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Structural evolution of the Paleoproterozoic Trans-North China Orogen: Evidence from the Xiaoqinling region, central China

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Abstract

High-grade metamorphic rocks of Archean to Paleoproterozoic age, collectively called the Taihua Complex, are well exposed in the Xiaoqinling region in the western part of the southern segment of the Trans-North China Orogen (TNCO), central China. However, the evolution of orogenic events in this part of the TNCO remains unclear. Here we present structural and zircon U–Pb data to constrain the structural evolution of the rocks in the Xiaoqinling region. The first phase of deformation (D₁) produced penetrative, ductile fabrics and localized ductile shear belts, and it was accompanied by a regional high-grade metamorphism. The D₁ structures were the result of WNW-directed thrusting movements that have been dated at 1863–1840 Ma, and the microstructures suggest temperatures of 600–650 °C, which correspond to the conditions of exhumation of these orogenic rocks. These data support the ca. 1.85 Ga collision model for the Western and Eastern blocks that involves the SE-directed subduction of the Western Block. The second phase of deformation (D₂) produced localized E–W-striking normal shear belts, and the D₂ structures provide reliable evidence for N–S extension during the late Paleoproterozoic. Intense magmatic activity accompanied this period of extension. Zircon U–Pb dating constrains the extension to the period between 1829 and 1703 Ma. Post-orogenic extension in the TNCO accounts for D₂ and the associated magmatism, and orogen-parallel extension is indicated by the structures.

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