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Zircon Hf isotope and its tectonic implications on crustal growth and evolution of the Western Block, North China Craton

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The Khondalite Belt prove progressively to be a continent-continent collisional belt along which the Yinshan Block in the north and the Ordos Block in the south were collided to form the Western Block of the North China Craton at ~1.95 Ga. Complemented by new zircon Hf isotopic data from the Qianlishan Complex of western part of the Khondalite Belt, available zircon U-Pb geochronological and in-suit Hf isotopic data from the Western Block provide significant differences between the tectonic units to evaluate particulars about the pre-amalgamation crustal formation and growth history of the Western Block. In particular, TTG rocks of the Yinshan Block mainly emplaced at around 2.5 Ga, corresponding to a main Hf model age peak of 2.8-2.7 Ga. This suggests that the significant crustal growth of the Yinshan Block would occur in the period 2.8-2.7 Ga, and then the Yinshan Block was intensively reworked to form the TTG rocks at about 2.5 Ga, without addition of juvenile mantle materials. Both the Ordos Block and the Khondalite Belt shown consistent zircon U-Pb ages and similar Hf isotopic features. These zircons yielded two distinct U-Pb age populations of Neoarchean (~2.5 Ga) and Paleoproterozoic (2.2-2.0 Ga). Of those, the Neoarchean zircons are minor in quantity and exhibit similar Hf isotopic features to those of the Yinshan Block. In contrast, Paleoproterozoic (2.2-2.0 Ga) zircons are predominated and possess positive $\varepsilon_{Hf}(t)$ values, amounts of which are close to that of depleted mantle. This suggests a major significant mantle extraction event of the Ordos Block in the Paleoproterozoic. Taken together, the Ordos Block was most likely a juvenile crust (e.g. arc) with minor old Neoarchean (~2.5 Ga) basement in the period 2.2-2.0 Ga. They provided a dominated provenance for the khondalites of the Khondalite Belt in the north margin and Lüliang Complex in the eastern margin at a passive continental margin environment.