Melting and Metasomatism in the South Patagonian Lithospheric Mantle

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This work focusses on a suite of alkali-basalt hosted mantle xenoliths from Pali Aike. These xenoliths are typically fertile in composition with mineral assemblages consisting of olivine (Fo_{88-90}), orthopyroxene (En_{86-90}), clinopyroxene (Cr-diopside $En_{50}Wo_{50}$) and an aluminous phase – garnet, spinel or commonly both. Some samples contain accessory phlogopite, vein glass & phlogopite filled veins, which is indicative of hydrous modal metasomatism. Phlogopite occurs in samples which have been calculated to have equilibrated at the highest pressures (c. 21-22 kbar). This is consistent with the concept of a metasomatic front at the base of the lithosphere. Some garnet-free samples contain silicic glasses of intermediate composition. These are commonly associated with small, irregular shaped spinels.

There is little conclusive evidence for cryptic metasomatism in analyses of REE in clinopyroxenes – variable amounts of LREE enrichment is observed. However, there is also no strong depletion in LREEs, indicating small amounts of melt extraction in the presence of this phase. REEs in garnet display a typical depleted trend.

Major element modelling based on the method of of Herzberg 2004[1], suggests that spinel + garnet lherzolites are produced by up to 15% adiabatic decompression melting over a pressure interval of 30-20 kbar, whereas spinel lherzolites are produced by up to 35% over a pressure interval of 40–10 kbar.

[1] Herzberg (2004) *J. Petrology,* **45(12),** 2507-2530