



## **Polyphase metamorphism and deformation in the Kalak and Reisa Nappe Complexes: unravelling the complex polyphase pre-Caledonian and Caledonian evolution of continental crust in northern Norway**

Carly Faber (1), Holger Stünitz (1,2), Deta Gasser (3,4), Petr Jeřábek (5), Katrin Kraus (1), Fernando Corfu (6), and Jiří Konopásek (1)

(1) UiT The Arctic University of Norway, Department of Geosciences, Norway (carlyfaber1@gmail.com), (2) Institut des Sciences de la Terre (ISTO), Université d'Orléans, 45100, France, (3) Western Norway University of Applied Sciences, Sogndal 6851, Norway, (4) Geological Survey of Norway, Trondheim 7491, Norway, (5) IPSEG, Faculty of Science, Charles University, Albertov 6, 128 43, Prague 2, Czech Republic, (6) Department of Geosciences & Centre for Earth Evolution and Dynamics, University of Oslo, Norway

The Kalak and the Reisa Nappe Complexes (KNC and RNC) represent large parts of the Caledonides in northern Norway and allow the reconstruction of the pre- and syn-collisional history of the mid- to lower-crustal rocks of the orogen. We use a combination of field mapping, tectonostratigraphic description, phase equilibrium modelling and age dating to discuss their original relationships and subsequent evolution. The structurally lower KNC occurs as several nappes composed of orthogneisses and thick sequences of psammitic and pelitic metasedimentary gneisses with minor felsic and mafic intrusions. The structurally higher RNC includes three nappes; the Vaddas, Kåfjord and Nordmannvik Nappes. All three nappes are comprised of metasedimentary rocks (metapelites and metapsammities) and are intruded by gabbroic bodies. Caledonian metamorphism is recorded by a pervasive fabric throughout both nappe complexes. It increases in grade upwards from greenschist facies at the base of the KNC to amphibolite facies at the KNC-RNC boundary and to granulite facies in the Nordmannvik Nappe.

In the KNC, the upper and lower parts record different pre-Caledonian histories. Age dating indicates that the lower part was affected by an event at c. 980-960 Ma, whereas the upper part experienced events at c. 850-820 Ma, c. 710 Ma and c. 580-520 Ma (Seiland Igneous Province). The upper nappes display pre-Caledonian amphibolite to granulite facies foliation (c. 710 Ma in age), while the lower nappes record upper greenschist-low amphibolite facies metamorphism associated with a different pre-Caledonian foliation. The difference in metamorphic conditions indicates that the upper and lower KNC represent different sections of basement juxtaposed by thrusting during Caledonian continental collision.

The RNC rocks preserve a younger evolution. The Nordmannvik Nappe metasediments may have been deposited in the late Neoproterozoic, and are probably related to the Narvik Nappe, whereas the Vaddas and Kåfjord rocks were deposited in the late Ordovician-early Silurian. All three nappes record an anticlockwise P-T path, with high T, medium P metamorphism and mafic magmatism at ~440 Ma, followed by higher P, lower T solid state shearing during nappe stacking at ~430 Ma. Conditions at ~440 Ma indicate that the migmatized Nordmannvik Nappe was deeper than the Kåfjord and Vaddas metasediments. The tectonic setting for the anticlockwise evolution is best described by magmatic underplating and heating of the three nappes in the subduction back-arc domain, which was quickly followed by an onset of subduction with subsequent nappe stacking and the RNC rocks probably formed parts of a back-arc during Ordovician-early Silurian subduction of the Seve Nappe rocks, outboard of the extended margin. Subduction rapidly followed the heating of these units caused by magmatic underplating (during back arc extension). The hot and weak crust was detached from the continental lithosphere and incorporated in the nappe their stacking during continental collision.