Shallow Subduction of the Paleo-Asian Oceanic Plate beneath the Northern North China Craton: Constraints from Peridotite Xenoliths in the Yangyuan Basalts

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Shallow subduction occurs at several present-day convergence zones, but it is highly likely that this process has occurred throughout the Earth history.

In this research, *In-situ* major and trace elements and Sr isotopic compositions of peridotite xenoliths carried by the Yangyuan Tertiary basalt were analysed to constrain subduction style of the Paleo-Asian oceanic plate (PAOP) and its influence on the northern North China Craton (NCC). One group of peridotite xenoliths have major element compositions of minerals fall in the range of Archean-Proterozoic SCLM beneath the NCC. Clinopyroxenes in these xenoliths exhibit REE patterns varied from LREE-depleted to LREE-enriched with $^{87}Sr/^{86}Sr$ ratios increase from 0.7022 to 0.7042. Correlations between $^{87}Sr/^{86}Sr$ with the Nb/La and Th/Nb ratios in these clinopyroxenes suggest that the metasomatic agents are aqueous fluids derived from the subducted PAOP at relatively shallow depth. Modal calculations show that the other group of xenoliths could have experienced much low degree of partial melting. Clinopyroxenes in these xenoliths exhibit LREE-depleted REE patterns with the highest $^{87}Sr/^{86}Sr$ ratios (0.7040 - 0.7050). Patches of silica-rich glasses were found in their grain boundaries. These glasses have very low Ce/Pb (0.11 - 0.13) and Nb/Th (0.76 - 1.34) ratios with sediment-like trace elements patterns and thus are supposed to be the melt from recycled sediments. These observations indicate that a newly lithospheric mantle may has accreted to the mantle wedge from freezing asthenosphere above the subducted PAOP. Combined with geophysical and tectonic evidences, we propose that a shallow subducted PAOP may have existed beneath the northern NCC and contributed to the transformation and relamination of the lithosphere.