Structural investigation of deformation across the Frontal Wedge south of Lake Vättern

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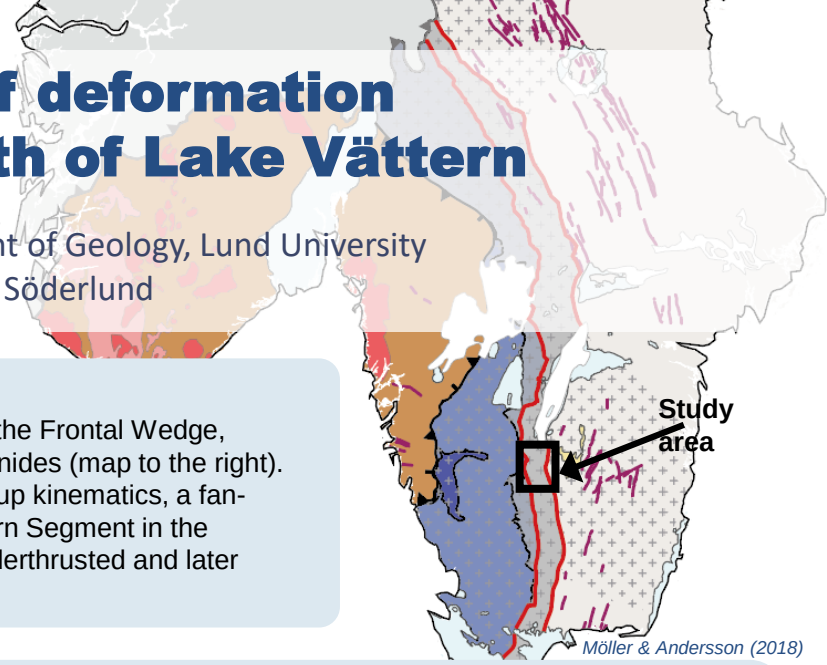


Möller & Andersson (2018)

The Frontal Wedge

A 20-30 km wide deformation zone at the front of the Sveconorwegian orogen, the so called the Frontal Wedge, extends from Scania to central Sweden, where it disappears below the Scandinavian Caledonides (map to the right). The belt is characterized by vertical to steep west-dipping deformation zones with west-side-up kinematics, a fan-shaped structure, and non-penetrative deformation. The Frontal wedge is a part of the Eastern Segment in the Sveconorwegian orogen. During the Sveconorwegian orogeny the Eastern Segment was underthrusted and later uplifted due to isostatic rebound caused by orogenic collapse.

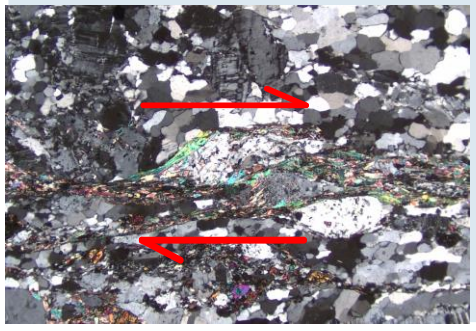
Aim & Method

Different models for the development of the Frontal wedge have been proposed. Both extensional and collisional settings are suggested as the origin of the complex belt of deformation. The aim of this project was to study an E-W transect across the Frontal wedge south of Lake Vättern with the objective to contribute to a closer understanding of the tectonic evolution of the frontal wedge. The aim is also to bring attention to whether the overall structure of the study area is similar to the structures described in previous studies north of lake Vättern.

- **Field study:** Investigation of the deformation zones and shear-sense indicators. Measurements of the orientation of the foliation planes.
- **Microscopy:** Study of shear-sense indicators as well as minerals and textures related to deformation.

Shear-sense indicators = Structures with a geometry which indicate the sense of movement during deformation. For example:

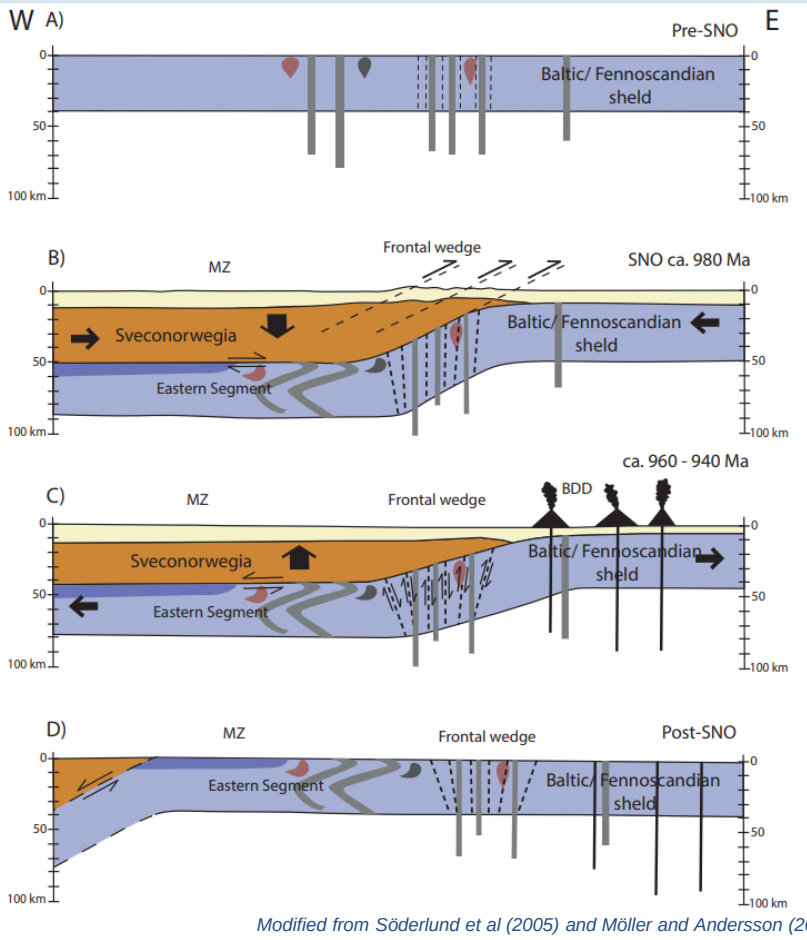
Mineral fish



Tailed porphyroclast

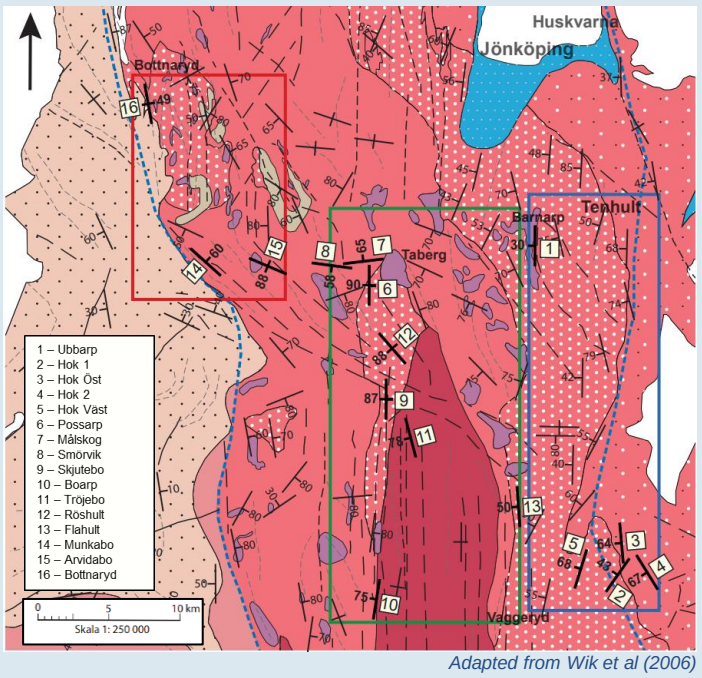
Interpretation

The model preferred for the development of the Frontal wedge structures, suggest that the frontal wedge originates from zones of weakness in the crust caused by pre-Sveconorwegian intrusions (A). During the Sveconorwegian orogeny these were reactivated and the weight of the overthrusting Sveconorwegian plate caused further break up along these zones of weakness (B). Later extension and associated collapse of the orogen was followed by uplift of the Eastern Segment, leading to western-block-up movement along the deformation zones and the formation of the Frontal wedge (C). Further tectonic processes, uplift and erosion have since then exposed the characteristic and complex deformation of the Frontal wedge (D).



Modified from Söderlund et al (2005) and Möller and Andersson (2018)

Results

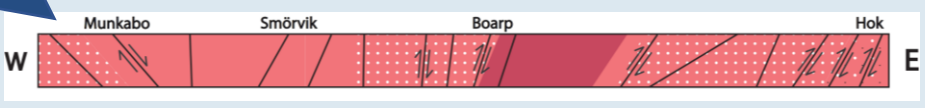


Adapted from Wik et al (2006)

Bedrock geological map with means of the measured foliations marked by the bold structural symbols. Thin structural symbols are data from SGU. Blue, green, and red boxes mark the eastern, central, and western subareas investigated.

Conclusions

- The deformation zones along the transect are steep to vertical
- The transect show a fan-like structure with western-up kinematics
- Recrystallization of feldspar increases from east to the west
- The transect studied is similar to that described north of lake Vättern



Schematic W-E profile showing the mean of the measured dip direction from each locality. The western localities are extrapolated southwards to form a straight E-W profile.

Möller, C. & Andersson, J., 2018: Metamorphic zoning and behaviour of an underthrusting continental plate. *Journal of Metamorphic Geology 36*, 567–589. Doi: 10.1111/jmg.12304.

Söderlund, P., Söderlund, U., Möller, C., Gorbatschev, R. & Rodhe, A., 2005: Petrology and ion microprobe U-Pb chronology applied to a metabasic intrusion in southern Sweden: A study on zircon formation during metamorphism and deformation. *Tectonics 23*, 1–16. Doi: 10.1029/2003TC001498.

Wik, N. G., Andersson, J., Bergström, U., Claeson, D., Juhojuntti, N., Kero, L., Lundqvist, L., Möller, C., Sukotjo, S. & Wikman, H., 2006: *Beskrivning till regional berggrundskarta över Jönköpings län*. Sveriges geologiska undersökning. Uppsala, 60 pp.