Geophysical Research Abstracts, Vol. 8, 08903, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08903

Continuous shear over a broad P-T range – the fall and rise of eclogites in the Tromsø Nappe of the Arctic Caledonides, Norway

J. R. Mackenzie (1), H. Stünitz (1), R. Heilbronner (1), E. J. K. Ravna (2), K. Kullerud (2) and S. Bergh (2)

(1) Geological Institute, University of Basel, Switzerland, (2) Geological Institute, University of Tromsø, Norway, (James.Mackenzie@unibas.ch)

The Troms region of Arctic Norway contains two of the highest remaining tectonic units in the entire Scandinavian Caledonides – the eclogite-bearing Tromsø Nappe and the underlying Skattøra Migmatite Complex. The polyphase structural and metamorphic history of these two units documents the progression from subduction to early exhumation of ultra-high pressure crustal rocks over a broad range of P-T conditions.

Two large eclogite bodies – Tromsdalstinden and Snyfjellet – are surrounded by metasedimentary lithologies. The oldest deformation microstructures are found within the Snyfjellet eclogite body. A strong foliation and marked lineation – in places mylonitic – developed under UHP conditions (2.8 GPa, 725˚C). The sense of shear connected to this deformation is top-to-the-SW. Later deformation microstructures – with approximately SSE-trending lineation and top-to-the-SSE sense of shear – are developed along the margins of the large eclogite bodies and pervasively throughout the metasedimentary rocks of the Tromsø Nappe and also overprint the highest levels of the Skattøra Migmatite Complex. Although the fabrics of the later microstructures are similarly oriented, different mineral assemblages demonstrate that this fabric developed under very different P-T conditions in the two tectonic units. This implies that the two units obtained their common deformation fabric at significantly different positions (and hence different P-T conditions) along the same large-scale shear zone. Different lithologies within the Tromsø Nappe record successive stages of deformation under decreasing pressure conditions during the unit's exhumation. The margins of the Snyfjellet eclogite body record deformation under UHP conditions only, whereas

the lower contact of the Tromsdalstinden eclogite body documents deformation under the post-eclogitic, lower pressure conditions of clinopyroxene-plagioclase symplectite formation. Under lower pressure conditions both eclogite bodies show a “static” overprint (symplectisation of omphacite and two stages of partial melting) only. This suggests that during subsequent exhumation the large eclogite bodies behaved as rigid blocks and that all deformation was localised in the metasedimentary lithologies of the Tromsø Nappe and amphibolites of the Skattøra Migmatite Complex.

Displacement of the tectonic units, deformation and metamorphism along the shear zone were therefore a continuous process encompassing a broad range of P-T conditions and record the rapid exhumation of an UHP unit into a lower crustal position during thrusting towards Baltica. Thus the exhumation of the Tromsø Nappe in the northern Caledonides is thrust-related and in great contrast to the extensional exhumation of the Western Gneiss Region further south.