

Zircon record of Paleozoic evolution of central metamorphic belt in China

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The formation of collisional orogens is a complex process involving multistage tectonism of compression and extension due to subduction and collision. The central metamorphic belt marks the suture zone between the North China Block (NCB) and the South China Block (SCB) in central China, which records multistage processes of tectonism from oceanic subduction to continent–continent collision. The final Triassic continent–continent collision and HP-UHP metamorphism have been well constrained. However, the Paleozoic evolution, mostly recorded in the North Qinling orogen, has not been well studied. In this study, we carried out an integrated study of zircon U-Pb age, trace element, and Hf isotope compositions for high grade metamorphic rocks to constrain the evolution of the North Qinling. Ultra-high pressure rocks were distributed mainly along the northern margin and occasionally in the inner part of the North Qinling terrane. The UHP metamorphism occurred at ca. 490 Ma, resulting from the northward subduction of the North Qinling below the Erlangping arc. The UHP metamorphic rocks experienced partial melting at almost the same time, indicating very quick exhumation and partial melting. It is inferred that the North Qinling UHP terrane is small, thin, and fast UHP terranes formed early during the orogeny of the central metamorphic belt. Anatexis zircon from regional migmatites yields formation ages ranging from 455 ± 5 to 420 ± 4 Ma, with a peak at c. 435 Ma. Combined with previous results, we suggest that the migmatization of the NQ terrane occurred at c. 455 to 400 Ma, arguing for their formation due to the northward subduction of the Shangdan Ocean. The UHP rocks were exhumed along the northern edge and detached from the basement by the subsequent migmatization process. Therefore, the North Qinling terrane experienced multi-stage metamorphism in the Paleozoic during the amalgamation of the NCB and SCB.