



P-T conditions of Stor Jougdan garnet pyroxenite and phengite-bearing eclogite: further evidence of UHP metamorphism in the Seve Nappe Complex of northern Jämtland (Swedish Caledonides)

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The most recent comprehensive petrological studies of high grade rocks within the Seve Nappe Complex (SNC) in the Scandinavian Caledonides have resulted in new discoveries of ultrahigh pressure metamorphism (UHPM) probably of Late Ordovician age. The first evidence was documented in the kyanite-bearing eclogite dyke within the garnet peridotite at the lake Fringen locality (Janák et al. 2013) in northern Jämtland, Sweden (Gee et al. 2013). A peak pressure assemblage yielded metamorphic conditions within the coesite stability field (~ 30 kbar and 800°C). About 25 km to the southeast, the Tjeliken eclogite records P-T conditions of 25-26 kbar and $650\text{-}700^\circ\text{C}$ (Majka et al. 2013). The study presented here, concerns P-T conditions of garnet pyroxenite and newly discovered, phengite-bearing eclogite located in the SNC about 4 km SE of Tjeliken Mt. on the northern side of lake Stor Jougdan. The investigated garnet pyroxenite, found as small veins within the garnet peridotite body, is composed essentially of Mg-garnet, -orthopyroxene, -clinopyroxene and -olivine, minor constituents include Cr-spinel, amphibole and phlogopite. The main mineral assemblage of phengite eclogite consists of garnet, omphacite, amphibole and minor phengite, plagioclase-diopside symplectites, rutile, titanite, zoisite and quartz (possibly former coesite). Garnet peridotite occurring by the Stor Jougdan lake was studied by Van Roermund (1989) who estimated the temperatures of c. $720\text{-}800^\circ\text{C}$ using Fe-Mg geothermometer (Harley 1984a) and the pressures of 14-18 kbar using Al_2O_3 contents of the orthopyroxene (Harley 1984b) to constrain the P-T conditions of Caledonian metamorphism (M_2 garnet with prograde growth zoning and M_2 orthopyroxene according to Van Roermund 1989). In the present work, we have used garnet-orthopyroxene (Harley 1984b) and Ca in orthopyroxene (Brey & Koehler 1990) geothermometry in combination with Al in orthopyroxene geothermobarometry (Brey & Koehler 1990) and obtained the peak metamorphic conditions of 30-32 kbar and $800\text{-}825^\circ\text{C}$ for garnet pyroxenite. For the phengite-bearing eclogite, results from Ravna & Terry (2004) geothermobarometric method applied for the garnet + clinopyroxene + phengite + quartz/coesite assemblage yield pressure conditions in the stability field of coesite (≥ 30 kbar at $800\text{-}900^\circ\text{C}$). Our calculated P-T conditions thus provide further evidence for the Late Ordovician UHPM within the SNC in northern Jämtland.

Brey, G.P. & Koehler, T. (1990) Journal of Petrology, 31, 1353-1378.
Gee, D. G., Janák, M., Majka, J., Robinson, P. & Van Roermund, H. 2013. Lithosphere, 5, 169-178.
Harley, S.L. (1984a). Contributions to Mineralogy and Petrology 86, 353-373.
Harley, S.L. (1984b). Journal of Petrology 25, 665-696.
Janák, M., Van Roermund, H., Majka, J. & Gee, D. G. 2013. Gondwana Research, 23, 865-879.
Majka, J., Janák, M., Andersson, B., Klonowska, I., Gee, D. G., Rosén, Å. & Kośmińska K. 2013. Geological Society, London, Special Publications, 390.
Ravna, E. J. K. & Terry, M. P. (2004). Journal of Metamorphic Geology, 22, 579-592.
Van Roermund, H.L.M. (1989). The Caledonide geology of Scandinavia: London, Graham & Trotman, 205-219.