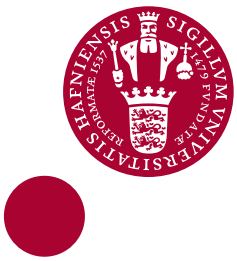

For richer and poorer

depletion and enrichment in sub-continental lithospheric mantle xenoliths from southern Zealandia

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For richer and poorer: depletion and enrichment in sub-continental lithospheric mantle xenoliths from southern Zealandia

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New Zealand continental crust has a simple and young history, and the oldest exposed rocks are Cambrian in age. However, xenoliths of the subcontinental lithospheric mantle (SCLM) in Eocene-Miocene intra-plate alkaline volcanics yield Re model ages that indicate ancient depletion and a history that is decoupled from the overlying crust (1).

Laser ablation trace element data and radiogenic isotope compositions have been determined for a suite of clinopyroxene separates from spinel peridotite xenoliths from southern New Zealand. Isotope compositions predominantly overlap with those of the host volcanics, especially with respect to Pb isotopic compositions, suggesting that the HIMU-like signature of the volcanics is also present in the SCLM. However, some samples extend to more depleted compositions and point to a depletion history not evident in the overlying crust.

Three groups of xenoliths can be identified. Group 1 has rare earth element (REE) signatures indicative of high degrees of depletion and subsequent metasomatism, i.e. generally depleted patterns but enrichments in the lightest REE. Isotopic compositions of group 1 are consistent with ancient depletion (0.5-2.0 Ga) coupled with relatively ancient metasomatism. Group 2 has trace element compositions consistent with moderate degrees of depletion and no evidence for subsequent metasomatism. Isotopic compositions for group 2 suggest that depletion is not modern but occurred at some point in the Phanerozoic. Group 3 has REE compositions indicative of moderate to small degrees of depletion and relatively large amounts of subsequent metasomatism. The isotopic signatures of these samples represent either relatively recent depletion and metasomatism, or generally large degrees of metasomatism that swamp potentially ancient depleted signatures and thus preclude distinguishing between ancient or recent depletion and metasomatism. No single metasomatising component can explain the observed REE patterns and some samples are best modeled using a low-degree silicate melt as the metasomatising agent, whereas others require a carbonatitic fluid.

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Reference
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