Geophysical Research Abstracts
Vol. 21, EGU2019-18214, 2019
EGU General Assembly 2019

Early Devonian anatexis was contemporaneous with extensional tectonics in the Svalbard Caledonides

Per Inge Myhre (1), Synnøve Elvevold (1), Fernando Corfu (2), and Rune Selbekk + (3)

(1) Norwegian Polar Institute, Norway (myhre@npolar.no), (2) Department of Geosciences, University of Oslo, Norway, (3) Natural History Museum, University of Oslo, Norway. + deceased.

The archipelago of Svalbard records several stages of the Caledonian Wilson cycle: Late Precambrian to Ordovician sediments of the Laurentian passive margin, high-pressure metamorphic nappe complexes that record Ordovician continent-ocean collision, and a major phase of continent-continent collision which led to regional metamorphism. Eventually this gave way to orogenic collapse and formation of Old Red Sandstone basins, and rifting in the Carboniferous as well. The Svalbard outcrops provide a link between the Atlantic and the Arctic Caledonides and the key to understand what happened along strike at the intersection of the mountain belt with the Arctic Ocean realm. Concerning the timing of subduction, continent-continent collision and orogenic collapse, the Svalbard records of these events should be accounted for in models of the Caledonian Wilson cycle as a whole.

We present new CA-ID-TIMS U-Pb-ages for orthogneiss and migmatite from Nordaustlandet in north-eastern Svalbard that demonstrate a three-stage orogenic evolution of these rocks: Intrusion of granite in the Mid-Silurian, followed by a phase of deformation and final anatexis in the Early Devonian. While bracketing Late Silurian deformation directly, these ages also demonstrate a temporal correlation between the Caledonian thermal phase and extension. The migmatites appear to have formed by partial melting of granitic augen gneisses in the presence of a H_2O-bearing fluid phase. Anatexis occurred at relatively low temperatures at or near the solidus, and field evidence such as lack of garnet and medium grade mineral assemblages in the pelitic anatectic units speak towards a relatively shallow crustal level for the migmatisation. Recently, a major shear zone in north-west Svalbard, separating the Old Red Sandstone and migmatites, was re-interpreted as a Late Silurian to Mid-Late Devonian extensional detachment (Braathen et al., 2018). If such a tectonic process was active across a larger area, extension-related exhumation might provide a mechanism for the anatexis dated here and correlative migmatite regions in the archipelago.

The new data and interpretation highlight some unresolved questions pertaining the across-strike metamorphic gradients of the Caledonides of Svalbard. While several large shear zones are mapped, the knowledge on the dynamics in the waning stages of the Caledonian orogeny and subsequent rifting here is still lacking.

Braathen, A., Osmundsen, P. T., Maher, H., & Ganerød, M. (2018). The Keisarhjelmen detachment records Silurian–Devonian extensional collapse in Northern Svalbard. Terra Nova, 30(1), 34–39. https://doi.org/10.1111/ter.12305