Geophysical Research Abstracts
Vol. 12, EGU2010-10191, 2010
EGU General Assembly 2010

Petrogenesis of spinel peridotite suite xenoliths from northern Santa Cruz province, Argentina; implication for the Patagonian Lithospheric Mantle

Theodoros Ntaflos (1), Andrea Mundl (1), Ernesto Bjerg (2), Cornelius Tschegg (1), and Jan Kosler (3)

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

Mantle xenoliths from Don Camilo, an area located on the North margin of the Deseado Masiff in Patagonia, comprise spinel bearing lherzolites, harburgites and dunites, wehrlites, clinopyroxenites and gabbros. The most common rock type in our collection is spinel-lherzolite followed by dunites. Harzurgites, wehrlites and gabbros are less widespread. Spinel-lherzolites and harzburgites have protogranular textures whereas dunites have equigranular to equigranular tabular textures. There are two kinds of dunites: mantle dunites 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 dunites contain fine grained interstitial diopside. Hydrous phases, besides one sample that contains amphibole, were so far not found.

The spinel peridotites have 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 REE and other incompatible trace element patterns in cpx: group I has depleted LREE abundances, group II is highly enriched in LREE (20-30 x PM) and group 3 has moderate LREE enrichments. The core of some clinopyroxenes in group II has 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). Clinopyroxene Sr and Nd isotopic ratios vary largely from 0.702671 to 0.705788 and from 0.51229 to 0.513251 respectively.

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

Calculated equilibrium 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 can be assumed as reasonable, indicating that xenoliths were extracted from shallow depths, in the order of 40 to 60 km.

Model calculations have shown that the Lithospheric Mantle beneath Don Camilo 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 presumably similar to that which affected the xenoliths from Cerro Clark locality, north of Don Camilo. 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.