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Geochronological studies in the Northern Scandinavian Caledonides, Finnmark Province, Northern Norway, new evidence for Grenvillian and Scandian components in the Kalak Nappe complex and the extent of the Mageroy Nappe

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Abstract

U-Pb ID-TIMS ages are reported for several magmatic and anatectic phases from the Kalak Nappe Complex (KNC), northern Norwegian Scandinavian Caledonides. Euhedral prismatic zircons from a suite of plutons intruding the metaturbidite sequences of the Hellefjord Group, Sørøy-Seiland Nappe (upper KNC) yielded intrusion ages of 440.9 ± 1.5 Ma for a syenogranite, and 435.9 ± 1.6 Ma and 436.7 ±0.8 Ma, respectively, for a granite and gabbro. The period of magmatic activity was followed closely by a phase of deformation associated with upper amphibolite-granulite facies metamorphism at c. 430 Ma. This caused local anatexis in the granite and growth of magmatic zircon (429.5 ± 1.4 Ma), as well as the common growth of metamorphic titanite (431.4 ± 1 Ma and 427.8 ±2.7 Ma). These late Ordovician-early Silurian ages link this tectonometamorphic activity to the *Scandian* phase of the Scandinavian Caledonian orogeny. Evidence for *Scandian* tectonometamorphic activity is also recorded at c. 425 Ma in the Klubben Group of the Olderfjord Nappe (lower KNC). This is documented by the intrusion of a granodiorite pegmatite (425.9 ±0.7 Ma) and anatexis of the Klubben Group (425.5 ± 1.3 Ma). In addition, the Klubben Group records a c. 980 Ma *Grenvillian* age for anatectic veins crosscutting an earlier fabric (980.9 ± 2.6 Ma, syenogranitic leucosome), linking the initial evolution of the Klubben Group to the amalgamation of Rodinia.

It is suggested that a previously undetected structural break exists in the Sørøy Succession of the KNC at base of the Hellefjord Group. This is supported by c. 441-436 Ma *Scandian* ages obtained for bimodal magmatic activity in the Hellefjord, which does not relate to the intrusion of the SIP further down in the Sørøy Succession at c. 570-560 and c. 530-520 Ma. In addition, *Scandian* magmatic ages have not been detected in the Sørøy Succession underlying the Hellefjord Group. However, these ages are coeval with bimodal plutons in the overlying Magerøy Nappe (c. 440-436 Ma), which is composed largely of metaturbidite sequences. The Hellefjord Group is suggested to represent an extension of the Magerøy Nappe, which evolved in a ridge-trench intersection.

A tentative window of c. 430-425 Ma is suggested for the thrusting of the Magerøy Nappe over the Kalak Nappe Complex, in light of the formation of deformational fabrics in the Hellefjord Group at c. 430 Ma and the localised c. 425 Ma anatexis recorded in the Klubben Group.