



New data on the thrust tectonics in Central Balkan region

Нови данни за навлачната тектоника в района на Централен Балкан

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The Late Alpine thrust tectonics is regarded as determining the present-day structure of the Central Balkanides. The Tertiary thrust zones in the region of Central Stara Planina are traditionally assumed as a first-rank tectonic contact between Sredna Gora and Stara Planina tectonic zones. Nevertheless even well-presented data in the scientific publications are contradictory and show the necessity of new investigations. In this contribution we present initial results of ongoing work in the region of Central Stara Planina ridge between Gerdek-tepe summit (north of Iganovo village) and Botev summit (north of Kalofer).

Botev Vrah thrust is the largest and the most impressive nappe structure in Central Stara Planina. It is described after the first geological mapping (Cheshitev, 1958; Milanov et al., 1969). The allochthonous plate is considered as an element of Sredna Gora zone emplaced over the external parts of the Balkanides (Jaranoff, 1960; Bonchev, Karagiuleva, 1961; Ivanov, 1998; Dabovski et al., 2002). Despite the incomprehensiveness of the existing publications they indicate the complex character of Botev Vrah thrust. Two different models have been proposed that give a different explanation for the relations of the rock units in the allochthonous plate. Milanov et al. (1969) presume the existence of a system of two imbricated thrust sheets. According to that model Botev Vrah thrust consists of a lower thrust plate, built of the so called "Stara Planina high grade metamorphic series" (SPHGMS), and an upper plate, predominantly of Sredna gora type granites. On the other hand Cheshitev (1958) and Cheshitev et al. (1994) consider that the Botev vrah allochthon represents a single plate built predominantly of Sredna Gora type granites. The map interpretation of Cheshitev et al. (1994) clearly presents the intrusive relations of the Sredna Gora granitoids with the high grade meta-

morphites of Sredna Gora zone as well as with the metamorphites of Stara Planina zone.

Our principal aim for the present investigation was to find answers for the following main problems: the type of rock units building the allochthonous plate of the Botev Vrah thrust; and the relations between the rock complexes within the allochthon. We do not have the full set of data for definitive answers of these questions but our investigations on the south slopes of Central Stara Planina ridge unambiguously indicate the necessity of reconsidering of the suggested tectonic models.

The field as well as the preliminary microstructural data confirm the complex character of the Botev Vrah thrust. A rock association of predominantly leucocratic fine-grained granites and their host rocks of low-grade schists (sericite-chlorite, biotite, etc.) and fine-grained amphibolites is outcropped in the west parts (the region of Dobrila hut, Ambaritsa summit, southern slopes of Kupena, Kafadikildi and Zhaltets summit). The leucocratic granites are unevenly metamorphosed and sheared. At many localities they are transformed into sericite schists with fine mylonitic layering. On the other hand domains with massive structure that have preserved the fabric of the initial granite protolith are observed. Intrusive relations between these granites and the host rocks are also presented at many places. Black, compact fine-grained hornfels along these contacts are also observed. Porphyroclastic fine-grained, strongly chloritised granodiorites and diorites are comparatively common. They are probably co-magmatic with the leucocratic granites according to structural characteristics. These rocks have been referred to the SPHGMS (Milanov et al., 1969; Cheshitev et al., 1994), but our data do not confirm their high grade metamorphic character. Contrariwise the absence of

garnet in the metasediments and the presence of biotite as small flakes indicate synmetamorphic temperatures lower than 450–420°C. Lazarova et al. (this volume) present similar data for the SPHGMS.

Various comparatively coarse-grained granitoids building up the highest parts of Stara Planina ridge east of Kupena summit represent another well-defined part of Botev Vrah thrust. North-east of Kalofer the connection between the allochthonous plate and rocks in parautochthonous position is mapped (Cheshitev, 1958). This fact as well as the absence of data for the occurrence of any fault zone between the allochthon and the parautochthon unambiguously indicates that the allochthonous granites belong to the Sredna Gora type granitoids. The Sredna Gora granitoids of the west parts of Botev Vrah allochthon show uneven degree of ductile deformation localized in variously thick zones. The imposed deformations are especially intensive close to the contacts with the rocks of SPHGMS. This fact complicates the distinguishing of the two rock complexes.

The relations between Sredna Gora type granitoids and the rocks of “Stara Planina high grade metamorphic series” are of special interest. Our observations along continuous three-dimensional outcrops indicate complex relations that explain to some extent the existing contradictions in the literature. The field data unambiguously indicate: 1) The absence of described by Milanov et al. (1969) brittle tectonic contact between Sredna Gora granitoids and the rocks of SPHGMS and 2) Coarse-grained granitoids of Sredna Gora type are in intrusive relations with the rocks of SPHGMS — xenoliths (meters and decimeters in size) of fine-grained, strongly schistose rocks of SPHGMS are observed in non-deformed coarse-grained granites. Another argument that confirms these relations is the lower intensity of ductile fabric in Sredna Gora type granitoids in comparison to the intensively foliated rocks of SPHGMS.

References

- Bonchev, E., I. Karagiuleva. 1961. Das Srednogorije antiklinorium und die Staraplanina-granituberschichtungsdecke. — In: *Travaux sur la géologie de la Bulgarie.*, 2 (in Bulgarian).
- Dabovski, Ch., I. Boyanov, Kh. Khrishev, T. Nikolov, I. Sapounov, Y. Yanev, I. Zagorchev. 2002. Structure and Alpine evolution of Bulgaria. — *Geologica Balc.*, 32, 2–4, 9–15.
- Ivanov, Z. 1998. *Tectonics of Bulgaria*. Professorship Thesis. Sofia University (in Bulgarian).
- Jaranoff, D. 1960. *La tectonique de la Bulgarie*. Sofia, Technica, 283 p. (in Bulgarian).
- Milanov, L., S. Kuikin, I. Gercheva, S. Christov, V. Kuneva. 1969. Geological structure of Eastern Troyan mountain. — *Ann. Com. Geol.*, 18, 199–221 (in Bulgarian).
- Cheshitev, G. 1958. Géologie du haut Balkan entre les cols de Troyan et de Chipka. — *Ann. Direct. Gener. Rech. Geol.*, 9, 1–27 (in Bulgarian).
- Cheshitev, G., T. Nikolov, V. Milanova, Ts. Chontova. 1994. *Explanatory Note to the Geological Map of Bulgaria on Scale 1:100 000, Troyan Map Sheet*. Com. Geol. Min. Res., Geol. and Geoph. Sofia, 105 p. (in Bulgarian).

These facts confirm the data presented by Cheshitev et al. (1958). On the other hand our investigations indicate more complex relations between Sredna Gora granites and the rocks of SPHGMS. The contact is fairly wide (tens of meters structural thickness at some places) zone where Sredna Gora granitoids are deformed. They are often foliated parallel to the contact that is also parallel to the foliation in the SPHGMS. Numerous sheets of coarse-grained K-Feldspar porphyric and leucocratic granitoids are found parallel to the foliation in the contact zone. Most of them show also solid-state fabric and just latest magma pulses are not foliated and are crosscutting the foliation. These data are evidence for overlapping in time processes of intrusion of Sredna Gora granitoids with ductile shearing that have affected the rocks of SPHGMS.

There is no doubt that the solid-state fabric in Sredna Gora granitoids as well as the ductile deformation of the rocks of SPHGMS is related to the Variscan tectono-metamorphic events. The Late Alpine thrust emplacement in the investigated area have resulted in formation of brittle fault rocks in the upper levels of the crust. The interpretations of the earlier researchers that the mylonitization at the sole of Botev Vrah thrust is related to the emplacement of the allochthon are not confirmed.

The presented results necessitate essential reevaluation of the nature and importance of the Botev Vrah allochthon. Problems with the mapping of the root zone of the thrust also arise. Undoubtedly it is necessary additional field and geochronological data to be obtained for the creation of a well-grounded model for the Variscan and Alpine development of the region.

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