

Early Archean metabasites of the Okhotsk terrain (north-east Russia): geochemical features and tectonic setting

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The Okhotsk terrain is the most interesting structural element of the Asian segment of the Pacific Mobile Belt. It is made up of the Early Archean formations study of which gives an insight into the earliest history of the continental crustal origin, and allows an obtaining geochemical characteristics of the most ancient rocks, and their tectonic setting definition.

Geological, petrographic, geochemical, and isotopic-geochronological study of the Okhotsk terrain show that the Okhotsk Formation is made up of gneisses and migmatites interbanded with minor mafic shists (metabasites) formed as a result of high grade polymetamorphism of the Early Archean (3535±10 Ma) volcanogenic-sedimentary sequence, and intrusive rocks [1].

Conformable bedding of the mafic shists, correspondence of their chemical composition to that of the basic magmatic rocks, and occurrence of melt inclusions typical for volcanics in rock-forming minerals and zircons testify that basalts were a protolith for the mafic shists. Metabasites correspond to sub-alkaline and tholeiitic series, and are strongly evolved (MgO=4-9%) according to the Fenner trend of differentiation. Metabasites under consideration most closely correspond to typical low-Ti flood basalts in the content of rock-forming elements, and significantly differ from arc-related basalts and continental rift basalts. Chondrite-normalized REE patterns for metabasites show a weak differentiation ($(La/Yb)_N=4.8-1.0$, $(Gd/Yb)_N=1.1-1.9$), and small negative Eu-anomalies ($Eu/Eu^*=0.76-1.0$). REE contents and REE distribution patterns of metabasites are consistent with that of flood basalts, but slightly differ from the latter in less differentiated HREE distribution pattern. Hence, it is most likely that the Early Archean metavolcanics from the Okhotsk terrain have mantle plume (or hot spot) origin. In terms of HFSE ratios ($Zr/Y-Nb/Y$, and $Nb/Th-Zr/Nb$) [2] the Okhotsk metabasites are also similar to the mantle plume related basalts.

References

- [1] V.K. Kuzmin, V.A. Glebovitsky, D.I. Matukov (2005) Doklady RAS **402**, 217-221
[2] Condie K.C. (2005) Lithos **79**, 491-504.