

## NEW GEOCHEMICAL AND AGE DATA ON THE OPHIOLITES FROM THE OTHRYS AREA (GREECE): IMPLICATION FOR THE TRIASSIC EVOLUTION OF THE VARDAR OCEAN

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### ABSTRACT

This paper presents new radiolarian biostratigraphic and volcanic geochemical data for the Agoriani Mélange Unit and Fourka Unit, which represent the basal part of the Othrys ophiolitic nappe (central Greece). The Agoriani Mélange Unit is the base of the Othrys ophiolitic nappe, consists of a tectono-sedimentary mélange that is, in turn, tectonically overthrust by the Fourka Unit, which consists of basalt-radiolarian chert sequences. Geochemical data show that, in the study area, the Agoriani Mélange includes alkaline within-plate basaltic (WPB) and normal-type mid-ocean ridge (N-MORB) sequences in the pillow-facies, while the Fourka Unit mainly consists of normal-type mid-ocean ridge basaltic (N-MORB) sequences, as well as low-K tholeiitic (L-KT) sequences, both in occurring in the pillow-facies. Alkaline WPB have a clear enriched nature, with high concentration of high field strength elements (HFSE), relative enrichment in light (L-) rare earth elements (REE) with respect to heavy (H-) REE, and high Nb/Y (> 0.7), Ce/Y (> 1.5) Ta/Hf (> 0.35), Th/Yb (> 0.7) and Ta/Yb (> 0.3) ratios. N-MORB rocks have a more depleted nature with flat N-MORB normalized HFSE patterns, flat or slightly LREE depleted chondrite normalized REE patterns, and low Nb/Y (< 0.3), Ce/Y (< 0.5) Ta/Hf (< 0.1), Th/Yb (< 0.08) and Ta/Yb (< 0.05) ratios. L-KT basalts show an evident subduction-related geochemical signature exemplified by depletion of Ta, Nb, Zr, and Ti relative to other HFSE, slight LREE/HREE enrichment, and relative enrichment of Th with respect to Ta. Biostratigraphic data for the Fourka Unit show that radiolarites associated with N-MORBs were deposited, on the whole, in Middle and Late Triassic time. In particular the late Anisian - early Ladinian age found in one stratigraphic section represents the oldest age ever reported for a MORB sequence in the Hellenides. Radiolarites deposited over the L-KT basaltic sequence are early Carnian - middle Norian/Late Norian in age. The radiolarites associated with alkaline WPB in the Agoriani Mélange did not yield determinable radiolarians, while a radiolarite sequence in this mélange not associated with basalts is middle Bathonian to late Bathonian/early Callovian in age. The data presented in this paper provide new constraints on the early (Middle-Late Triassic) phase of evolution of the Vardar Ocean in the Hellenides. The MORBs are interpreted to have erupted during Middle-Late Triassic time, related to the initial opening of the Vardar oceanic basin. The L-KT basalts are interpreted to have erupted during Middle-Late Triassic time (i.e., in part contemporaneously with MORBs), in the ocean-continent transition zone adjacent to the rifted continental margin. Moreover, we speculate that the alkaline WPB have formed in oceanic seamounts or in the ocean-continent transition zone adjacent to the rifted continental margin.