# Multiple metasomatic events within the Siberian SCLM revealed by halogen and noble gas analysis

M. W. BROADLEY[1*], P. H. BARRY[2], R. BURGESS[3], H. SUMINO[1], C. J. BALLENTINE[2], D. A. ZEDGENIZOV[4] AND L. TAYLOR[5]

[1]GCRC, Univ. Tokyo, Tokyo 113-0033, Japan (*correspondence: broadley@eqchem.s.u-tokyo.ac.jp)
[2]Dept. Earth Sciences, Univ. Oxford, Oxford OX1 3AN, UK
[3]SEAES, Univ. Manchester, Manchester M13 9PL, UK
[4]V.S. Sobolev Institute of Geology and Mineralogy, SBRAS, Novosibirsk 630090, Russia
[5]Dept. Earth Planet. Sci., Univ. Tennessee, TN 37996, USA

Kimberlite eruptions transport mantle material (i.e., eclogites, peridotites, diamonds) from the sub-continental lithospheric mantle (SCLM) to Earth's surface. Previous studies of xenoliths have shown the Siberian SCLM has been extensively metasomatized by subduction and plume related fluids [1] [2], respectively. Here we investigate halogen and noble gas characteristics of peridotites and diamonds from the Udachnaya (360 Ma) and Obnazhennaya (150 Ma) kimberlites in order to determine the extent to which volatiles are introduced into the SCLM through metasomatic events.

Udachnaya peridotites and diamonds have consistently higher halogen (CL, Br, and I) concentrations than those from Obnazhennaya, although all samples are enriched by several orders of magnitude compared to MORB. Values of Br/Cl and I/Cl of the xenoliths values are similar to eclogite fluids and Canadian diamonds, whereas Udachnaya diamonds are indistinguishable from marine pore fluids [3] [4].

High concentrations of halogens, together with Br/Cl and I/Cl values similar to eclogites and Canadian diamonds, indicate that the Siberian SCLM has been subjected to metasomatism by a halogen-rich fluid, likely incorporated into the SCLM directly from the release of subducted eclogitic fluids. Alternatively, this fluid may result from halogen fractionation and Cl removal during crystallization of Cl rich phases. Isotopes of He from both localities suggest that a secondary metasomatic event occurred, involving the impingement of the Siberian Flood Basalt (SFB) plume (250 Ma) into the Siberian SCLM [2]. This increased the $^{3}He/^{4}He$, while contemporaneously lowering the halogen concentration in the Obnazhennaya xenoliths relative to Udachnaya samples, which were erupted prior to SFB emplacement.

[1] Pernet-Fisher et al., 2015 Lithos **218-219,** 141. [2] Barry et al., 2015, Lithos, **216**, 73. [3] Svenson et al., 1999 Geology **27**, 467. [4] Burgess et al., 2009 GCA **73**, 1779.