

Geochronology and Hf-O isotopes of gneisses from the Taihua Complex in the southern Trans-North China Orogen: Implications for early Paleoproterozoic global magmatism

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The Paleoproterozoic era is of great importance in the evolution of the Earth and may be represented the first supercontinent cycle. Although the Early Paleoproterozoic magmatism appears to be rare, the Taihua Complex on the southern margin of the Trans-North China Orogen (TNCO) records extensive magmatism during this period. The ca. 2.3 Ga magmatism was concentrated in the southern TNCO more than that in the middle–northern TNCO. The Taihua Complex in the Xiaoqinling area is the largest exposure of Precambrian basement in the southern TNCO, which is one of the most potential sites for investigating the early Paleoproterozoic tectonic and magmatic evolution of the North China Craton (NCC). In this contribution, we use zircon U–Pb dating, Lu–Hf and O isotopic analysis to constrain the age, provenance, and magmatic processes of the protoliths for the Paleoproterozoic granitic gneiss, tonalitic gneisses, and migmatitized tonalitic gneiss from the Taihua Complex within the Xiaoqinling terrane. Our new U–Pb and Hf–O isotope data in combination with similar regional data in the entire NCC, allows us to better assess the source characteristics of these gneisses, and to constrain the tectonic evolution of the southern TNCO during the early Paleoproterozoic global plate tectonic slowdown or shutdown. This study shows that the tonalitic gneisses in the Taihua Complex have crust-like Hf–O isotopic compositions with slightly negative to positive mean $\epsilon\text{Hf}(t)$ (–1.8– +0.7) and low to moderately elevated mean $\delta^{18}\text{O}$ values (4.3–6.6‰), indicating a mixed origin of continental crust assimilated by mantle-derived magmas.