$^{40}Ar/^{39}Ar$ geochronologic constrains of a Variscan transpression in Central Stara Planina Mountain

$^{40}Ar/^{39}Ar$ изотопни данни за проява на Херцинска транспресия в Централна Стара планина

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Along the southern foot of Central Stara Planina Mountain the contact between the high-grade and low-grade metamorphic complexes marks an important Variscan structure with an orogenic-scale significance. Interpreted for years as Late Alpine fault, in fact the contact represents a km-scale ductile shear zone. Kinematic data indicate both top-to the W-NW and top-to the N shearing with syn-kinematic greenschist (or lower) facies recrystallization.

Two segments of this structure – western and eastern – can be distinguished on the basis of spatial arrangement and geometry (Lazarova et al., 2010). The western segment represents the Stargel-Boluvanya tectonic zone (SBTZ), where stratigraphical relations unambiguously indicate Late Variscan age (336–315 Ma) of the shearing along the contact. Unlike the western segment, there is no direct contact between high- and low-grade complexes in the eastern one. Here, the low-grade complex shows a higher grade fabric which could be ascribed to both the emplacement of syn-kinematic granitoids and the exposure of deeper levels of the contact. The presented in this study $^{40}Ar/^{39}Ar$ dating of muscovites aims to correlate the both segments of the contact and to constrain their thermotectonic evolution.

Two samples from the SBTZ (western segment) were examined. The first one is a mylonitic pegmatitic dyke, emplaced at amphibolite facies conditions (within the “high-grade orthometamorphic domain” defined by Gerdjikov et al., 2007). The $^{40}Ar/^{39}Ar$ laser probe dating of a muscovite yielded a well-defined plateau age at 333.9±0.2 Ma (1σ), which either dates cooling following dyke emplacement and contemporaneous shearing or (more probably, according to the 450–500 °C estimated ambient temperature, similar to estimated muscovite isotopic closure temperature) dates dyke emplacement and concomitant shearing. The second sample is a porphyroclastic gneiss located next to the contact with low-grade rocks. The fabric of the rock indicates a remarkable destruction of the precursor migmatitic layering. Due to intense shearing the leucosomes were extremely disrupted and boudinaged as the process was related with the growth of large flakes of white mica. The $^{40}Ar/^{39}Ar$ dating of these large grains suggests crystallization of muscovite at ca. 334 Ma. Experiment clearly expresses a subsequent disturbance but its age cannot be specified.

$^{40}Ar/^{39}Ar$ analyses of muscovites from variously deformed granitoids all yield disturbed age spectra. Such disturbances could be related to Alpine tectonic events, but unfortunately for now $^{40}Ar/^{39}Ar$ experiments are not discriminant. On the other hand, a muscovite from a granitoid sealing the SBTZ yields a slightly disturbed age spectrum that nevertheless could suggest a Lower Triassic (ca. 247 Ma) initial crystallization age.

Two samples from the eastern segment were collected so far away from the zones affected by obvious Alpine overprint as it is possible. Despite disturbed and difficult to interpret age spectra the muscovite $^{40}Ar/^{39}Ar$ results seem characterizing a Late-Variscan cooling.

The presented data suggest that shearing along the SBTZ occurred rather shortly after the thermal peak of the metamorphism in the Variscan basement of Srednogorie Mountain. These ages are at about

20 Ma older than those reported by Velichkova et al. (2004). This fact as well as the reported here ages indicate prolonged and complex exhumation path of the consolidated Variscan crust. We suggest that the both segments of the orogen-scale zone were active at the same time but at distinct crustal levels. This interpretation needs additional supporting by quantitative data. In terms of Alpine perspective, there is no doubt that better understanding of the Variscan evolution and structure will improve our knowledge of Early and Late Alpine compressional tectonics and the estimates of associated displacements.

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