Diffusion Profiles within Garnet Grains of Peridotites from the Western Gneiss Region, Norway

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The internal chemical and isotopic structure of mineral grains in combination with numerical modelling of diffusion profiles to determine the *PT* and metasomatic evolution of peridotites from the WGR will provide a greater understanding of their metamorphic development. The study will include samples from localities thought to have been entirely reequilibrated during the Caledonian continental collision (e.g. Grubse quarry) and localities in which major and trace element diffusion profiles suggest that reequilibration during the Caledonian was incomplete, therefore retaining earlier compositions and thus the *PT* conditions within cores of first generation phases (e.g. Gurskebotn, Sandvika).

Major and trace element diffusion profiles will be measured using EMP, SIMS and LA-ICP-MS. Preliminary geothermobarometric calculations for the Grubse locality, using the Krogh Grt-Cpx geothermometer [1] and the Brey & Köhler Al-in-Opx geobarometer [2], agree with earlier work, with calculated *PT* estimates of circa 660 °C at 2.4 GPa for the Grubse quarry and circa 712 °C at 28.8 GPa for the Gurskebotn location.

Trace element studies will be used to indicate the presence and chemical nature of metasomatic fluids and/or melts within the mantle either before or during decompression. Thermal modelling, calculated using a program, which has been successfully implemented for the Alpe Arami UHP peridotite [3], in conjunction with careful petrographic work will help to constrain exhumation rates. The Caledonian metamorphic event has been well-established through radioactive dating, however many questions remain about the nature of the metamorphic development of the WGR, as well as the mantle conditions prior to the peridotite's entrapment in the country rocks. This project will increase our understanding of the upper mantle beneath continental plates and the geochemical distribution (budget) and circulation of important key major and trace elements.

[1] Krogh EJ (1988) CMP 99, 44-48.
[2] Brey G, Köhler T (1990) J Petrol 31, 1353-1378.
[3] Olker B, Altherr R, Paquin J. (2003) J Meta Geol. 21, 395-402.