

In searching for old lithospheric relict beneath North China craton: Sr-Nd-Os isotopic composition of peridotite xenoliths from Yangyuan

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The North China Craton (NCC) experienced widespread lithospheric extension during the late Mesozoic and Cenozoic, which have resulted in the replacement of the thick, old, cold and refractory lithospheric keel by a thin, young, hot and fertile mantle. Recent studies further suggest that the Mesozoic lithospheric thinning was diachronous with that in west to the Daxin'anling-Taihang Gravity Lineament (DTGL) being later than in the eastern part of the NCC[1]. It has been speculated that the present lithosphere mantle in western China is the relics of ancient mantle, whereas that in the eastern NCC is a mixture of ancient mantle and newly accreted mantle. To test this prediction, major, trace element abundances and Sr-Nd-Os isotopic analyses have been carried out on the peridotite xenoliths from Tertiary alkali basalts in Yangyuan, western NCC. Some samples are characterized by moderate $^{87}\text{Sr}/^{86}\text{Sr}$ (0.7044 to 0.7047) and low ϵ_{Nd} (-6.9 to -10.6), pointing to an EMI-type signature. Given the fact that EMI isotopic compositions are largely observed in ancient cratons, it is suggested that the Yangyuan xenoliths also represent samples of the old lithosphere mantle. The presence of the late Archean lithosphere mantle under Yangyuan is also supported by low $^{187}\text{Os}/^{188}\text{Os}$ ratios in the same samples (mostly < 0.12 with the lowest value of 0.11), which are typical of cratonic peridotites [2]. In addition, the low $^{187}\text{Os}/^{188}\text{Os}$ ratios in western NCC contrast with the relatively narrow $^{187}\text{Os}/^{188}\text{Os}$ range (0.118-0.128) for the eastern NCC samples, which largely overlap the Os isotopic range of abyssal peridotites [3]. This is compatible with the view that the lithospheric mantle beneath the western NCC is old and perhaps was stabilized in the Pre-Cambrian and the majority of the lithospheric mantle under the eastern NCC is mostly "young".

References

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