

EGU24-6324, updated on 25 Jul 2024

<https://doi.org/10.5194/egusphere-egu24-6324>

EGU General Assembly 2024

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Miocene basaltic lavas from Chios Island: Petrogenetic implications

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Extensional processes related to subduction initiation stages often result in the formation of back-arc basins. In central Anatolia and the northern-central Aegean, the main lithotypes geochemically correspond to high-K calc-alkaline rocks that formed during the Early Miocene, while volcanism in the Middle Miocene was predominantly Na-rich. The latter lithotypes were in most cases significantly affected by differentiation processes. On the island of Chios, volcanism is comprised of lithotypes that vary significantly from alkali basalts to rhyolites. In particular, the Pyrgi lavas are fine-grained with typical porphyritic and seriate textures, which are classified as alkali basalts according to the AFM ternary plot. These lavas also exhibit positive anomalies in PM-normalized P, Sr, and Pb elements and significant enrichments in LILE (i.e., Cs, Rb, Ba), presenting a probable interaction with subduction melts. The negative correlation between SiO₂ contents and the Nb/Yb ratio indicates that crustal contamination did not play a significant role during differentiation. Crystallization appears to be under extremely dry conditions due to the absence of hydrous phases (e.g., amphibole). The presence of MORB signature spinel crystals suggests the implication of a MORB-type source. In the case of Chios, the high Nb tholeiites can be associated with petrogenetic processes in which OIB-related melts interacted with the previously metasomatized mantle wedge, confirming the back-arc extension of the Northern Aegean during the Miocene and possibly to mantle delamination in the western Anatolia region.

Acknowledgments

This work is part of the first author's MSc. research, which is financially supported by the «Andreas Mentzelopoulos Foundation».