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P-T evolution of slivers of garnet-bearing micaschist in the sole of the Western Vardar Ophiolite Unit at Brezovica, Kosovo

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Rocks of the metamorphic sole of ophiolite complexes are regarded as an important factor to understand the process of obduction of former oceanic lithosphere on top of continental crust. The metamorphic evolution of these rocks can give, for instance, hints at the thickness of the obducted oceanic lithosphere.

We have started to study the sole of the Western Vardar Ophiolitic Unit at the municipality of Bresovica, Kosovo. This unit is regarded as part of the former Vardar Ocean, a branch of the Neotethys, which was obducted onto the margin of the Adriatic microplate in Jurassic times. The sole in our study area, below strongly serpentinized ultramafic rocks, is characterized by a melange of various rock types, which are of medium metamorphic grade only in the vicinity of the ultramafic rocks. Our field work resulted in the recognition of several slivers of garnet-bearing micaschist among these medium-grade rocks which are dominated by amphibolite. In such a medium-grade rock from Bresovica the mineral assemblage talc + phengite was reported (Abraham and Schreyer, 1976, J. Petrol. 17, 421-439), which turned out by experiments in a piston-cylinder apparatus to be a high-pressure (HP: > 10 kbar) assemblage (Massonne and Schreyer, 1989, Eur. J. Mineral. 1, 391-410).

We studied a garnet-bearing micaschist in detail. Elemental mapping and spot analyses of garnet obtained with an electron microprobe yielded core compositions of $Alm_{0.695}Gross(+Andr)_{0.11}Pyr_{0.185}Spes_{0.01}$. The composition of the garnet rim is $Alm_{0.71}Gross(+Andr)_{0.065}Pyr_{0.21}Spes_{0.015}$. On the basis of the bulk-rock composition of the micaschist, a P-T pseudosection was constructed with PERPLE_X in the system K-Na-Ca-Mg-Mn-Fe-Al-Si-Ti-O-H. This pseudosection was contoured by isopleths for various parameters among them were the molar fractions of garnet components. According to such isopleths and the compositional variation of garnet, a more or less isobaric heating is likely. This heating to 650 °C has occurred at a pressure of 11.5 kbar, which is compatible with the aforementioned talc + phengite assemblage.

We think that the recognized HP metamorphism of the studied micaschist was caused by the load of the obducting oceanic lithosphere, which must have been as thick as 35 km. Heating of the overridden rocks during this obduction process resulted in the release of H_2O, which hydrated the mantle rocks at the base of the obducting oceanic lithosphere. An alternative model, which assigned the location of the hydration to the mantle wedge overlying a subduction zone, was abandoned also because of the existence of higher levels of oceanic crust, such as pillow lavas, in the preserved oceanic lithosphere close to the Brezovica region.