

Digital Geological Map of the Loki Crystalline Massif (The Caucasus) and Its Multi-Informative Explanatory Note

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Abstract : The Caucasus is situated between the Eurasian and Africa-Arabian plates and represents a component of the Mediterranean (Alpine-Himalayan) collision belt. The Loki crystalline massif crops out within one of the terranes of the Caucasus - Baiburt-Sevanian terrane. By the end of 2018, a digital geological map (1:50 000) of the Loki massif was compiled. The presented map is of great importance for the region since there is no large-scale geological map which reflects the present standards of the geological study of the massif up to the last time. The existing State Geological Map of the Loki massif is very outdated. A new map drawn by using GIS (Geographic Information System) technology is loaded with multi-informative details that include: specified contours of geological units and separate tectonic scales, key mineral assemblages and facies of metamorphism, temperature conditions of metamorphism, ages of metamorphism events and the massif rocks, genetic-geodynamic types of magmatic rocks. Explanatory note, attached to the map includes the large specter of scientific information. It contains characterization of the geological setting, composition and petrogenetic and geodynamic models of the massif formation. To create a geological map of the Loki crystalline massif, appropriate methodologies were applied: a sampling of rocks, GIS technology-based mapping of geological units, microscopic description of the material, composition analysis of rocks, microprobe analysis of minerals and a new interpretation of obtained data. To prepare a digital version of the map the appropriated activities were held including the creation of a common database. Finally, the design was created that includes the elaboration of legend and the final visualization of the map. The results of the study presented in the explanatory note are given below. The autochthonous gneissose quartz diorites of normal alkalinity and sub-alkaline gabbro-diorites included in them belong to different phases of magmatism. They represent "igneous" granites corresponding to mixed mantle-crustal type granites. Four tectonic plates of the allochthonous metamorphic complex-Lower Gorastskali, Sapharlo-Lok-Jandari, Moshevani, and Lower Gorastskali differ from each other by structure and degree of metamorphism. The initial rocks of these plates are formed in different geodynamic conditions and during the Early Bretonian orogeny while overthrusting due to tectonic compression they form a thick tectonic sheet. The Lower Gorastskali overthrust sheet is a fragment of ophiolitic association corresponding to the Paleotethys oceanic crust. The protolith of the ophiolitic complex basites corresponds to the tholeiitic series of basalts. The Sapharlo-Lok-Jandari overthrust sheet is metapelites, metamorphosed in conditions of greenschist facies of regional metamorphism. The regional metamorphism of Moshevani overthrust sheet crystalline schists quartzites corresponds to a range from greenschist to hornfels facies. The "mélange" is built of rock fragments and blocks of above-mentioned overthrust sheets. Sub-alkaline and normal alkaline post-metamorphic granites of the Loki crystalline massif belong to "igneous" and rarely to "sialic" and "anorogenic" types of granites.

Keywords : digital geological map, 1:50 000 scale, crystalline massif, the caucasus

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