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Petrological study of Greene Point mantle xenoliths, Northern Victoria Land, Antarctica.

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A petrological study of mantle, anhydrous spinel-bearing lherzolites and harzburgites from Greene Point (GP) (Northern Victoria Land, NVL) have been carried out. Texturally they vary from protogranular to porphyroclastic with large orthopyroxene (opx) and olivine (ol) grains. Clinopyroxene (cpx) is smaller and often associated with vermicular and lobated spinel (sp). Several types of reaction textures occur with secondary phases represented by olivine (ol2), clinopyroxene (cpx2), cpx with spongy rim, and glass.
Ol in lherzolites presents lower forsteritic content (90.5-91.7) than in harzburgites (Fo: 91.6-92.3), but for three samples with an anomalously high Fo contents (92.3-92.7). Irrespective of lithology NiO contents are on the average ∼0.38 wt%. Opx, equilibrated with ol1, has mg# (Mg/(Mg+Fe)*100mol) values ranging from 91.0 to 92.6 with the highest values found in harzburgites. As for Ol, however three lherzolitic samples have mg# in opx overlapping the most residual harzburgites; $Al2O_3$ varies from 2.33 to 4.92 wt% following a residual trend. Opx is characterized by fractionated REE-chondrite normalized patterns, depleted in light REE (LREE), with the most residual character in harzburgites. Cpx1 has mg# varying from 91.5 to 93.9, with cpx in harzburgites presenting the highest values. As for the other two phases, cpx in three lherzolites presents mg# values comparable with those of harzburgites. $Al2O_3$ contents is between 4.00 and 6.42 wt% in lherzolites and from 2.32 to 4.37 wt% in harzburgites. TiO_2 never exceeds 0.66 wt%.
Cpx in lherzolites are usually depleted in Th, U, Nb, and Ta with Ti, Zr and Hf negative anomalies. They present a REE patterns variable from slightly LREE-enriched (with La and Ce inflections) to LREE-depleted with a general convex-upward trend. This latter trend is related to mg# rich lherzolites. In harzburgites cpx show the lowest HREE contents (YbN 1.00-2.94), with a strong positive fractionated L-MREE and flat HREE. Sp1 show a negative correlation between cr# (Cr/(Cr+Al) *100mol) (17.5-50.5) and mg# (67.3-81.6).
Glasses are silica-rich (SiO_2=59.16-68.51 wt%) with K2O and Na2O contents varying from 5.89 to 6.12 and from 5.76 to 9.72wt%, respectively. Trace elements are characterized by positive fractioned REE patterns at low HREE (YbN 2.10-2.72). Based on major and trace element models this mantle domain underwent a degree of partial melting variable between 10 and 18%. The Fe/Mg distribution between ol and sp evidences equilibrium for the majority of ol-sp pairs, leading to choose the ol-sp geothermometer of Ballhaus et al. (1991) to evaluate the GP thermal condition. Assuming a P of 15 Kbar, the majority of the samples has T close to 950°C; fO_2 ranges from Δlog fO_2 (QFM) -1.70 to -0.38 (Ballhaus et al., 1991). On the whole these new data confirm the tendency for anhydrous GP xenolith population to have higher equilibration T and comparable redox condition with respect to the nearby hydrous Baker Rocks peridotites (Bonadiman et al., 2014).

Ballhaus et al. (1991) CMP 106, 27-40
Bonadiman et al., (2014) CMP 167:984