Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.31528

Tracing Subduction Zone Processes in the Aegean: A Geochemical Study of the Volcanic Magmatic Centres in Northeastern Greece

JULIAN WOLF[1], MARCEL REGELOUS[2], KARSTEN M. HAASE[2] AND PANAGIOTIS VOUDOURIS[3]

[1]GeoZentrum Nordbayern, Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg
[2]GeoZentrum Nordbayern, Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg, 91054 Erlangen, Germany
[3]National and Kapodistrian University of Athens

Since the Cretaceous, the African plate has been subducted beneath the Eurasian plate in the present-day Aegean region. Over the last 32 million years, slab rollback and trench retreat have led to extension within the Eurasian plate, and southward migration of the Aegean subduction zone. As a result, several age-progressive plutonic centres with associated volcanism formed over a distance of ~300 km.

While multiple studies have been conducted on the plutonic bodies, the associated lavas, particularly of the older volcanic centres have been less explored. We present a compilation of new and existing geochemical data from volcanic rocks of the four oldest centres in northern Greece, Leptokaria/Kassiteres (~32 Ma), Maronia (~29 Ma), Samothraki (~23-16 Ma) and Limnos (~22-19 Ma), that shows significant compositional diversity between the magmatic units.

Major and trace element analysis indicates shoshonitic compositions with a stronger enrichment of incompatible elements for the lavas in Maronia, Samothraki, and Limnos, whereas the older magmatic rocks of Kassiteres/Leptokaria are high-K calc-alkaline andesites and dacites with less extreme enrichment of incompatible elements. Rocks from Maronia have higher La/Yb ratios than those from Kassiteres/Leptokaria, while the shoshonites from Samothraki and Limnos exhibit even higher La/Yb ratios. The younger shoshonitic volcanics from Samothraki and Limnos exhibit more radiogenic Sr and less radiogenic Nd compared to both the high-K calc-alkaline rocks from Kassiteres/Leptokaria and the shoshonites from Maronia.

The increase in La/Yb with decreasing age from Kassiteres/Leptokaria and Maronia to Samothraki and Limnos suggests a general decrease in the degree of mantle melting. The more radiogenic Sr and less radiogenic Nd isotope composition of Samothraki and Limnos reflect a different magma source, likely caused by differences in the volume and composition of subducted sediments. Samples from Maronia and Kassiteres/Leptokaria display high Ba/La and P/Nd ratios, suggesting the subduction and incorporation of P- and Ba-rich sediments. Low Nd/Sr and Hf/Nd ratios, combined with the isotopic composition of Aegean volcanics, suggest that the magmas formed through the mixing of mantle material with bulk sediments before melting occurred. Therefore, we propose that the magmatic centres originated from a variable degrees of melting of a heterogeneous peridotite-sediment mélange.