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Neoproterozoic clastic rocks of the Karatau and Talas ranges (western Northern Tianshan): Provenance and paleogeographic implications

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Sedimentary successions of Karatau and Talas ranges of the northwestern Tianshan in southwest CAOB consist of Neoproterozoic predominantly clastic rocks and Cambrian-Ordovician carbonates, which deposited respectively in rift and passive margin settings on the Ishim-Middle Tianshan Microcontinent (IMT). Deposition of clastic rocks occurred mostly in fault-bounded basins, and their ages and provenances are poorly constrained. Our combined U-Pb detrital zircon dating, whole-rock Sm-Nd isotopic and geochemical studies along with petrographic study of sandstones enable us to make the following conclusions.

1) Sandstones from turbidite units of Karatau (Kokdjot Group and Bolshekaroi Formation) and their correlatives in Talas Range contain detrital zircons with U-Pb ages ranging mainly from 900 to 800 Ma with prominent peak at ca. 820-800 Ma. Paleoproterozoic and Neoarchean grains are also widely distributed in all studied samples and form peaks at ca. 2050-2000, 2500, 2650 and 2730-2700 Ma. Similar distribution of detrital zircons ages in all samples implies that studied rocks deposited during a relatively short time interval. Low to moderate negative eNd(t) values of ca. -6 to -9 indicate mixed sources with Neoproterozoic and Paleoproterozoic-Archean rocks. Widespread occurrence of immature lithic and greywacke sandstones as well as low Zr/Sc ratio point to local provenance. Turbidite paleocurrent directions indicate sediment transport from the west and northwest.

2) In the shallow marine unit (Koksu Formation and Malokaroi Group of the Karatau Range), detrital zircons are dominated by Paleoproterozoic and Archean grains and form a prominent peak at ca. 2050-2000 Ma. It corresponds well with low negative eNd(t) values varying in all samples from -14 to -20 pointing to erosion of Paleoproterozoic and Archean crust. Sandstones have mainly arkosic to sublithic composition, but higher Zr/Sc ratio of ca. 30-50 point to occurrence of recycled sediments. The uppermost unit of the Malokaroi Group contains fine-grained tuffs and tuffaceous siltstones and differs from underlying rocks by positive eNd(t) of ca. +0.4, and predominance of detrital zircon ages of ca. 770-740 Ma.

3) Deposition of the studied sedimentary successions requires erosion of a landmass that is larger than IMT microcontinent, and a wide river system to transport clastic material. Distribution of detrital zircon ages in studied samples demonstrates similarity with that of the Tarim Craton and differs from adjacent terranes of Kyrgyz North Tianshan and Kazakhstan. This implies that the IMT microcontinent was likely linked with Tarim Craton in the Precambrian. Detrital zircons with ages of ca. 820-800 Ma and 770-740 Ma apparently reflect episodes of felsic magmatism, which are broadly recorded both in the IMT microcontinent and Tarim Craton.

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