



Zircon U–Pb chronology, Hf isotope analysis and whole-rock geochemistry for the Neoproterozoic–Paleoproterozoic Yudongzi complex, northwestern margin of the Yangtze craton, China

Bo Hui (1), Yunpeng Dong (1,2), Chao Cheng (1), Xiaoping Long (1), Xiaoming Liu (1), Zhao Yang (1), Shengsi Sun (1), Feifei Zhang (1), and Jan Varga (3)

(1) State Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, Northern Taibai Str. 229, Xi'an 710069, China, (2) Department of Earth Sciences, Western University, 1151 Richmond Street N., London, Ontario N6A 5B7, Canada, (3) School of Natural and Built Environments, University of Australia, GPO Box 2471, Adelaide, SA 5001, Australia

The Archean–Paleoproterozoic high-grade basement of Yudongzi complex is a key to understanding the early Precambrian crustal evolution of the Yangtze craton. It comprises mainly orthogneiss, paragneiss and amphibolite, whose protoliths are tonalitic-trondhjemitic-granodiorite (TTG), sedimentary and basic-intermediate volcanic rocks, respectively. The TTG gneiss, amphibole plagiogneiss and biotite plagiogneiss yield magmatic zircon LA-ICP-MS U–Pb ages of 2815 ± 18 Ma (MSWD = 0.92), 2692 ± 26 Ma (MSWD = 0.59) and 2449 ± 4 Ma (MSWD = 0.94), respectively. Metamorphic overgrowths on zircon from amphibolite have an age of 1848 ± 5 Ma (MSWD = 0.71). TTG gneisses show medium Sr/Y and variable high (La/Yb)_N ratios with low Y and Yb contents. They are characterized by positive Eu anomaly and distinct depletion of HREE together with negative Nb, Ta and Ti, implying amphibole, garnet and minor rutile as residual phases. Their positive $\epsilon_{\text{Hf}}(t)$ values of +2.1 to +8.1 with TDM2 of ca. 2.80–3.10 Ga suggest significant reworking of juvenile crust. Amphibole plagiogneisses display a strong enrichment of LREEs and depletion of Nb, Ta and Ti. Additionally, a relative enrichment of Ba, Rb, Pb and Zr, as well as high Cr and Ni contents and Mg# values, imply a mantle source with the addition of continental crust material. Zircon $\epsilon_{\text{Hf}}(t)$ values vary between -0.9 and +3.9, suggesting a proportionally significant input of juvenile material and therefore interaction between the mantle and pre-existing continental crust. Biotite plagiogneisses show negative $\epsilon_{\text{Hf}}(t)$ values between -3.4 and -0.1 with a few positive $\epsilon_{\text{Hf}}(t)$ values ranging from +0.1 to +1.5. Together with TDM2 ages of ca. 2.80–3.00 Ga, these $\epsilon_{\text{Hf}}(t)$ values suggest that these rocks were mainly generated by reworking of ancient crust. Thus, the Yudongzi complex exposed in the northern part of the Yangtze craton has experienced significant reworking of juvenile crust at ca. 2.80 Ga and subsequent crustal growth at ca. 2.70 Ga, followed by a second stage of reworking of ancient crust at ca. 2.45 Ga. During the Late Paleoproterozoic, the Yudongzi complex was probably involved in the amalgamation of the Paleoproterozoic supercontinent Columbia, and affected by a post-collisional metamorphic event at ca. 1.85 Ga.