

## Whole-rock Nd-Hf isotopic study of I-type and peraluminous granitic rocks from the Chinese Altai: constraints on the nature of basement and tectonic setting

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Previously published whole-rock Nd isotopic data are often inconsistent with zircon Hf isotopic data for the early Paleozoic granitic rocks (380–478 Ma) in the Chinese Altai, which led to contradictory interpretations for their magma sources and tectonic setting. Nd and Hf isotopic analyses were conducted in this study on the same whole-rock samples of representative early to middle Paleozoic granitic rocks, and the data are used to reconcile the controversies and to discuss the complicated crust-mantle interaction in the accretionary orogenesis. Our samples include I-type granites (Hanasi batholith, Kurmutu pluton, Altay batholith and Kezgar pluton), strongly peraluminous granites (Hemu batholith, Kuwei batholith), and rhyolites (Jiadengyu). The I-type granites are metaluminous to weakly peraluminous and have  $\varepsilon_{Nd}(t)$  and  $\varepsilon_{Hf}(t)$  values ranging from -2.6 to 0.7 and from 4.0 to 13.0, respectively. The strongly peraluminous granites and rhyolites have similar  $\varepsilon_{Nd}(t)$  and  $\varepsilon_{Hf}(t)$  values ranging from -3.2 to 1.7 and from 2.1 to 15.7, respectively. All samples plot above the Terrestrial Array in a Nd-Hf isotopic diagram, indicating significant Nd-Hf isotopic decoupling in the magma sources. Our sample locations nearly cover the entire Chinese Altai, and their ages range from 445 Ma to 368 Ma, illustrating that the Nd-Hf isotopic decoupling prevailed in the region throughout the early and middle Paleozoic. All samples show flat HREE pattern and have Lu/Hf ratios similar to the average crust, suggesting that isotopic decoupling was not originated from an ancient basement with elevated Lu/Hf ratios. The high  $\varepsilon_{Hf}(t)$  values and poor correlation between  $\varepsilon_{Hf}(t)$  and  $\varepsilon_{Nd}(t)$  values suggest that these rocks represent an early Paleozoic magmatic arc built on a late Neoproterozoic crustal block such as the Lake Zone in western Mongolia. The observed isotopic decoupling is similar to that for those modern island arcs, such as the Lesser Antilles and Sunda, where Nd selectively enriched over Hf due to metasomatism in the mantle wedge and consequently resulted in decoupling between the Sm-Nd and Lu-Hf isotopic systems. Our data, combined with the available data show that prolonged subduction and crust-mantle interaction caused the Nd-Hf isotopic decoupling in the lithospheric mantle beneath the Chinese Altai.