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Petrology, Geochemistry and Formation Conditions of Metaophiolites of the Loki Crystalline Massif (the Caucasus)

Authors : Irakli Gamkrelidze, David Shengelia, Tamara Tsutsunava, Giorgi Chichinadze, Giorgi Beridze, Ketevan Tedliashvili, Tamara Tsamalashvili

Abstract : The Loki crystalline massif crops out in the Caucasian region and the geological retrospective represent the northern marginal part of the Baiburt-Sevanian terrain (island arc), bordering with the Paleotethys oceanic basin in the north. The pre-Alpine basement of the massif is built up of Lower-Middle Paleozoic metamorphic complex (metasedimentary and metabasite rocks), Upper Devonian quartz-diorites and Late Variscan granites. Earlier metamorphic complex was considered as an indivisible set including suites with different degree of metamorphism. Systematic geologic, petrologic and geochemical investigations of the massif's rocks suggest the different conception on composition, structure and formation conditions of the massif. In particular, there are two main rock types in the Loki massif: the oldest autochthonous series of gneissic quartz-diorites and cutting them granites. The massif is flanked on its western side by a volcano-sedimentary sequence, metamorphosed to low-T facies. Petrologic, metamorphic and structural differences in this sequence prove the existence of a number of discrete units (overthrust sheets). One of them, the metabasic sheet represents the fragment of ophiolite complex. It comprises transition types of the second and third layers of the Paleooceanic crust: the upper noncumulated part of the third layer gabbro component and the following lowest part of the parallel diabase dykes of the second layer. The ophiolites are represented by metagabbros, metagabbro-diabases, metadiabases and amphibolite schists. According to the content of petrogenic components and additive elements in metabasites is stated that the protolith of metabasites belongs to petrochemical type of tholeiitic series of basalts. The parental magma of metaophiolites is of E-MORB composition, and by petrochemical parameters, it is very close to the composition of intraplate basalts. The dykes of hypabissal leucocratic siliceous and medium magmatic rocks associated with the metaophiolite sheet form the separate complex. They are granitoids with the extremely low content of CaO and quartz-diorite porphyries. According to various petrochemical parameters, these rocks have mixed characteristics. Their formation took place in spreading conditions or in the areas of manifestation of plumes most likely of island arc type. The metamorphism degree of the metaophiolites corresponds to a very low stage of green schist facies. The rocks of the metaophiolite complex are obducted from the Paleotethys Ocean. Geological and paleomagnetic data show that the primary location of the ocean is supposed to be to the north of the Loki crystalline massif.

Keywords : the Caucasus, crystalline massif, ophiolites, tectonic sheet
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