

Th-U-Pb dating of monazites from the Upper Köli Nappes in the Northern Scandinavian Caledonides

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The Köli Nappe Complex in the Scandinavian Caledonides of Sweden originated as terranes within the Iapetus Ocean derived from subduction-related magmatic and basin systems. The Krutfjellet Nappe in Västerbotten, Sweden, and the Gasak Nappe in Nordland, Norway, are both part of the Upper Köli Nappes. In both of these units, siliclastic, carbonate and volcanic protoliths underwent amphibolite facies metamorphism (involving in places extensive migmatization) which was of a distinctly higher grade than the lower and Middle Köli Nappes. Foliations and early folds in the metasediments are cut by metagabbros and metagranites with an age of ~445-435 Ma (e.g. Senior and Andreiessen 1990; Pedersen *et al.* 1991). Emplacement of the intrusions was followed by regional greenschist-lower amphibolite facies metamorphism, probably related to the Scandian collision.

Four sillimanite and/or kyanite-bearing pelitic migmatite samples from the Norra Storfjället lens of the Krutfjellet Nappe and three samples of pelitic garnet mica schists and migmatites from the Sulitjelma area of the Gasak Nappe were selected for Th-U-Pb dating of monazite. Monazites were dated *in-situ* using LA-ICP-MS at the Institute of Geology of the Czech Academy of Sciences. One sample from the Krutfjellet Nappe yields a U-Pb concordia age of 427.88 ± 1.31 Ma. The remainder of the samples yielded a large proportion of discordant analyses that fall on discordia lines at high angles to the concordia curve. We interpret this discordance to be due to the presence of initial Pb in the monazites, thus the ages are taken from the lower intercepts of the discordia to remove the effect of initial Pb. U-Pb lower intercept ages for 3 samples from the Krutfjellet Nappe are found to be 422.92 ± 1.36 Ma, 426.27 ± 1.16 Ma and 426.44 ± 1.96 Ma. U-Pb lower intercept ages for the Gasak Nappe are found to be 416.74 ± 1.50 Ma, 423.53 ± 1.71 Ma and 427.7 ± 1.5 Ma. These ages are interpreted as being related to metamorphism and/or fluid-related alteration at between 428-417 Ma in both the Krutfjellet and Gasak Nappes. In lower Köli Nappe Complex units further south in Sweden, similar ages of 431-426 Ma have been interpreted as representing the time of shearing related to nappe stacking during assembly of the Caledonian orogenic wedge (Bender *et al.* 2019) prior to its final translation and imbrication.

Our isotopic ages for the Krutfjellet Nappe are younger than EPMA U-Th-total Pb ages obtained for the same monazite grains (Carter *et al.* 2023). The monazites often have complex zoning patterns in Y, however the zoning appears to be decoupled from the ages. We suggest that the monazites from the Krutfjellet Nappe may have experienced pervasive resetting, possibly related to dissolution-reprecipitation, which led to contamination of the monazites with initial Pb and decoupling of the U-Th-Pb system from Y zoning. The actual age of migmatization remains enigmatic.

References

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