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Regional study of orogenic ultramafics of the Seve Nappe Complex, Scandinavian Caledonides - preliminary results from northern and central Jämtland, Sweden

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The Scandinavian Caledonides comprise numerous ultramafic bodies emplaced within metamorphic nappe complexes. A hypothetical suture between the most distal crustal units representing Baltican margin (Seve Nappe Complex, SNC) with the oceanic Iapetian terranes (Köli Nappe Complex) is abundant in such occurrences. Here we present preliminary data on garnet/spinel peridotites/pyroxenites from SNC in central and northern parts of Swedish Jämtland county. The presented results are a part of a project involving regional study focused on orogenic peridotites (mostly spinel-bearing) of Seve and Köli nappe complexes.

The ultramafic bodies in the study area range from a meters to kilometer scale and comprise: 1) garnet peridotites, 2) spinel peridotites, 3) spinel pyroxenites and 4) garnet pyroxenites. Individual outcrops often record different levels of serpentinisation.

The Grt-peridotites are usually harzburgites (sparsely dunites/lherzolites) with an assemblage of Ol+Opx+Cpx+Amph+Grt+Spl. Minerals within the Grt-peridotites are characterised by Ol Fo=~90-91 and Mg# in pyroxenes 90-92 and 92-96 (enstatite and diopside/Cr-diopside, respectively). Garnet is pyrope with end-members Prp=60-69%, Usp=0-4% and Cr#=0.5-4. Amphibole (pargasite; Mg#=88-92) typically occurs as patches or rims around Grt and often host significant amounts of Spl. The spinel has an intermediate composition between hercynite-spinel and magnesiochromite-chromite (Cr#=41-55, Mg#=40-57).

The spinel peridotites are formed of Ol+Opx+Amph+Chl+Spl and classify mostly as harzburgites/dunites. Olivine and Opx (enstatite, rarely Cr-enstatite; often as porphyrocrysts) show a high range of Fo/Mg# values (90-95 and 90-94, respectively). Amphibole (tremolite; Mg#=91-96) is usually evenly distributed within the rock, while Chl is often associated with grain boundaries. Spinel has a chromite composition (Cr#=82-100, Mg#=5-10). Within single large (~0.5mm) spinel grains, cores with higher Mg# (~23) and lower Cr# (~82) can be observed.

The garnet pyroxenites are websterites characterised by lower Mg# (88-90) in enstatite, presence of Al-diopside and lower Cr# (<0.5) in pyrope than in peridotites. The Spl-pyroxenites are

orthopyroxenites with Mg# in enstatite (86-88) lower than in peridotitic orthopyroxene.

The presented preliminary data suggest that lithologies formed under different pressures (i.e. Grt and Spl facies) and must have recorded different evolution paths. Garnet ultramafics mineralogy resembles typical “mantle” assemblage with Prg suggesting possible metamorphic input also for other consisting phases (similarly to M2 paragenesis described in [1]). While the Grt ultramafic rocks and their evolution has been a subject of several studies before, the Spl ultramafics are relatively understudied and can shed new light on the evolution of SNC. The composition of Spl peridotites represents a mixture of typical “magmatic” mantle phases with metamorphic minerals (Amph+Chl). Very high Mg# values and occurrence of 120° triple point junctions in Ol (also described in [2]) suggest complex genesis, which probably includes serpentinisation (+exhumation?) followed by deserpentinisation. This indicates that the Spl ultramafics of SNC might have been subducted after their primary serpentinisation, which can be related either to emplacement and exhumation of ultramafics during Rodinia breakup or derivation from shallow, serpentinised “wet” mantle wedge in the subduction zone.

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[1] Gilio et al. (2015). Lithos 230, 1-16.
[2] Clos et al. (2014). Lithos 192-195, 8-20.