Late Mesozoic A-type magmatism in Hailar basin, NE China: Constraints on the evolution of the Mongol-Okhotsk Ocean

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The northeastern China situated between the Siberian and Sino-Korean (North China) cratons was characterized by widespread volcanism and well developed extensional basins in the period of Late Mesozoic. In the north-west of Hailar basin which located west part of NE China there exposes a suit of A-type rhyolitic rocks that had been rarely noticed. Major and trace element, Sr-Nd-Pb and zircon U-Pb data are presented for this special profile. Furthermore general I-type volcanic rocks from mafic to felsic aged 160~120 Ma also selected and performed for comparing.

The first U-Pb Zircon ages that constrains the timing of emplacement of the A-type rhyolites as Early Cretaceous (125±3~136±4 Ma), and the zircon ages range from 158±6~125±3 Ma indicate complicated magma chamber evolution and mixing process. All the volcanic rocks belong to high-K calc-alkaline series. The mafic-felsic rocks show enrichment of LILE and LREE, and depleted in HFSE and HREE compared to the A-type rhyolites with higher HFSE, HREE contents and no negative Nb-Ta anomalies. All the volcanic rocks show slightly depleted to enriched isotopic features. These data suggest that basaltic-andesitic rocks in Hailar basin were generated by fractional crystallization of melts partial melting from the enriched lithospheric mantle which had been metasomatised by previous slab subduction of the Paleo-Asian Ocean and the Mongol-Okhotsk Ocean, whereas the andesitic-rhyolitic magmas were produced by the melting of lower crustal mafic and felsic granulites, respectively. Accordingly we suggest the A-type rhyolites are generated by high-temperature partial melting of lower continental crust which depleted by previous I-type melts extraction and the anhydrous melting with high F contents increased the HFSE contents in the melt. Considering the evolution of the Mongol-Okhotsk Ocean, this A-type magma event provides evidence for the slab break-off process of the Mongol-Okhotsk Ocean.

Incorporation of trace metals into soil microcodium as a novel proxy for paleo-precipitation

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Trace element compositions of carbonates have been successfully applied to reconstruct the paleo-environments under which they are precipitated. However, information on the incorporation of trace metals into the authigenic carbonates in soil is rare. Major challenges come from the impurity of soil carbonates and thus comtamination of trace metals by other mineral phases.

Here we present trace element compositions of microcodium found in Chinese loess. Microcodium is formed by the replacement of bio-residues by soil solution, which is very easy to identify and pick. We have observed large variation in the Mg/Ca and Sr/Ca ratios of microcodium in the Holocene soils across Chinese Loess Plateau, which reflects large variation in corresponding composition of soil solution. Rayleigh fractionation associated with the precipitation of secondary carbonate is responsible for the compositional variation of soil solution. The extent of Rayleigh fractionation is significantly correlated to precipitation amount (Fig. 1). The incorporation of trace metals in microcodium may serve as a novel proxy for paleo-precipitation. Initial application of the new proxy indicates clear glacial-interglacial changes of precipitation amount on Chinese Loess Plateau.

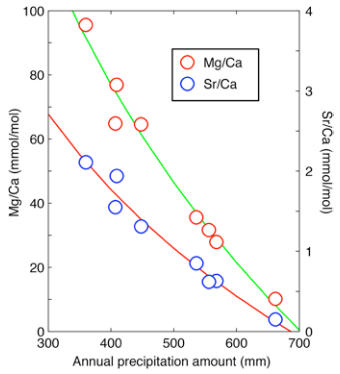

Fig. 1. Holocene calibration curves for the Mg/Ca and Sr/Ca ratios of microdium as proxies for precipitation amount.

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