Preliminary structural data on the "Stara Planina high-grade metamorphic series", Teteven Stara Planina Mountains

Предварителни структурни данни за Старопланинската висококристалинна метаморфна серия, Тетевенска Стара планина

Anna Lazarova[1], Neven Georgiev[2], Dimo Dimov[2]
Анна Лазарова[1], Невен Георгиев[2], Димо Димов[2]

[1] Geological Institute, Bulgarian Academy of Sciences, 1113 Sofia; E-mail: alazarova@geology.bas.bg
[2] Sofia University, Dept. of Geology and Paleontology

Key words: Central Stara Planina Mountains, metamorphic rocks, structural data

Limited data are available on the metamorphic complex known as "Stara Planina high-grade metamorphic series" (Kuikin et al., 1971; Milanov et al., 1971) and exposed in large areas in Troyan and Teteven Stara Planina Mountains. A variety of metamorphic rocks have been recognized within the complex: gneisses, biotite schists, amphibolites, and marbles as well as lenses of greenshist metamorphites. The complex is interpreted as to be a higher-grade counterpart of the Diabase-Phyllitoid Complex (Kuikin et al., 1971; Milanov et al., 1971) or an association of migmatites and anatectites (Tscheshitev et al., 1995). Several granitoid bodies (often foliated near the contacts) intrude the metamorphic rocks. The largest ones are Ribaritsa and Karlovo granites (Kuikin et al., 1971; Milanov et al., 1971).

Our research focuses only on the metamorphites extending as a narrow E-W elongated strip between Kostina and Chernata reka river valleys to the south of the Ribaritsa village (Fig. 1). Here, these rocks have brittle tectonic contact with the Variscan Vezhen pluton to the south, and are covered by Triassic-Lower Jurassic sediments to the north (Kuikin et al., 1971, Lazarova, 2006). Field observations showed that foliated granites are the dominating rock type in the complex, thus this study focuses on them. Isolated outcrops of gneisses (partly migmatized; Zavodna river valley), amphibolites and biotite schists with garnet porphyroblasts (Stara Ribaritsa river valley) have been recognized as well, but their relationship with the granites remain unclear at this stage.

Two types of granites are distinguished. Reddish, medium- to coarse-grained biotite granites with centimeter-scale K-feldspar porphyroclasts prevail in the western part of the complex in Kostina and Zavodna river valleys. These rocks are foliated, however transitions into almost isotropic varieties are observed even in the scale of a rock specimen. Common feature is the abundance of centimeter-scale aplite veins, often parallel to the foliation planes, though oblique ones are found as well. In the eastern part of the area (along Stara Ribaritsa and Chernata reka river valleys) dominate fine- to medium-grained leucocratic granites, enriched in white mica. Generally, they display intensive foliation and clear stretching lineation.

The foliation within both types of granites strikes 85–120° and dips moderately (25–40°) to the south and southwest. Within the intensively deformed varieties the foliation is defined by the alternation of quartz-feldspar and mica layers (biotite-rich in the reddish granites, or white mica-rich in the leucocratic granites). The lineations are shallow-plunging (15–35°) to the west and southwest. Elongated micas, feldspars and quartz, define the stretching lineation within the leucocratic granites. The transitions of this type lineation into slickenside striations with same orientations are common. Lineation structure within the reddish varieties is rarely observed.

Microstructural observations of the behavior of rock-forming minerals as well as the mineral growth within the studied rocks give indirect information about the mechanisms and thermal conditions of deformation. Feldspars (both K-feldspars and plagioclases) form large porphyroclasts and small grains within the matrix of the foliated granites. Some of the feldspar porphyroclasts preserved primary (igneous) idiomorphic outlines, zoning and earlier-phases inclusions. The porphyroclasts are deformed mainly by cataclastic flow and minor diffusion mass

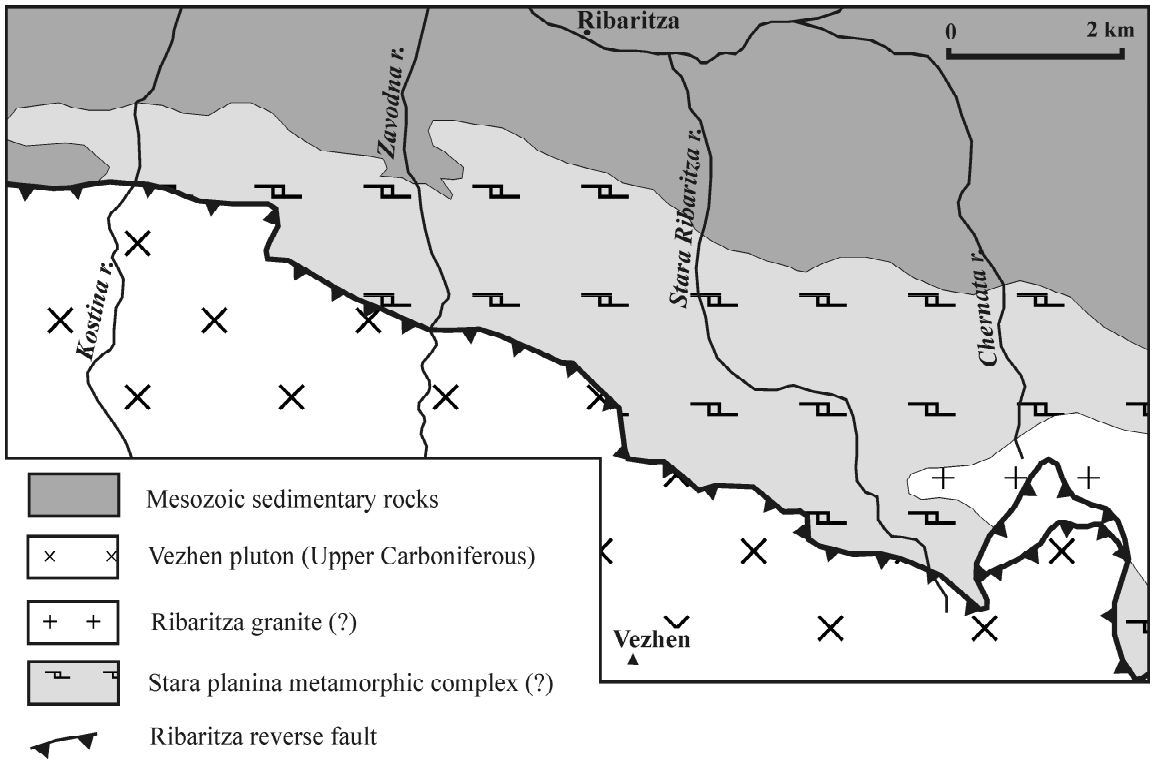

Fig. 1. Schematic geological map of the studied area (after Kuikin et al., 1971)

transfer processes. Fractures and microfaults are common, reducing the size of the grains and forming angular-shaped fragments, arranged along the foliation. Microstructures reflecting the intracrystalline deformation are also present. Widespread are deformation twins ("flame-shaped" perthite), kink-bands and undulate extinction. Locally, the initial stage of dynamic recrystallization is marked by the presence of deformational myrmekites and subgrain formation. The development of distinct core-and-mantle structure in the K-feldspar grains was not observed.

Quartz is the major phase within the granites' matrix. Generally, it is fine-grained, forming elongated polycrystalline aggregates along the foliation or asymmetric tails around feldspar porphyroclasts. The polycrystalline aggregates contain recrystallized grains of equal size or grains of different sizes with irregular boundaries, core-and-mantle structures with subgrains and recrystallized grains. All these peculiarities reflect bulging and almost subgrain rotation recrystallization processes.

Mineral phases developed along the foliation planes or shear bands, within strain shadows and caps or as overgrows around porphyroclasts are indicative of the deformational conditions. Such phases are chlorite, epidote, white mica, green biotite and quartz. Numerous microstructures within the granites imply the important role of diffusion mass transfer processes during deformation. Such microstructures are strain shadows and caps, overgrows, pressure solution seams developed along the foliation, fibrous quartz veins (along the foliation or crosscutting the porphyroclasts) and intensive transformation of feldspar into white micas.

The behavior of feldspars and quartz within the foliated granites, the presence of chlorite-epidote-white mica-green biotite-quartz assemblage as well as the signs of high fluid activity indicate thermal conditions of deformation in the range between 350–450°C. These temperatures correspond to medium- to high-grade greenshist facies deformation conditions.

The preliminary field and microstructural data put some new aspects on the recent notions of the so-called "Stara Planina high-grade metamorphic series". In the area of the Teteven Stara Planina Mountains these "high-grade metamorphic series" are built up almost entirely of foliated granites deformed in medium- to high-grade greenshist facies conditions (350–450°C). The new data contradict to the conclusion of Tscheshitev et al. (1995) that these rocks are migmatites and anatectites. The contacts of the granites with the other metamorphic rock types in the studied area (migmatized gneisses, amphibolites and biotite schists) remain unclear, but it could be assumed that the latter represent parts of the host complex.

Irrespectively of the preliminary character of these conclusions the presented data raise a lot of ques-

tions. The characteristics of the so-called "Stara Planina high-grade metamorphic series" are still very obscure and need further geological investigations. Is it really a higher-grade counterpart of the Diabase-Phyllitoid Complex or is it an independent unit comprising different rock types of specific relationships, ages and metamorphic history. Resolving these problems requires more detailed studies.

Acknowledgements: This research was financially supported by Sofia University Scientific Research Fund.

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