Sources and geodynamics of Early Paleozoic Gabbro–Monzodiorite intrusions of the Kuznetsk Alatau Ridge, Siberia

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There is the Kuznetsk Alatau Caledonian terrane in the western part of the Central Asian orogenic belt. It is believed that its tectonic evolution took place mostly in the island-arc geodynamic environment and was accompanied by Early Paleozoic granitoid and mafic magmatism. There are many intrusive massifs (up to 40-60 km^2) on the Eastern slope of the Kuznetsk Alatau within the Batenev Ridge, which are considered to be derivatives of a gabbro-monzodiorite formation. Subalkaline gabbroids, later monzodiorites, and monzonites are dominant in the composition of these massifs. They form homodrome high-K calc-alkaline magmatic series. Isotope U-Pb dating (SHRIMP-II) of zircons in these rocks that we carried out showed that these massifs were formed at ~ 500–485 Ma. Some granitoid associations in the region have similar age.

Studied rocks have similar HFSE distribution and ratio to island-arc basalts and just like them are characterized by Nb-Ta and Zr-Hf spectrum minimums of subduction volcanites. Observed complementarity of geochemical spectrums indicates fractioning of melts in intermediate chambers. Unlike gabbro, monzonitoids are significantly enriched in Cs, Rb, Ba, U, Th, Sr, REE that might indicate influence of intraplate OIB-type magmatic source and less of continental crust. Variations in isotope composition of the rocks (εNd ~ +3,4…+3,9; εSr ~ +2…+11) suggest participation of heterogeneous matter in magma formation, they indicate possible mixing of mantle (PREMA+EM) and crust matter. Early Paleozoic granitoids and alkaline-mafic intrusions of the Kuznetsk Alatau have similar parameters, thus suggesting the same nature for parental magma sources at Cambrian-Ordovician stage of its geological evolution. The data obtained demonstrate possibility of gabbro-monzodiorite plutonic complexes to be formed under geodynamic settings where active continental margin was interacting with mantle plume.

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