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Heterogeneous mantle beneath S Sweden – evidences from peridotitic xenoliths

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Scania region in S Sweden is located in the periphery of East European Craton. It is underlain by Palaeo- to Mezoproterozoic crust, greatly reworked during the Sveconorwegian orogeny. In Jurassic/Cretaceous one to three pulses of volcanic activity producing alkaline mafic rocks took place (Bergelin et al., 2011, IJES; Tappe et al., 2016, GCA). Some of the basaltoids probed a substantial part of the lithosphere and carried peridotitic, pyroxenitic, noritic and granitoid xenoliths (Rehfeldt et al, 2007, IJES). We examined a suite of peridotitic xenoliths from 4 localities in Scania. The suite consists of spinel-bearing, anhydrous, clinopyroxene (Cpx)-poor lherzolites, harzburgites and subordinate dunites. The peridotites display a wide range of textural types, from porphyroclastic to protogranular, one harzburgite being unequigranular.

The porphyroclastic peridotites are characterized by low bulk rock Mg# (0.88-0.89) while in the protogranular xenoliths the Mg# is higher (0.90). Minerals forming protogranular peridotites are chemically homogeneous: the forsterite (Fo) content in olivine (Ol) and Mg# in pyroxenes are 91-92 and 0.91-0.93, respectively. Minerals forming porphyroclastic peridotites are slightly heterogeneous within a sample in terms of Mg#: the Fo content is 90-91 and Mg# in orthopyroxene (Opx) is 0.90-0.92. The heterogeneity of porphyroclastic peridotites is visible in Mg# of Cpx (91-92 within a single sample) and in its $Al2O_3$ (either 3 or 4-5 wt. % within a single sample) and $Cr2O_3$ contents ($\sim$1.2 wt.% where Mg#=90.8-91.8 and 0.8 wt.% where Mg#=91.9 – 92.3). Cr-rich Cpx is always associated with spinel (Spl). Fo in Ol in unequigranular harzburgite is 78, while Mg# in Opx is $\sim$81. In porphyroclastic and protogranular peridotites the Cr# in Spl is 0.23- 0.32, while in unequigranular harzburgite it is 0.06-0.09.

Cpx in the protogranular peridotites has convex downward REE patterns with positive bump at Nd, Opx is LREE-depleted. In porphyroclastic peridotites the trace element composition of pyroxenes is strongly variable within a sample (up to one order of magnitude); Cpx has convex upward REE pattern, while Opx is LREE-enriched. Scarce clinopyroxene in unequigranular harzburgite is LREE-depleted. εNd in protogranular peridotites is 2.63 and 4.13-4.52 in porphyroclastic ones. The equilibration temperatures in the protogranular peridotites exceed 1200°C (Brey & Köhler, 1990, JPetrol.).

The protogranular (high-Mg#) peridotites show typical melting-related characteristic pointing to $\sim$10% of depletion, but were also affected by cryptic metasomatic enrichment. The chemical composition of porphyroclastic (low-Mg#) peridotites was not shaped by partial melting but by cryptic metasomatism as suggested by LREE-enrichment in pyroxenes. The lack of chemical equilibrium in porphyroclastic rocks suggests, that the processes forming their composition were short-lasting. Equigranular harzburgite may record early stage of dunitization.

Peridotitic xenoliths from S Sweden show great variety in terms of textural and chemical properties: at least three lithologies varying in melting and metasomatic history have been described. Therefore, lithospheric mantle beneath this region must be strongly heterogeneous. Nevertheless, none of the lithologies shows features typical for cratonic mantle (e.g. Fo content in Ol<92).

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