Eoarchean to Paleoproterozoic crustal evolution in the North China Craton

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The early evolution of continental crust, particularly its lower layer, during the first 2.0 billion years of Earth history remains enigmatic. In our recernt paper, we present coupled *in-situ* U-Pb, Lu-Hf and O isotope data for the Precambrian zircons from fourteen deep-crustal xenoliths from five localities in the North China craton. The results show that:

(1) Eo-Paleoarchean Xinyang granulite xenoliths are the oldest pieces of the crust in the southern NCC and perhaps the known oldest unexposed lower crustal rocks in the world, dating back to ~3.82 Ga. The 3.82−3.55 Ga magmatic zircons have predominant sub-chondritic Hf isotope compositions and elevated $\delta^{18}O$ values, suggesting Lu-Hf fractionation and crust-hydrosphere interactions on the Earth can be traced back to Eoarchean or even earlier.

(2) The magmatic zircons from the studie xenoliths define four age populations at 3.82−3.55 Ga, ~2.7 Ga, ~2.5 Ga and 1.95−1.85 Ga, and yield a non-linear Hf isotope-age array. These data reveal crustal growth in the North China occurred as early as >3.9 Ga and reached its climax in the Neoarchean. The pre-existing continental crust was reworked at 3.8−3.5 Ga, ~2.7 Ga, ~2.5 Ga and 1.95−1.85 Ga.

(3) The zircons from lower crustal xenoliths record a secular change in O isotopes. An increasing range in zircon $\delta^{18}O$ values at ~2.5 Ga marks enhanced recycling of surface-derived materials, including high-$\delta^{18}O$ sediments, weathered and altered rocks and low-$\delta^{18}O$ altered oceanic crust. Subduction of hydrated oceanic crust back to mantle depths may have occurred at least before ~2.5 Ga and have played an important role in generation of continental crust.

Reference:

Ma Q., et al. Eoarchean to Paleoproterozoic crustal evolution in the North China Craton: Evidence from U-Pb and Hf-O isotopes of zircons from deep-crustal xenoliths. Geochimica et Cosmochimica Acta (*in presss*) https://doi.org/10.1016/j.gca.2019.09.009.