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Detrital zircon U-Pb and Hf isotopic data from the Idermeg terrane, Eastern Mongolia: Constrains on depositional age, sedimentary provenance and tectonic setting

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Idermeg passive continental-margin terrane, Eastern Mongolia is one of the main constituent terranes of Argun-Idermeg superterrane extending through the territories of Mongolia, Russia and China [1]. According to the latest tectonic subdivision of Mongolia, the Idermeg terrane belongs to the South Mongolian orogenic belt and contains Precambrian basement rocks overlain by Neoproterozoic-Early Cambrian greenschist facies metamorphosed rocks [2]. Several metamorphic blocks outcropping in the north-eastern part of Idermeg terrane which is considered as a Precambrian basement, comprising mainly gneiss, various schists, quartzite, amphibolite and minor marble [3; 4; 5]. However, the age and nature of the metamorphic rocks are still not well constrained. Based on field relationship and metamorphic grade this metamorphic complex was regarded to the Paleoproterozoic Haichingol formation [4; 6].

Here we present new results of geochemical study of metamorphic rocks and in situ U–Pb age dating and Lu–Hf isotopic analyses of detrital zircons from the Zamttolgoi complex in the Idermeg terrane, a unit that has been interpreted as one of the oldest stratigraphic sequences in the Eastern Mongolia.

The garnet-bearing crystalline schist and muscovite-chlorite schist contain a youngest zircon population that yielded ages of 550 and 630 Ma, respectively, indicating that the sedimentary rock was deposited during the Late Neoproterozoic, not in Paleoproterozoic as previously inferred. The detrital zircons of the two samples have a predominant population between 638 to 990 Ma with prominent peak at 794 Ma and minor population between 1.0 and 1.16 Ga, clearly indicating that their provenance was dominated by Early to Middle Neoproterozoic rocks. In terms of Hf isotope compositions, their negative zircon $\varepsilon_{Hf}(t)$ values (-18.8 to -0.1) indicate that a significant amount of recycled ancient continental crustal material was involved in their sources, an idea also supported by their T_{DM}^{c} model ages of 2.0 and 2.4 Ga. These rocks have high CIA values (70-78), with ICV values (0.95–1.08), suggesting that they experienced moderate chemical weathering and were mainly derived from a compositionally immature source. In addition, these rocks are characterized by enrichment in large ion lithophile elements (Rb, K) and LREE (La_N/Yb_N=4.9–9.7), with relative depletion in high field strength elements (Nb, Ta and Ti), typical characteristics for arkosic sandstone which were formed by weathering of felsic and intermediate magmatic rocks developed in an active continental margin.

The widespread occurrence of Early to Middle Neoproterozoic detrital zircons with negative εHf (t) values from the Zamttolgoi complex suggest that Precambrian rocks are present within the Idermeg terrane. Age and protolith of other metamorphic blocks of the Paleoproterozoic Haichingol formation in the Idermeg tarrane, Eastern Mongola, remain to be checked and reconsidered in the future.

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