

Hadean terrestrial crust in the southern North China Craton: evidence from the Xinyang felsic granulite xenoliths

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An increasing number of Hadean zircons have been discovered in China, which provide an important opportunity to unravel the nature and evolution of the early Earth. However, most of them were found as detrital or xenocrystic grains in the Phanerozoic orogenic belts, thus the source of the Hadean materials in China remain enigmatic. Four garnet-free felsic granulite xenoliths entrained by the Mesozoic Xinyang volcanic rocks in the southern North China Craton (NCC) were selected for zircon U-Pb dating and Lu-Hf isotope analysis, as well as whole-rock major- and trace elements. Their petrography and geochemical composition reveal that the xenoliths are of igneous origin. The magmatic zircons yield formation ages including 3.5-3.6 Ga and ca 2.1 Ga. The 3.5-3.6 Ga zircons have widely variable $\varepsilon_{\text{Hf}}(t)$ of -7.8 to +4.0 and T_{crust} of 3.5-4.3 Ga, whereas the ca 2.1 Ga grains give largely negative $\varepsilon_{\text{Hf}}(t)$ (-29.0 to -26.2) and Hadean model ages ($T_{\text{crust}}=4.4-4.5$ Ga). The metamorphic zircons from the studied xenoliths give two thermal episodes at 2.73 Ga and 1.61-2.35 Ga. These results suggest that the Hadean crustal components may exist in the southern NCC, and subsequently suffered the complex modification in the Paleoarchean-Paleoproterozoic. Combined with the published data, the Hf crustal model ages of zircons from the NCC (peak at ca 4.0 Ga) are older than those from the South China Craton (peak at ca 3.8 Ga). This means that there is much more likelihood of finding more Hadean terrestrial crust in the NCC, than in the South China Craton. Moreover, the Xinyang area in the southern NCC is prospective for further finds of Hadean zircons in China.