Geophysical Research Abstracts,
Vol. 11, EGU2009-12046-1, 2009
EGU General Assembly 2009

Metasomatic processes within the fertile lithospheric Mantle beneath Don Camilo, Santa Cruz, Argentina

Th. Ntaflos (1), A. Mundl (1), E.A. Bjerg (2), C. Tschegg (1), and J. Kosler (3)

(1) Dept. of Lithospheric Research, University of Vienna, Austria, (2) Instituto Geologico del Sur CONICET-UNS, Bahia Blanca, Argentina , (3) Dept. of Earth Science, University of Bergen, Bergen, Norway

Mantle xenoliths in alkalibasalts from Don Camilo, an area located at the North margin of the Deseado Massif in Patagonia, comprise mainly spinel-bearing lherzolites and dunites as well as less common harburgites, wehrlites, clinopyroxenites and gabbros. Spinel-lherzolites and harzburgites have protogranular textures whereas dunites have equigranular to equigranular tabular textures. There are two kinds of dunites: mantle and cumulate dunites. The olivine mg# in the mantle dunites vary within a narrow range from 90.5 to 91.5 and the NiO content from, 0.39 to 0.42 wt. %, whereas in the cumulate dunites the mg# ranges from 87 to 90.5 and the NiO content from 0.22 to 0.40 wt. %. Both types of dunite contain fine grained interstitial diopside. Hydrous phases, besides one sample that contains amphibole, were so far not found.

The spinel peridotites have Primitive Mantle normalized (PM) whole rock REE abundances depleted in LREE [(La/Yb)N=0.34-0.85)] and the dunites are LREE enriched [(La/Yb)N=3.49].

LA-ICP-MS analyses of cpx show that a number of the studied spinel peridotite xenoliths experienced cryptic metasomatism. Three groups of xenoliths have been recognized according to their PM normalized REE and other incompatible trace element patterns in cpx: group I has depleted LREE abundances and group II is highly enriched in LREE (20-30 x PM) and group III has moderate LREE enrichments. Cores of some clinopyroxenes in group II have depleted LREE similar to those in group I, apparently representing relictic cores not affected by metasomatism. In addition, the metasomatized clinopyroxenes are significantly enriched in Sr, Th and U. Evidently, the metasomatic agent was a H2O-rich fluid (high LREE, Sr, Th and U).

Mantle and cumulate dunites have experienced modal metasomatism. In both types of dunite interstitial clinopyroxene appear to be of metasomatic origin. The clinopyroxene from cumulate dunites depleted LREE abundances and low HREE indicating that they have been formed from residual melts. In contrast, clinopyroxene from mantle dunites enriched LREE (10 x PM) and LILE suggesting that the metasomatic agent was fluid-rich silicate melt.

Calculated equilibrium P-T conditions cover a wide range from 800 to 1100 °C. Considering the crustal thickness in the area being around 35 km, a pressure between 12 and 17 kbar could be assumed as reasonable, indicating that these xenoliths were extracted from shallow depths of 40 to 60 km.

Model calculations have shown that the lithospheric Mantle beneath Don Camilo, in Santa Cruz province is fertile and that spinel peridotites experienced low degrees of partial melting (2–8% batch melting in the spinel peridotite field). The metasomatic agent was a fluid-rich silicate melt of alkalibasaltic composition, presumably similar to this, which affected the Cerro Clark xenoliths north of Don Camilo locality. Don Camilo mantle xenoliths, like Tres Lagos, Cerro Redondo and Gobernador Gregores, does not show evidence for interaction of the lithospheric Mantle in southern Patagonia with subduction related components.