Hf-Nd isotope systematics in mantle xenoliths from Siberia and Mongolia

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Peridotite xenoliths provide rare direct samples of Earth's lithospheric mantle. Chemical and isotope analyses of their constituent minerals can provide crucial information about the chemical evolution and formation age of their source regions, if the effects of partial melting, metasomatism, metamorphism or surface alteration [1] can be disentangled. Here, we present high-precision Hf and Nd isotope data together with trace-element compositions on coexisting clinopyroxene-orthopyroxene (cpx-opx) pairs from well-characterised spinel peridotite samples of different fertility from five different locations in Siberia [2, 3] and Mongolia [4].

The trace element compositions of cpx-opx(-ol) and reconstructed whole-rocks reveal variable degrees and styles of metasomatism. The extent of isotopic disequilibrium between cpx and opx varies between and within the sample suite(s), but can distinguish between, and possibly date the age of, various metasomatic and depletion events. Information about the timing of depletion events can be preserved in the Lu-Hf isotope system although the Sm-Nd system is entirely reset by metasomatism. External and internal isochrons together with mixing models allow constraining the evolution of the continental lithospheric mantle.

Near-equilibrium of Nd and Hf isotope ratios between cpx and opx in some peridotites from the Siberian craton [4] indicate high-T isotopic equilibration before eruption. Any age information about prior depletion or metasomatism is obliterated here. However, samples from SE Mongolia show consistent internal and external Lu-Hf isochrons, and provide novel constraints about ancient depletion events [*cf.* 2], in line with cpx Sm-Nd [5] model ages for the mantle.

[1] Byerly & Lassiter (2015) *Chem. Geol.* **413**, 146–158. [2] Doucet *et al.* (2015) *Chem. Geol.* **391**, 42–55. [3] Ionov *et al.* (2005) *Chem. Geol.* **217**, 41–75. [4] Ionov (2007) *Contrib. Mineral. Petrol.* **154**, 455–477. [5] Deng & Macdougall (1992) *Nature* **360**, 333–336.