Lithium in mantle xenoliths from Siberian kimberlites

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Udachnaya (360 Ma) and Obnazhennaya (160 Ma) kimberlite pipes, Siberia, predate and postdate the emplacement of the Siberian Flood Basalt (SFB, 250 Ma), respectively. Mantle xenoliths from these two pipes have experienced extensive recycled crustal and basaltic metasomatism, which is apparent in distinct He and Re–Os isotope compositions [1] [2]. Li contents and isotope compositions were measured for spinel and garnet lherzolites as well as eclogites and a pyroxenite. Udachnaya xenoliths show more variable Li contents in bulk samples than Obnazhennaya xenoliths (1.7–15.2 ppm vs. 0.7–2.9 ppm, respectively). Conversely, ~30‰ variation in δ^7Li was determined for Obnazhennaya vs. ~10‰ for Udachnaya, implying distinct metasomatic imprints for the two suites. Compared with classical partitioning and isotope fractionation schemes in normal mantle peridotites and eclogites [3], these samples suggest garnet plays an important role due to elevated Li (up to 19 ppm) and predominantly high δ^7Li (up to 19.2‰). Olivine is most resistant to such metasomatic events, whereas clinopyroxene incorporates large amounts of Li with normal to high δ^7Li values. These findings contrast with metasomatic effects by basaltic melts in mantle xenoliths from other sub-continental lithospheric settings (e.g., [4]), but recycled crustal fluids [cf. 1] would require specific compositions (i.e., high δ^7Li signatures). Eclogites are particularly enriched in Li (up to 445 ppm; garnet has up to 115 ppm), and their δ^7Li suggests near equilibrium between pyroxene and garnet. The high δ^7Li values of eclogites from Udachnaya and Obnazhennaya stand in stark contrast to worldwide eclogite localities [5]. Whether kimberlitic melts may play a prominent role in generating the observed high-[Li]-δ^7Li signature remains to be investigated.

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[1] Barry et al. (2015) *Lithos* **216-217**. [2] Pernet-Fisher et al. (2015) *Lithos* **218-219**; [3] Seitz & Woodland (2000) *ChG* **166**. [4] Ackerman et al. (2013) *J Petrol* **54**. [5] Marschall et al. (2007) *EPSL* **262**.