

## **Zircon U-Pb-Hf isotopes and geochemistry of Neoproterozoic magmatic rocks in the Lüliang Complex, North China Craton: Constraints on petrogenesis and tectonic implications**

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The North China Craton suffered a strong tectonothermal event in late Neoproterozoic, with the crystalline basement dominantly composed of ca. 2.6-2.5 Ga granitoid gneisses and metamorphosed volcano-sedimentary sequences. However, controversial issues have long existed on the geodynamic setting of this event. We present new in situ LA-(MC-) ICP-MS zircon U-Pb-Hf isotopic data, and whole rock geochemical data for Neoproterozoic magmatic rocks in the Lüliang Complex. Seven biotite-monzonitic (plagioclase) gneisses and two meta-basalts yield crystallization ages of 2535-2504 Ma. Gneisses and meta-basalts exhibit variable Zircon  $\epsilon_{\text{Hf}}$  values of -1.4-8.8 and 5.1-11.6, respectively, with the highest  $\epsilon_{\text{Hf}}$  values near or equal to the contemporary depleted mantle. Metamorphic zircons from one gneiss show weighted mean age of  $2489 \pm 29$  Ma, suggesting that the Lüliang Complex was subjected to metamorphism in the Neoproterozoic- early Paleoproterozoic. Geochemical analyses of twelve meta-basalts reveal that these Neoproterozoic mafic rocks belong to the tholeiite and transitional series, and consist of basalt and basaltic andesite. They display weakly fractionated chondrite-normalized REE patterns ( $\text{La}_N/\text{Yb}_N=1.0-5.6$ ,  $\text{Sm}_N/\text{Yb}_N=0.9-2.9$ ) and prominently negative Nb-Ta-Ti anomalies. The generally low Ce/Yb ratios (most are 3.2-11.7), the lack of correlation between  $(\text{Nb/La})_{\text{PM}}$  and  $(\text{La/Sm})_N$  ratios, the high radiogenic Hf isotopes, and the EMORB-like geochemical features for some samples suggest no or little crustal contamination. It is suggested that the parental magma of most meta-basalts were derived from ~3-20% (mostly of ~3-10%) partial melting of a dominantly fluid-metasomatized sub-arc mantle wedge with ~2% spinel in the source. Other samples were generated from deeper levels in the mantle with ~2-7% garnet in the source. This study indicates Neoproterozoic lateral accretion and crustal growth in the central North China.