Geophysical Research Abstracts, Vol. 7, 10240, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10240
© European Geosciences Union 2005

The mafic complexes of the Athos-Volvi-Zone – a suture zone between the Serbo-Macedonian Massif and the Rhodope Massif?

F. Himmerkus, P. Zachariadis and T. Reischmann and D. Kostopoulos

Johannes Gutenberg Universität Mainz, Department of Geology, Graduiertenkolleg: Stoffbestand von Kruste und Mantel,

Max-Planck-Institut für Chemie, Abteilung Geochemie, Mainz, himmerku@mail.uni-mainz.de

Faculty of Geology and GeoEnvironment, Department of Mineralogy and Petrology, National and Kapodistrian University of Athens, Panepistimioupoli Zographou, Athens 15784, Greece

The Serbo-Macedonian Massif (SMM) is an elongated basement complex in northern Greece, which is built by two entirely different crustal segments, namely the Vertiskos unit in the NW and the Kerdillion unit in the east (Burg, 1996 and literature therein). The Kerdillion unit is closely related to the adjacent Rhodope Massif to the east in terms of lithology, geochemistry and intrusion ages, whereas the Vertiskos Unit is an exotic terrane that has been accreted to the Hellenic orogen along the nearby Vardar Zone. The border between the two basement units of the SMM is a crustal-scale shear zone, which can be described as a mélange zone since it contains a number of mafic and ultramafic complexes as well as strongly deformed and metamorphosed metasediments.

The main mafic and ultramafic bodies outcrop in the Volvi-Therma area and on the Athos peninsula. Smaller sized isolated occurrences are scattered between the two main bodies. The rocks have been subjected to amphibolite facies metamorphism; some samples show retrograde greenschist facies overprint. The ultramafic rocks are altered to serpentinite and in cases contain bastite. The only primary mineral preserved in the ultramafics is chromite. The mafic rocks classify as cumulate and non-cumulate. Geochemically, the great majority of the samples are low-K tholeiites with

oceanic affinity. The oceanic origin of the non-cumulate mafic rocks along with the existence of cumulate rocks of gabbroic composition and ultramafic rocks suggest that this rock association represents relics of a former ophiolitic assemblage. According to discrimination diagrams based on high-field-strength elements (HFSE), the non-cumulate rocks are classified as mid-ocean ridge basalts (MORB) or backarc basin basalts (BABB) and volcanic-arc tholeiites. The concentrations of the large-ion-lithophile elements (LILE) and the LREE patterns of the MORB-like rocks, show relative enrichment suggesting formation in an arc-related environment, most probably in a back-arc basin. The MORB-like group has La/Yb 0.64-1.95 and ΣREE that range between 41-79, the $\varepsilon_{Nd(t)}$ values range between 6.74 and 5.34, $^{87}Sr/^{86}Sr$ between 0.703916 to 0.704987 and $^{143}Nd/^{144}Nd$ between 0.512863 and 0.513005, while the arc-like group has La/Yb 2.24-6.49 and ΣREE content between 61-142, the $\varepsilon_{Nd(t)}$ values vary from 6.8 to 3.45, $^{87}Sr/^{86}Sr$ from 0.703053 to 0.706157 and $^{143}Nd/^{144}Nd$ from 0.512792 to 0.513008. The cumulate rocks have Mg# between 0.42 and 0.65, are characterized by a positive Eu anomaly, total REE content lower than that of the non-cumulate rocks, and depleted to slightly enriched LREE patterns with La/Yb from 0.73 to 2.55. The $\varepsilon_{Nd(t)}$ values range between 1.7 and 7.7, $^{87}Sr/^{86}Sr$ between 0.702789 to 0.704045 and $^{143}Nd/^{144}Nd$ between 0.512785 and 0.513065. The isotopic composition of the samples is in agreement with the formation of the rocks in a subduction-zone environment.

Based on the recognition of the mafic and ultramafic rocks as remnants of former oceanic crust now placed between the two distinct crustal blocks of Vertiskos and Kerdillion, the Athos-Volvi zone is interpreted as a major ophiolite-decorated suture zone.

Literature:

Burg, J.P. et al. (1996): Syn-metamorphic nappe complex in the Rhodope Massif. Structure and Kinematics. – Terra Nova 8: 6–15.