

Geochronological and geochemical constraints on the petrogenesis of late Cretaceous volcanic rock series from the eastern Sakarya zone, NE Anatolia-Turkey

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New SHRIMP zircon U-Pb ages and whole-rock geochemical data as well as Sr-Nd-Pb and $\delta^{18}\text{O}$ isotopes of late Cretaceous volcanic rock series from the Giresun and Artvin areas (NE Anatolia, Turkey) in the northern part of the eastern Sakarya zone (ESZ) provide important evidence for northward subduction of the Neo-Tethyan oceanic lithosphere along the southern border of the ESZ. In particular, tectonic setting and petrogenesis of these subduction-related volcanites play a critical role in determining the nature of the lower continental crust and mantle dynamics during late Mesozoic orogenic processes in this region. The late Cretaceous time in the ESZ is represented by intensive volcanic activities that occurred in two different periods, which generally consist of alternation of mafic-intermediate (basaltic to andesitic) and felsic rock series (dacitic to rhyolitic) within each period. Although there is no geochronological data for the lower mafic-intermediate rock series of the first volcanic period, U-Pb zircon dating from the first cycle of felsic rocks yielded ages ranging from 88.6 ± 1.8 to 85.0 ± 1.3 Ma (i.e. Coniacian-Early Santonian). The first volcanic period in the region is generally overlain by reddish biomicrite-rich sedimentary rocks of Santonian-Early Campanian. U-Pb zircon dating for the second cycle of mafic-intermediate and felsic rocks yielded ages varying from 84.9 ± 1.7 to 80.8 ± 1.5 Ma (i.e. Early to Middle Campanian). The studied volcanic rocks have mostly transitional geochemical character changing from tholeiitic to calc-alkaline with typical arc signatures. N-MORB-normalised multi-element and chondrite-normalised rare earth element (REE) patterns show that all rocks are enriched in LILEs (e.g. Rb, Ba, Th) and LREEs (e.g. La, Ce) but depleted in Nb and Ti. In particular, the felsic samples are characterised by distinct negative Eu anomalies. The samples are characterized by a wide range of Sr-Nd-Pb isotopic compositions (initial ε_{Nd} values from -7.1 to 6.7, initial $^{87}\text{Sr}/^{86}\text{Sr}$ from 0.7044 to 0.7075, $^{206}\text{Pb}/^{204}\text{Pb}$ from 18.54 to 19.39, $^{207}\text{Pb}/^{204}\text{Pb}$ from 15.56 to 15.66, and $^{208}\text{Pb}/^{204}\text{Pb}$ from 38.04 to 39.06). These data together with $\delta^{18}\text{O}$ values reflect a genetic relationship between the mafic-intermediate and felsic volcanic rocks through fractional crystallization process with some crustal contamination.

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