

Regional Metamorphism of the Loki Crystalline Massif Allochthonous Complex of the Caucasus

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Abstract : The Loki pre-Alpine crystalline massif crops out within the Caucasus region. The massif basement is represented by the Upper Devonian gneissose quartz-diorites, the Lower-Middle Paleozoic metamorphic allochthonous complex, and different magmatites. Earlier, the metamorphic complex was considered as indivisible set represented by the series of different temperature metamorphites. The degree of metamorphism of separate parts of the complex is due to different formation conditions. This fact according to authors of the abstract was explained by the allochthonous-flaky structure of the complex. It was stated that the complex thrust over the gneissose quartz diorites before the intrusion of Sudetic granites. During the detailed mapping, the authors turned out that the metamorphism issues need to be reviewed and additional researches to be carried out. Investigations were accomplished by using the following methodologies: finding of key sections, a sampling of rocks, microscopic description of the material, analytical determination of elements in the rocks, microprobe analysis of minerals and new interpretation of obtained data. According to the author's recent data within the massif four tectonic plates: Lower Gorastskali, Sapharlo-Lok-Jandari, Moshevani and "mélange" overthrust sheets have been mapped. They differ from each other by composition, the degree of metamorphism and internal structure. It is confirmed that the initial rocks of the tectonic plates formed in different geodynamic conditions during overthrusting due to tectonic compression form a thick tectonic sheet. Based on the detailed laboratory investigations additional mineral assemblages were established, temperature limits were specified, and a renewed trend of metamorphism facies and subfacies was elaborated. The results are the following: 1. The Lower Gorastskali overthrust sheet is a fragment of ophiolitic association corresponding to the Paleotethys oceanic crust. The main rock-forming minerals are carbonate, chlorite, spinel, epidote, clinoptilolite, plagioclase, hornblende, actinolite, hornblende, albite, serpentine, tremolite, talc, garnet, and prehnite. Regional metamorphism of rocks corresponds to the greenschist facies lowest stage. 2. The Sapharlo-Lok-Jandari overthrust sheet metapelites are represented by chloritoid, chlorite, phengite, muscovite, biotite, garnet, ankerite, carbonate, and quartz. Metabasites containing actinolite, chlorite, plagioclase, calcite, epidote, albite, actinolitic hornblende and hornblende are also present. The degree of metamorphism corresponds to the greenschist high-temperature chlorite, biotite, and low-temperature garnet subfacies. Later the rocks underwent the contact influence of Late Variscan granites. 3. The Moshevani overthrust sheet is represented mainly by metapelites and rarely by metabasites. Main rock-forming minerals of metapelites are muscovite, biotite, chlorite, quartz, andalusite, plagioclase, garnet and cordierite and of metabasites - plagioclase, green and blue-green hornblende, chlorite, epidote, actinolite, albite, and carbonate. Metamorphism level corresponds to staurolite-andalusite subfacies of staurolite facies and partially to facies of biotite muscovite gneisses and hornfelse facies as well. 4. The "mélange" overthrust sheet is built of different size rock fragments and blocks of Moshevani and Lower Gorastskali overthrust sheets. The degree of regional metamorphism of first and second overthrust sheets of the Loki massif corresponds to chlorite, biotite, and low-temperature garnet subfacies, but of the third overthrust sheet - to staurolite-andalusite subfacies of staurolite facies and partially to facies of biotite muscovite gneisses and hornfelse facies.

Keywords : regional metamorphism, crystalline massif, mineral assemblages, the Caucasus

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