Rejuvenation and growth of micro-continents of the CAOB: insights from zircon isotopic mapping in the Yili Block and adjacent regions

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Clarification of the large-scale spatio-temporal distribution of various (juvenile, reworked, ancient) crusts and understanding of geologic processes controlling the formation of crust is one of the major subjects of geologic studies, and is also extremely important in mineral exploration and prospecting. The triangular Yili Block is a microcontinent bordered by sutures and fault zones in the western Chinese Tianshan. Voluminous igneous rocks, mostly granitoids, were exposed and constitute two major belts stretching in southern and northern margins of the Yili Block. We synthetically compile up-to-date geochronogical, zircon Hf isotopic and whole-rock geochemical data for Paleozoic felsic rocks from the Yili Block and adjacent tectonic domains.

The results suggest the considerable spatio-temporal heterogeneity in sources of these felsic rocks, i.e., deep crustal compositions. They were mainly formed at three stages, i.e., ~470 to ~390 Ma, ~370 to ~320 Ma and ~320 to 250 Ma. The first-stage granitoids are characterized by relatively ancient Hf isotopic compositions [$\varepsilon Hf(t)$=-5.2 to +8.3, crustal Hf model ages (T_{DM}^{c}) range from 0.91 to 1.77 Ga, mostly >1.1 Ga]. On the contrary, the second- and third-stage granitoids show more juvenile Hf isotopic signatures ($\varepsilon Hf(t)$=-4.5 to +15.7, T_{DM}^{c}=0.35 to 1.60 Ga, mostly <1.15 Ga). Spatially, granitoids with more ancient Hf isotopic features are dominantly exposed in comparatively marginal parts of the Yili Block, whereas the inner parts are dominated by granitoids with juvenile Hf isotopic features. The temporal and spatial variation in zircon Hf isotope is indicative of rejuvenation and growth of the Yili Block and adjacent regions during the CAOB evolution. The juvenile isotopic signatures was likely related to anatexis of basic to intermediate, juvenile igneous/metaigneous rocks that replaced the ancient basement rocks of the microcontinent. Such a replacement was likely associated with the retreating suduction of branches of the Paleo-Asian Ocean.

Key words: Hf-in-zircon isotope; Microcontinent; CAOB

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