Iron and calcium isotopic compositions of continental basalts from the North China Craton

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Isotopic characteristics of Iron and Calcium in high temperature geochemical processes have been proven to be important constraints on understanding mantle dynamics. It is already documented that lower iron and calcium isotopic compositions in some oceanic basalts from Koolau volcano in Hawaii, were attributed to a mafic component and recycled ancient marine carbonates in the mantle source [1, 2]. However, few investigations have been conducted on continental basalts so far.

Here we present high-precision iron and calcium isotopic analyses on Cenozoic alkaline basalts from Yangyuan in the North China Craton. Notably, these continental basalts show limited variations in both $\delta^{57/54}$Fe and $\delta^{44/40}$Ca, which indicate homogeneous iron and calcium isotopic compositions. In the basalt samples, $\delta^{57/54}$Fe ranges from 0.24 to 0.29, isotopically heavier than reported $\delta^{57/54}$Fe in Yangyuan mantle peridotites (0.08 ± 0.04) [3]. And $\delta^{44/40}$Ca ranges from 0.62 to 0.68, ~0.4 per mil lower than reported $\delta^{44/40}$Ca for typical upper mantle value (~1.0) [1]. Apparently, the two offsets in the continental basalts from North China Craton are different with those in oceanic basalts from Koolau lavas, probably stem from complicated geochemical processess during partial melting of the mantle and magma evolution, and implies that the $\delta^{57/54}$Fe and $\delta^{44/40}$Ca values of primitive basaltic melts might not represent the composition of the mantle source.

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