

Geochronology of pervasive top-to-the-SE directed deformation in the Caledonian nappe stack, Jämtland, Sweden

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The Caledonian orogen of Scandinavia is thought to be a Himalaya-style head-on collisional orogen. However, in contrast to the Himalayas, the Caledonides are characterized by various ultrahigh-pressure belts of different ages, which make them a unique orogen on Earth. The Seve Nappe Complex (SNC) in Jämtland (Sweden) holds the key to better understanding the multi-stage tectonometamorphic evolution of a well-studied ultrahigh-pressure belt in the central Scandinavian Caledonides. Leucogranites and migmatic gneisses record an ultrahigh-pressure event at ~ 460 Ma (Brueckner and Van Roermund, 2007; Grimmer et al., 2015), followed by migmatization at ~ 440 Ma (Ladenberger et al. 2014). How those high-grade metamorphic events relate to the nappe structure remains elusive. We use a combined structural and geochronological approach to show that amphibolite- and greenschist-facies foreland-directed, top-to-the-ESE shearing formed the nappe pile consisting of the Köli Nappe overlying the SNC, the various nappes of the SNC, and the underlying units. Furthermore, we present new Rb–Sr internal multi-mineral isochron ages from two east–west transects in central and northern Jämtland. Most isotopic ages, complemented by a dense network of kinematic field data, range between ~ 431 and ~ 427 Ma. These ages are interpreted to reflect the timing of amphibolite-facies top-to-the-ESE-directed nappe stacking. Blackwall formation, i.e. in-situ chemical interaction between ultramafic rocks and felsic gneiss, at the Seve-Köli boundary occurred at ~ 423 Ma, an age interpreted to postdate nappe emplacement. Biotite in top-to-the-ESE greenschist-facies shear bands in the Middle Köli nappe formed at ~ 416 Ma. These new geochronological data show that the nappe assembly postdates deep subduction and subsequent decompression melting. Top-to-the-foreland directed thrusting occurred at ~ 430 Ma and continued for several million years, while amphibolite-facies shear criteria yield older ages than retrograde structures.

References:

- Brueckner and Van Roermund, 2007, *J. Geol. Soc.* 164, 117–128.
Grimmer et al., 2015, *Geology* 43 (4), 347–350.
Ladenberger et al., 2014, *Geol. Soc. Spec. Publ.* 390, 337–368.