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Style of deformation and lithological features of the Paleozoic basement in Shipka Stara Planina Mountains

Стил на деформация и литоложки особености на палеозойския фундамент в Шипченска Стара планина

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The Paleozoic low-grade metamorphic rocks in Shipka Stara Planina Mountains (Fig. 1) comprise a major part of the pre-Mesozoic basement in this area. They have been an object of interest of quite a few studies (Kostov, 1949; Kalvacheva, Prokop, 1988; Yanev et al., 1995). Unsolved problems concerning their tectonic position, stratigraphy and deformation history still exist. Several tectonostratigraphic units with different lithostratigraphic composition have been distinguished (Yanev et al., 1995). They are described in tectonic superposition, thrusted one over another during the Late Alpine compressional events. Although Devonian age was proven by fossil evidence in limestone-pelitic intervals in part of the section (Kalvacheva, Prokop, 1988; Yanev et al., 1995), the age of the other main units comprising the Paleozoic sequence is still presumable.

This paper presents some new preliminary results on the stratigraphy and deformation structure of the Paleozoic basement in the region. The study has been carried out along the main ridge between the summits of Buzludzha and Bedek as well as along the southern slopes of the mountain.

The construction of the wind generator park near Bedek summit resulted in several new road cuts that give an excellent opportunity for observation of the entire Paleozoic sequence and direct study of the lithological boundaries within the section (Fig. 1). The low-grade metamorphic rocks are composed of various lithologies that appear to represent uninterrupted section. The lower levels of the section consist of predominantly metasedimentary succession – phyllites, chlorite-sericite schists, quartzites with marble lenses including the marbles of Buzludzha summit. A characteristic feature in the section is the presence of greenish diabase tuffs, tuffites and rare diabase or gabbroic bodies. They are overlaid by a turbidite sequence fol-

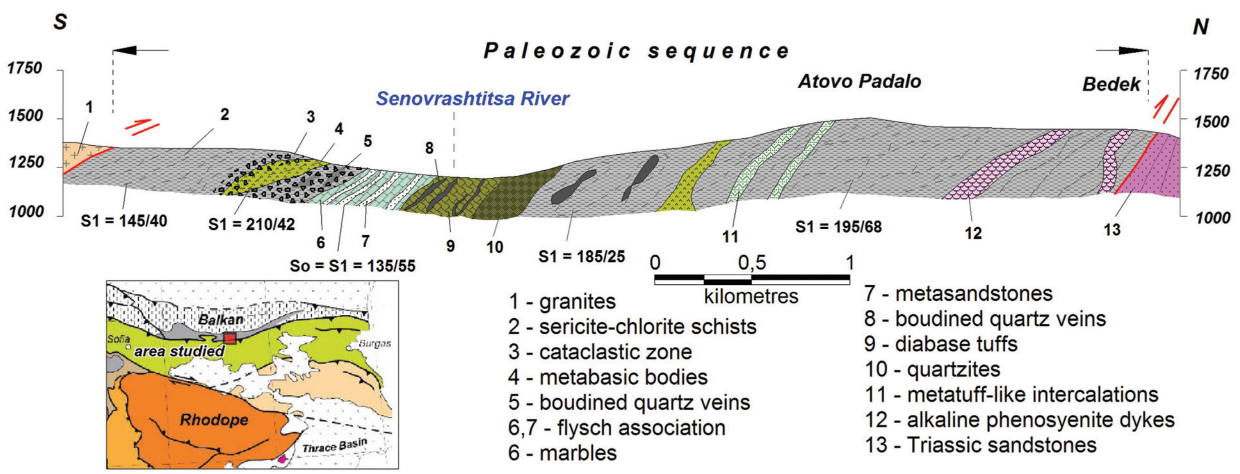

Fig. 1. Generalized cross-section of the Paleozoic sequence south of Bedek summit, Shipka Stara Planina Mountains

lowing by sharp lithological boundary. It consists of carbonate flysch sediments alternating with quartzites (metasandstones) at some places. Basic tuffs, tuffites and diabase bodies are also observed within this level. The carbonates are re-crystallized and transformed into marbles but some relict limestone lenses also exist. These rocks are dated as Devonian (Kalvacheva, Prokop, 1988; Yanev et al., 1995). The upper parts of the section consist of coarse-grained levels presented by conglomerates with quartz clasts, quartzites and sandstones. An interesting feature of the Paleozoic sequence is the metamorphic overprint that is unevenly distributed within the section. Apart from the dominantly low-grade greenschist metamorphism of the rocks, anchimetamorphic changes at different parts of the Paleozoic basement are also observed.

Within the Paleozoic basement evidence for at least two deformational events can be distinguished – intensive synmetamorphic ductile penetrative fabric and later brittle to brittle-ductile reworking. Although the latter are well preserved at many places they do not obliterate entirely the earlier synkinematic structures.

The Paleozoic rocks have been thrusted in general northward over various Mesozoic rocks. This tectonic boundary can be easily observed at the mountain crest. Part of the Paleozoic low-grade metamorphic rocks is also thrusted over Lower and Middle Triassic rocks at the south foot near to the town of Kran. As a result a wide zone (over 50 m in thickness) of cataclastic deformation was formed. We did not observe tectonic boundaries between the different lithological varieties of the Paleozoic basement. The rocks of the Paleozoic sequence are intensively deformed and deformation affected entire rock volume. Low strain lenses also exist at several places. Some of them are interpreted in the sense of rheology varieties.

The synmetamorphic structures are presented clearly in that part of the section composed mainly of phyllites, chlorite-sericite schists and quartzites. Penetrative foliation that is often isoclinally folded is developed. It dips southeastward to southward. Quartz veins parallel to the foliation are abundant. They are often boudinaged and also isoclinally folded. Fold hindges dip shallowly (20–35°) to southeast and south. Some quartzites and chlorite-sericite schists have undergone intensive shearing. Synmetamorphic stretching lineation is well developed and they resemble L-tectonites. Within the section of the carbonate turbidites it is visible that the foliation often inherited primary bedding. Synkinematic shear sense criteria (pressure shadows around boudins of quartz, sigma-like porhyroclasts, orientation of mezo-duplex structures, drag folds) unambiguously indicate northward direction of tectonic transport.

The later brittle to brittle-ductile structures (presumably Late Alpine) are predominantly presented by penetrative cleavage, shear bands and secondary fault surfaces, riedel and duplex structures. They are presented in almost the entire rock volume of the Paleozoic section but nevertheless some zones of strongly localized brittle deformation (predominantly in quartzites and schists) are observed (Fig. 1). These zones are composed of gouge and ultracataclasites that are intensively cleaved. Cataclastic foliation is also developed. Differences in rock rheology have influenced the formation of various brittle to brittle-ductile structures. Corrugations on shearing surfaces in quartzites are well preserved. Kink bands and chevron folds are common in the schists, phyllites and metatuffs. Boudins as low-strain lenses of magmatic bodies cutting the Paleozoic sequence (mainly later dykes of leucocratic composition) are often observed. Duplex structures with sigma-like horses, development of back thrusts and antiformal stacks are also common at different scales in all rock varieties. The kinematic analyses of structures (striation lineation along shearing surfaces, riedel shears, duplex structures) indicate northward compression. The cleavage dipping eastwards at some places as well as the presence of shear surfaces with subhorizontal lineation structures show also strike-slip component of the deformation. Some parts of the section demonstrate more chaotic orientation of the brittle structures that shows local variations of stress field during Alpine events.

The repetition of some parts of the Paleozoic section at several localities and the intensive tectonic rework and observation of duplex structures at different scales could be interpreted as refolding and thickening of the basement. The presence of duplexes and imbricate structures hampers the evaluation of the Paleozoic section thickness.

Discussing the lack of tectonic relationships between the single lithological varieties and the evidence for uninterrupted section of the metamorphites, Devonian age for the entire Paleozoic sequence could be assumed. Thus the presence of the supposed Zdravchenitsa Formation and the Diabase–Phyllitoid Complex in the region studied probably should be reconsidered.

In order to determine the precise stratigraphy and metamorphic history of the Palesozoic basement petrological, geochronological and microstructural studies are also in progress.

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