and LREE enrichments relative to HREE on chondrite normalized trace and rare earth element patterns indicate that subduction related material is present in the mantle source region. Their high initial $^{87}Sr/^{86}Sr$ (0.70798–0.70917) and low $^{143}Nd/^{144}Nd$ (0,512109–0,512239) ratios suggest that they originated from an enriched lithospheric mantle source with low Sm/Nd ratios. The elevated $^{207}Pb/^{206}Pb$ (15.743–15.797), low $^{143}Nd/^{144}Nd$ ratios and geochemical features such as low Nb/La and elevated Ce/Sr ratios may reflect the involvement of sediments as a metasomatic agent for the source region. The steep trend on the $^{207}Pb/^{204}Pb$ vs $^{206}Pb/^{204}Pb$ diagram also imply that the metasomatic component represents recycled continent-derived material in the source region. Integration of the geochemistry with regional and local geological data suggest that the ultrapotassic volcanic rocks from the Çamardı-Ulukışla basin were derived from a lithospheric mantle material in a post-collisional extension-related geodynamic setting following Late Mesozoic continental collision between the Eurasian plate and Tauride-Anatolide platform, as a result of convergence between the Eurasian and Afro-Arabian plates.

Keywords: Ultrapotassic volcanic rocks; Trace element geochemistry; Pb–Sr–Nd isotope geochemistry; Enriched mantle; Çamardı-Ulukışla basin; Central Anatolia; Turkey

1. Introduction

The Çamardı-Ulukışla Basin is one of the Late Cretaceous to early tertiary post-collisional central Anatolian basins (Fig. 1) (Göncüoğlu et al., 1995; Erdoğan et al., 1996; Poisson et al., 1996; Boztuğ et al., 2003, 2004). However, its development has been interpreted in various ways in terms of geodynamics such as a fore-arc basin (Görür et al., 1998), a back-arc basin (Demirtaşlı et al., 1984), an island-arc related basin (Oktay, 1982; Baş et al., 1986; İşler, 1988), and a rifting-related basin (Boztuğ et al., 2001; Clark and Robertson, 2002; Alpaslan et al., 2004). In particular, Clark and Robertson (2002) has proposed that the Çamardı-Ulukışla basin is an intracontinental rifting-related, transtensional basin developed after the late Cretaceous closure of the Northern Neotethys. Clark and Robertson (2002) have determined within-plate and also subduction-related geochemical signatures for the widespread basaltic to andesitic submarine volcanic rocks in the Çamardı-Ulukışla basin which are also documented by

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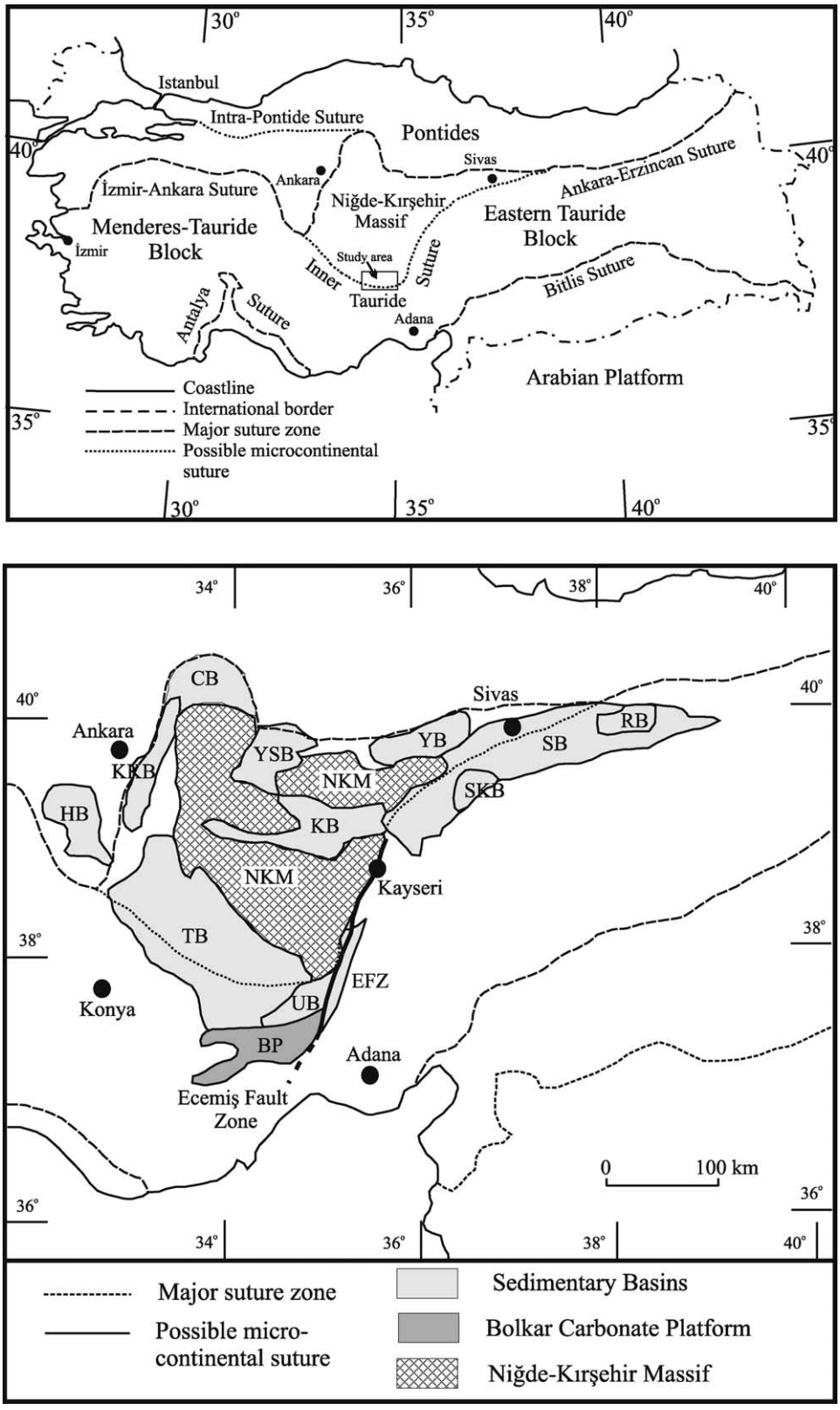

Fig. 1. (a) Location of the study area and Neotethyan sutures of Turkey (Modified after Clark and Robertson, 2002). b: Major sedimentary basins of central Anatolia. (Abbreviations: BP: Bolkar Carbonate Platform, NKM: Nigde-Kırşehir Massif, UB: Ulukışla basin, TB: Tuzgölü basin, HB: Haymana basin, KKB: Kırıkkale basin, CB: Çankırı basin, YSB: Yozgat-Sorgun basin, KB: Kızılırmak basin, YB: Yıldızeli basin, RB: refahiye basin, SB: Sivas basin, SKB: Şarkışla basin, EFZ: Ecemiş Fault Zone) (After Clark and Robertson, 2002).