

Timing of deformation, metamorphism and leucogranite intrusion in the lower part of the Seve Nappe Complex in central Jämtland, Swedish Caledonides

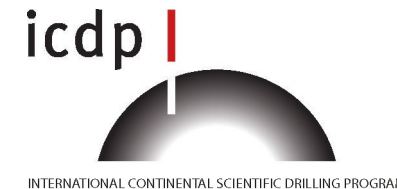
Iwona Klonowska¹, Anna Ladenberger², David G. Gee³,
Pauline Jeanneret³, and Yuan Li⁴

¹Faculty of Geology, Geophysics and Environmental Protection, AGH - University of Science and Technology, Kraków, Poland

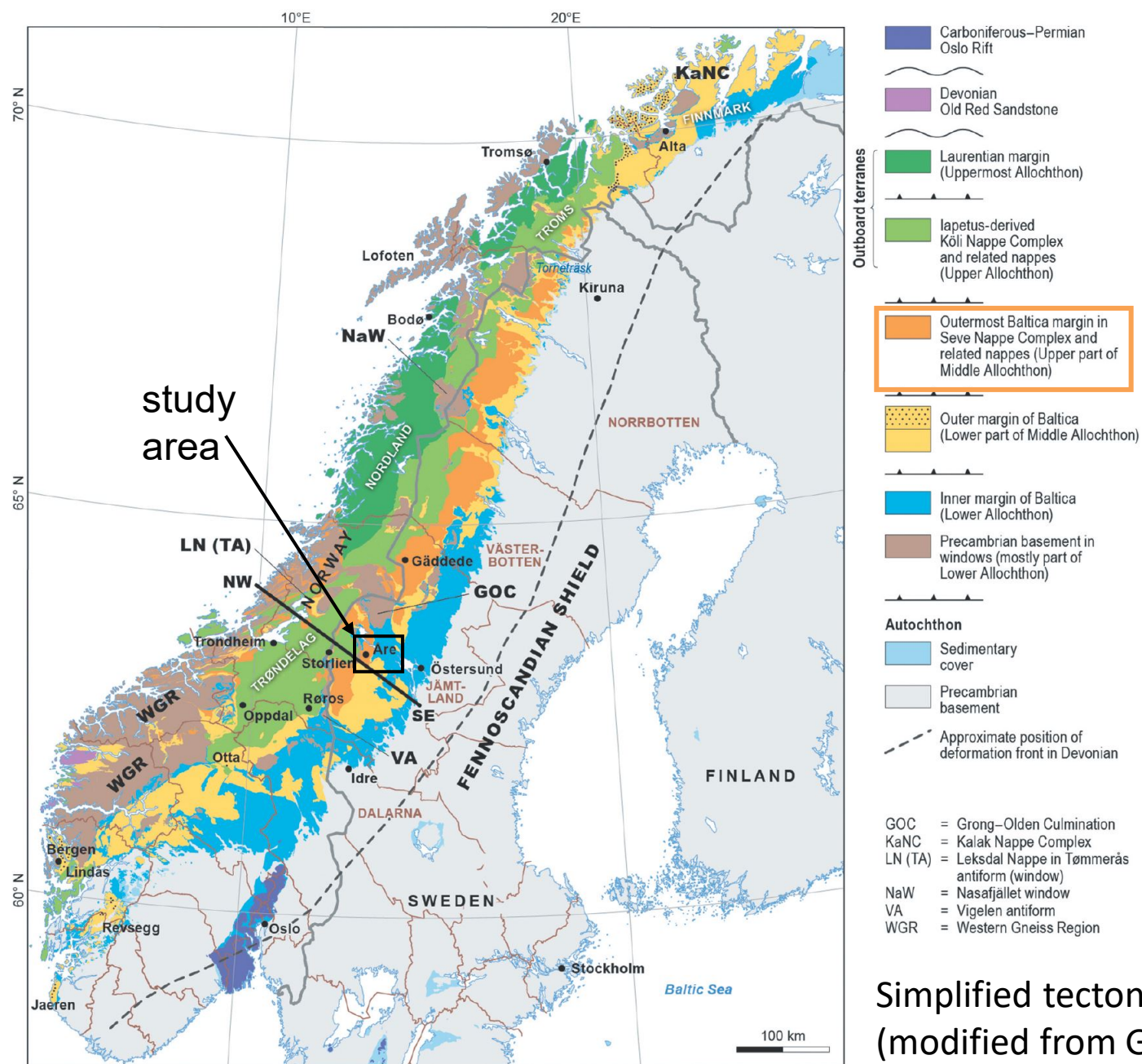
²Department of Mineral Resources, Geological Survey of Sweden, Uppsala, Sweden

³Department of Earth Sciences, Uppsala University, Uppsala, Sweden

⁴State Key Laboratory for Continental Tectonics and Dynamics, Chinese Academy of Geological Sciences, Beijing, China



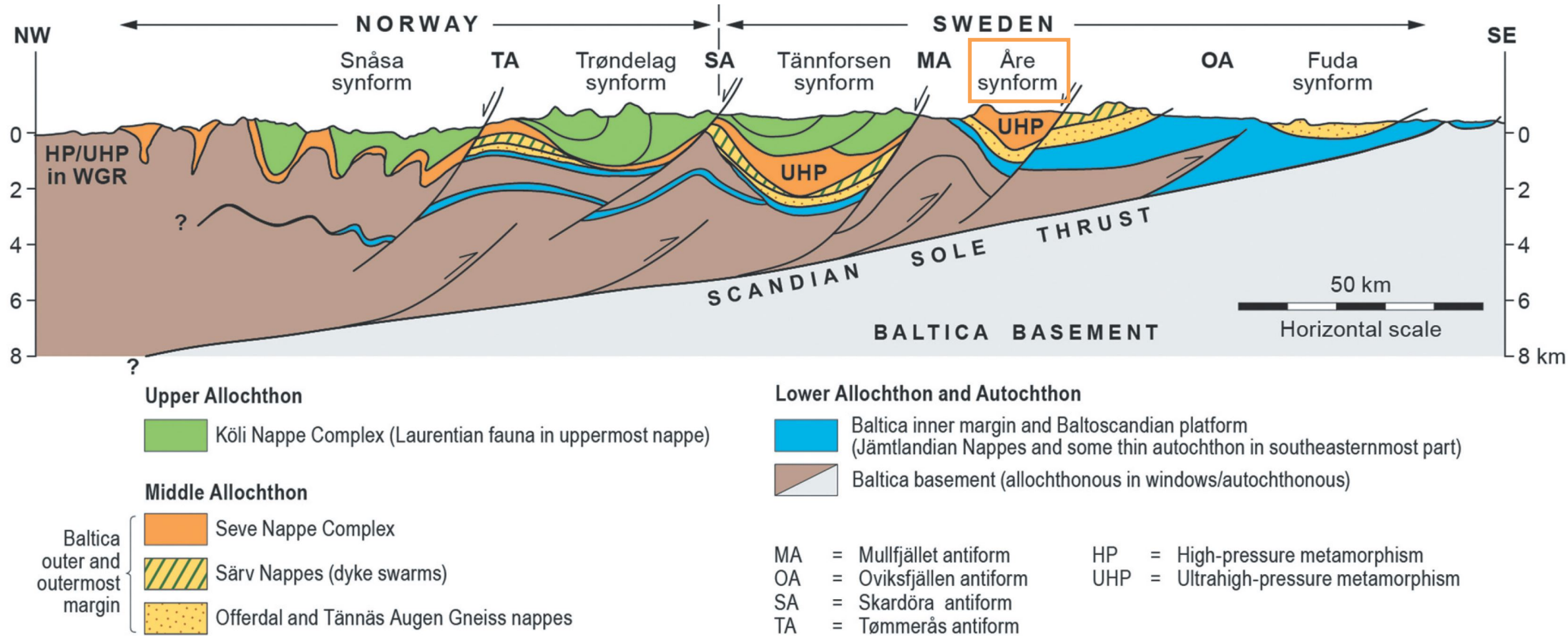
Scandinavian Caledonides



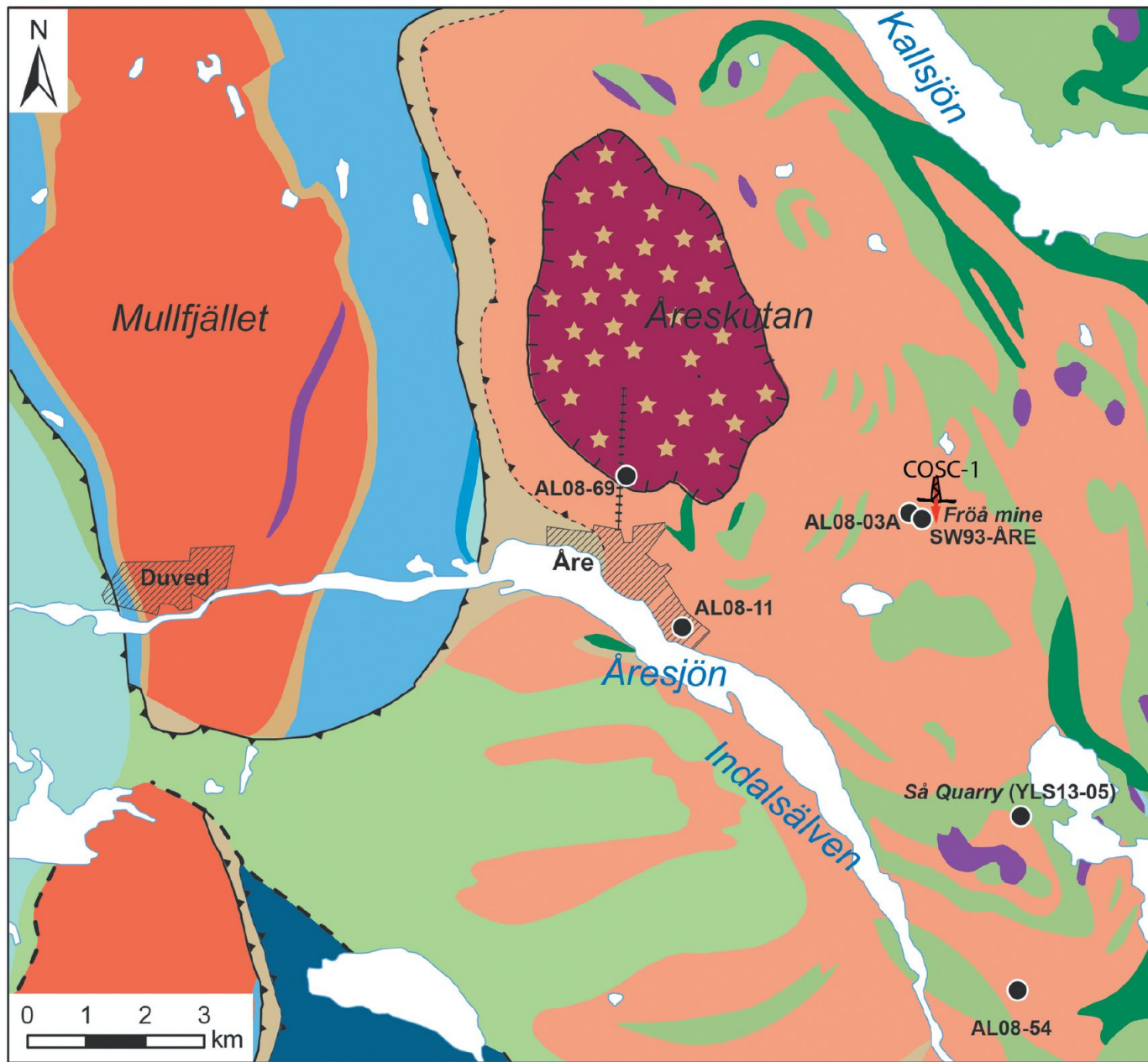
lower part of the Seve Nappe Complex

Simplified tectonostratigraphic map of the Scandinavian Caledonides (modified from Gee & Stephens 2020) (Li et al. 2021)

NW-SE profile across the central part of the Scandinavian Caledonides



A schematic NW–SE profile across the central part of the Scandinavian Caledonides illustrating the major nappe architecture (Gee 2020) (Li et al. 2021)



Geological map of the study area

Modified digital 50 000-250 000 bedrock map from the Geological Survey of Sweden. Sample locations of this study (Så quarry and COSC-1) the previous studies (Li et al. 2021); COSC-1: Collisional Orogeny in the Scandinavian Caledonides drill site

Field relationships – Sår quarry



A. Looking south at the main face.



B. Looking southeastwards down the axes of isoclinal folds.



C. An outcrop above the quarry wall, where **pegmatitic leucogranite** intruded **foliated amphibolite**.

Photo: Theo Berthet

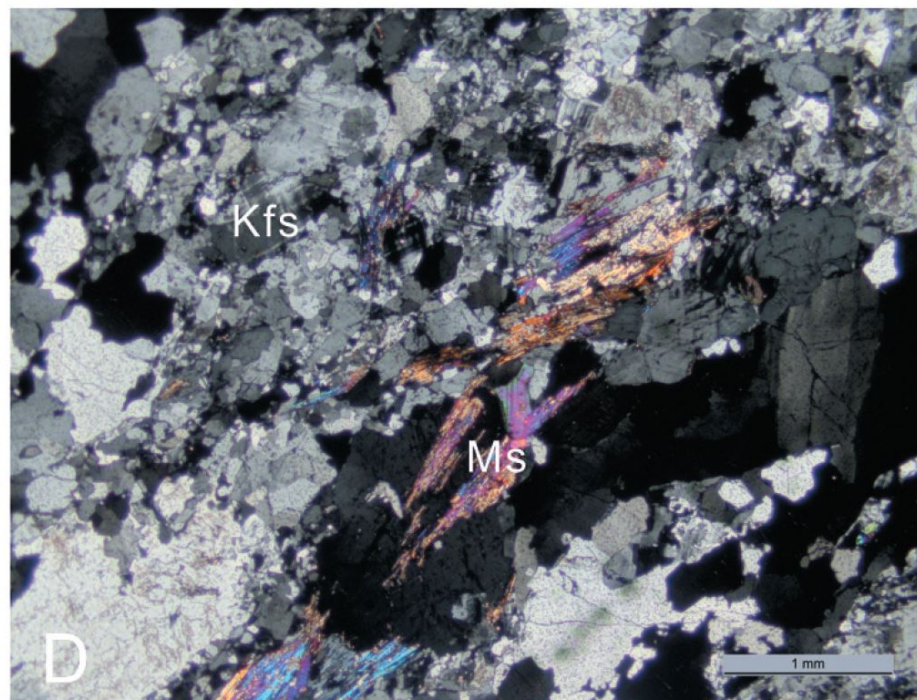
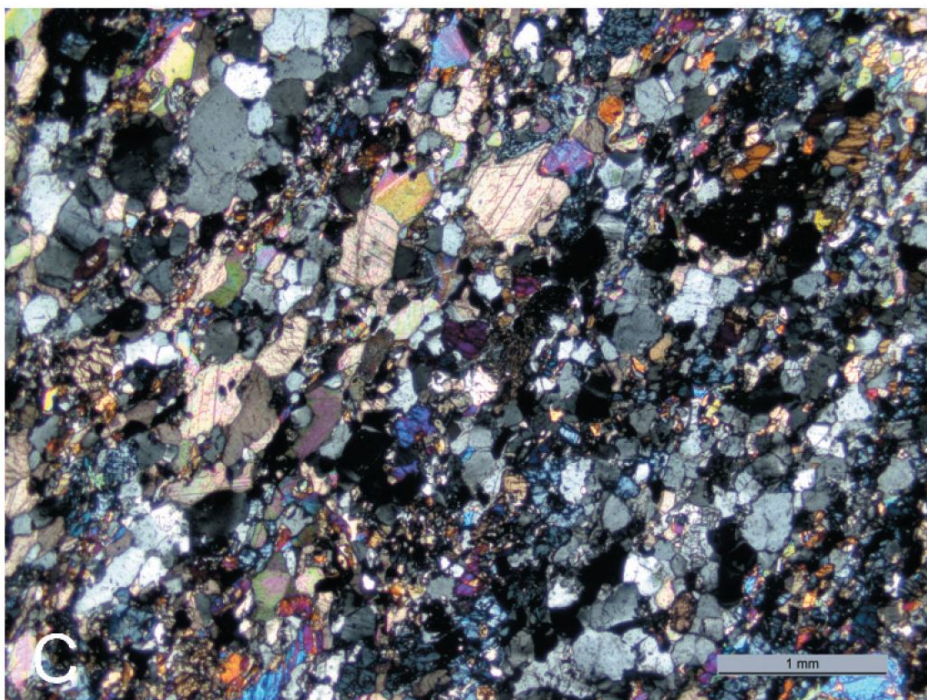
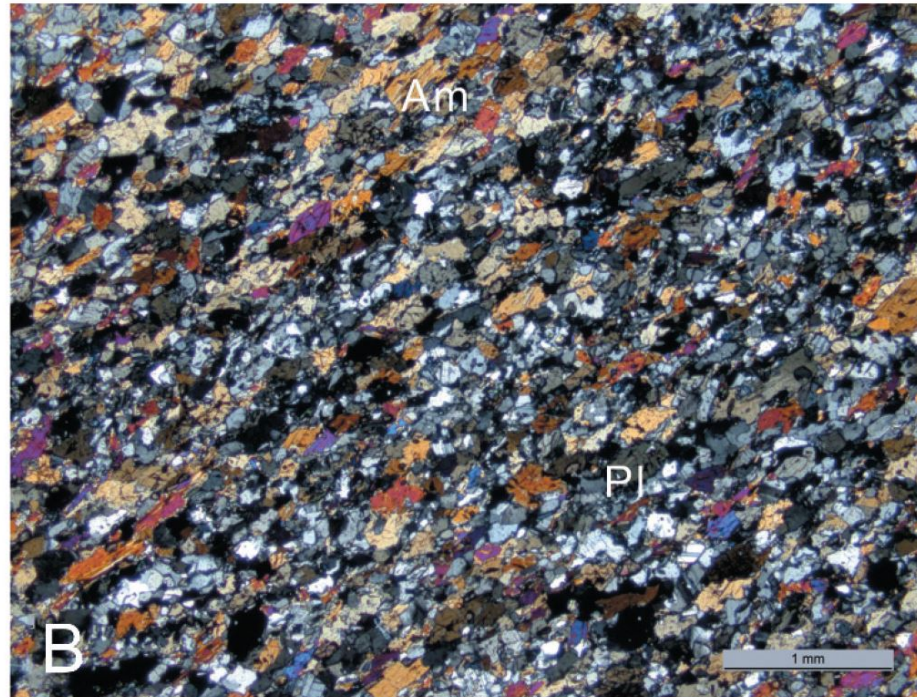
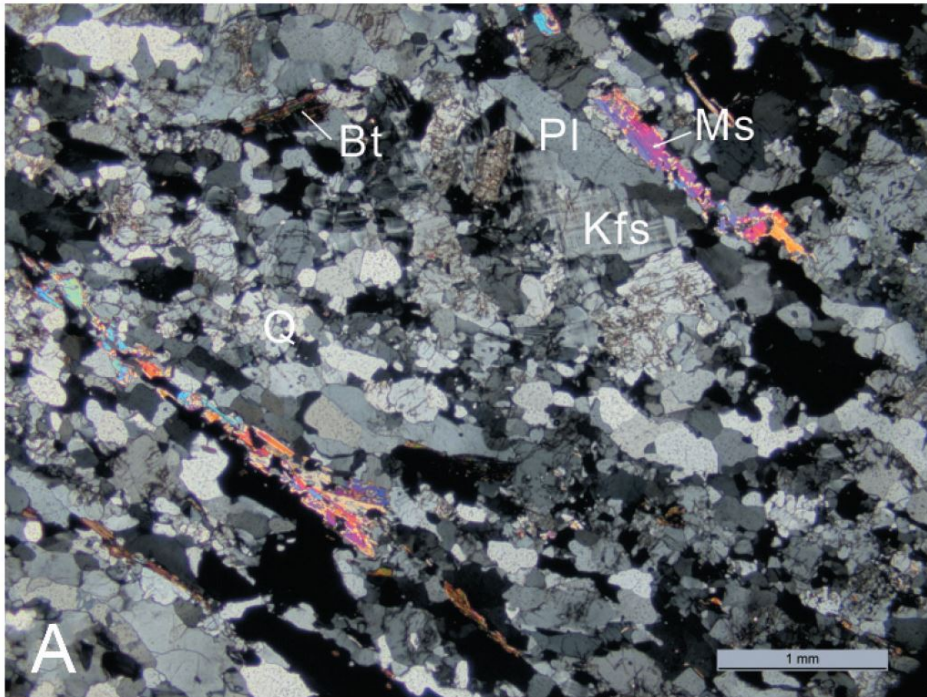
Li et al. (2021)

Field relationships – Sår quarry



Sår quarry wall below that of Figure C in the previous slide. It shows isoclinal folding of the leucogranite (x as symbols) intruded into host-rock paragneiss/calcsilicates and amphibolites.
Li et al. (2021)

Photomicrographs of dated lithologies



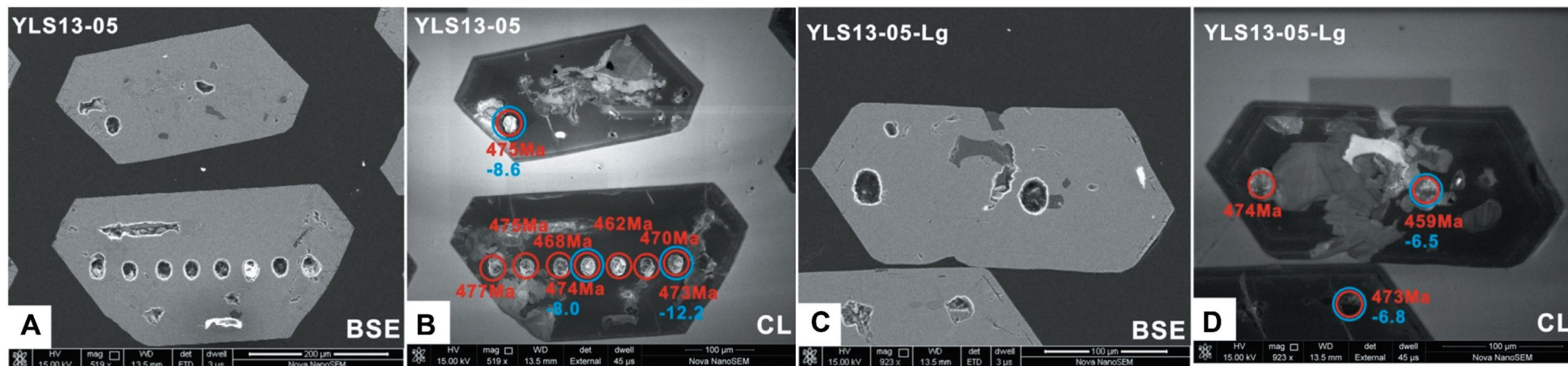
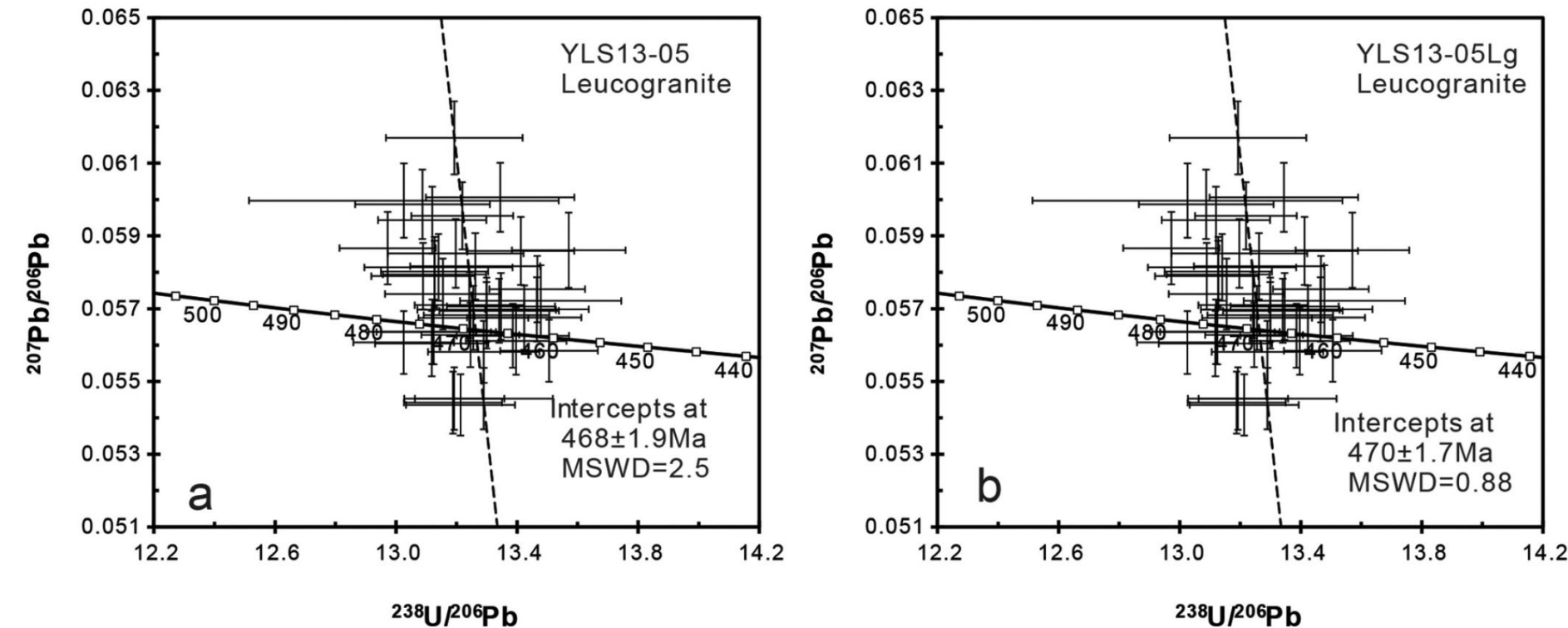
- A. Så leucogranite (YLS13-05).
- B. Så amphibolite (YLS13-05d).
- C. Så paragneiss (YLS13-05s).
- D. Fröå leucogranite (SW93-ÅRE)

Concordia plots for zircons

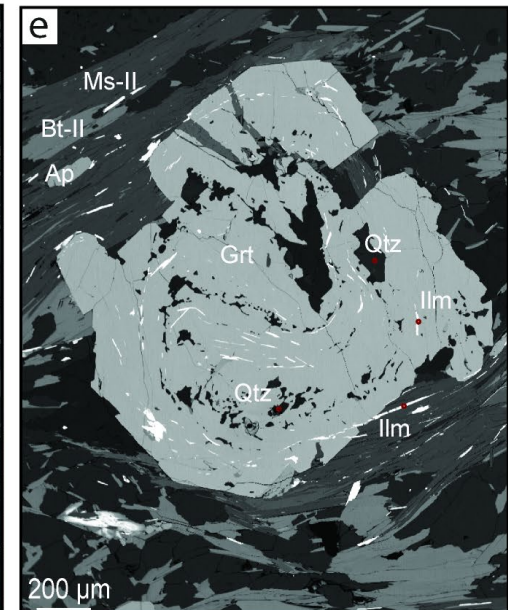
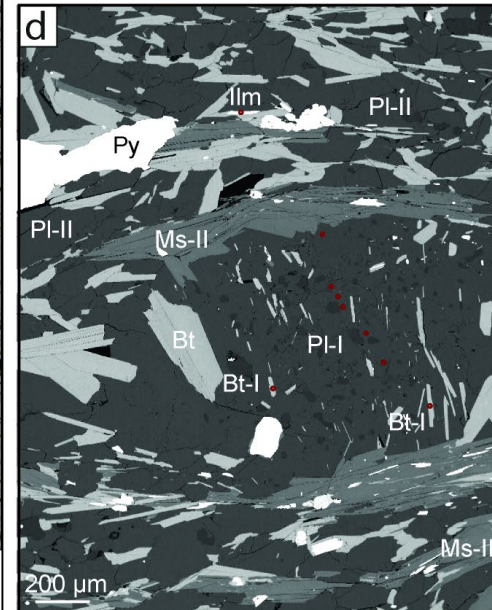
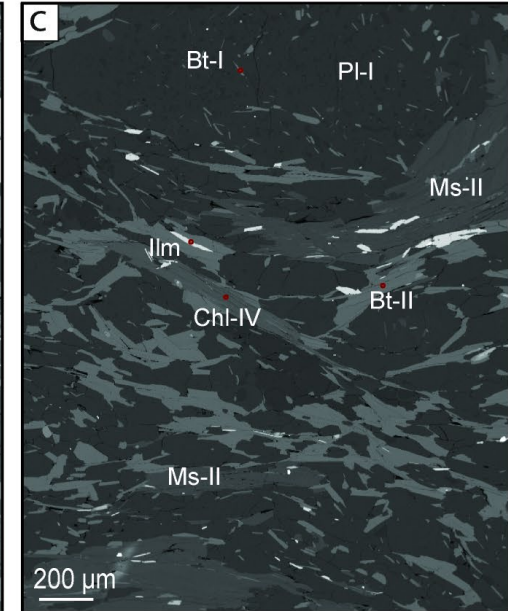
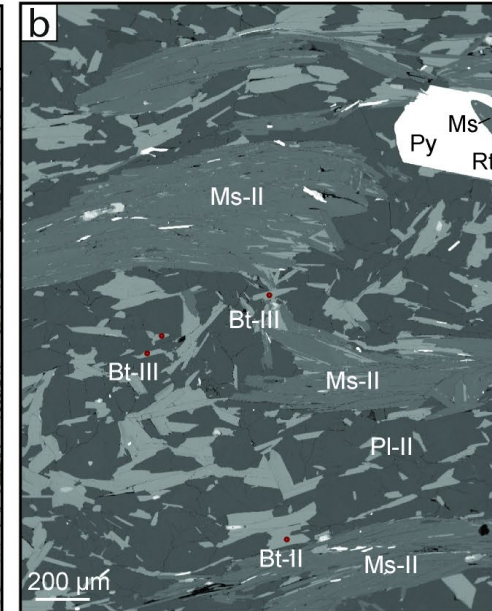
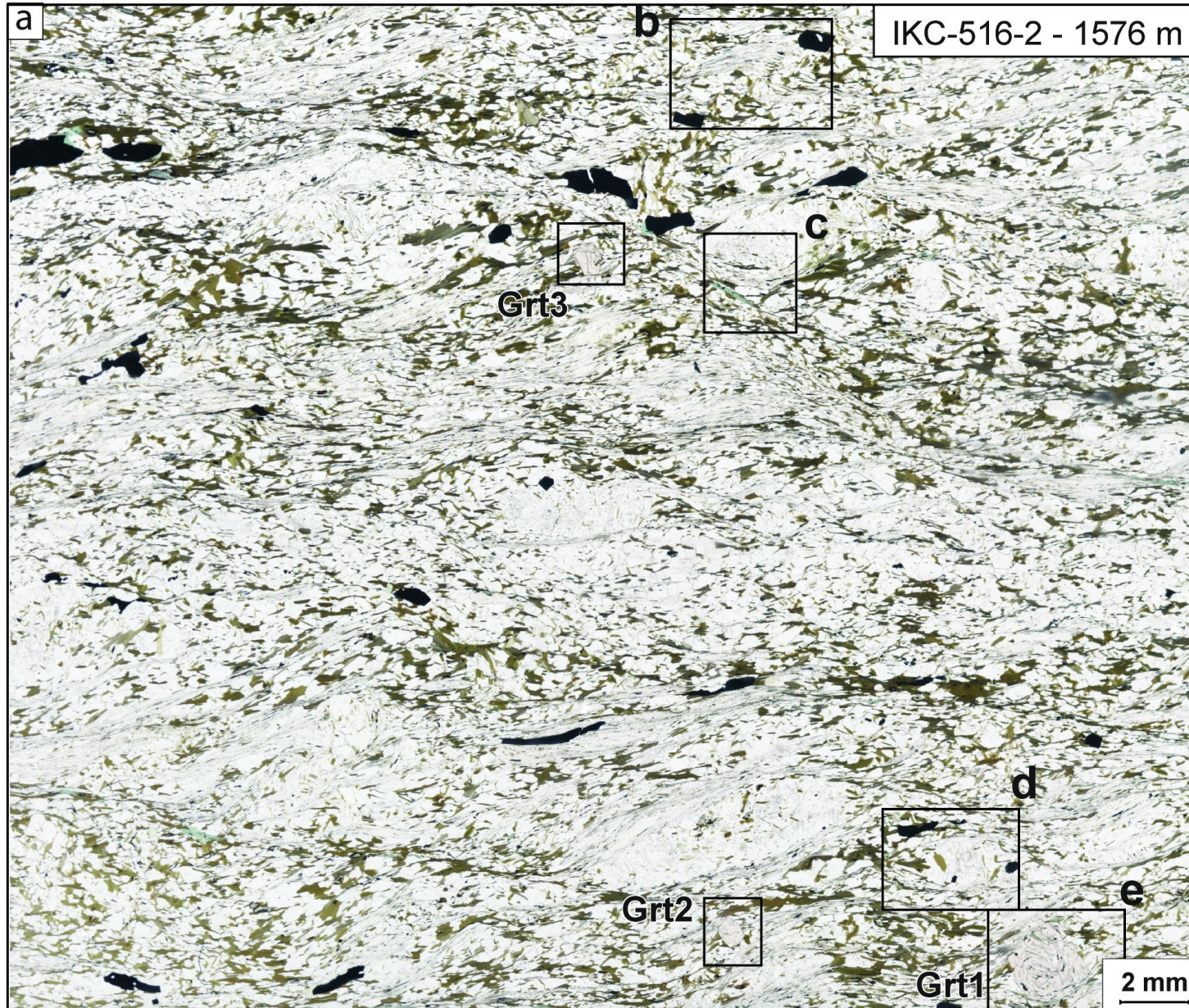
- Så leucogranite

468 – 470 Ma

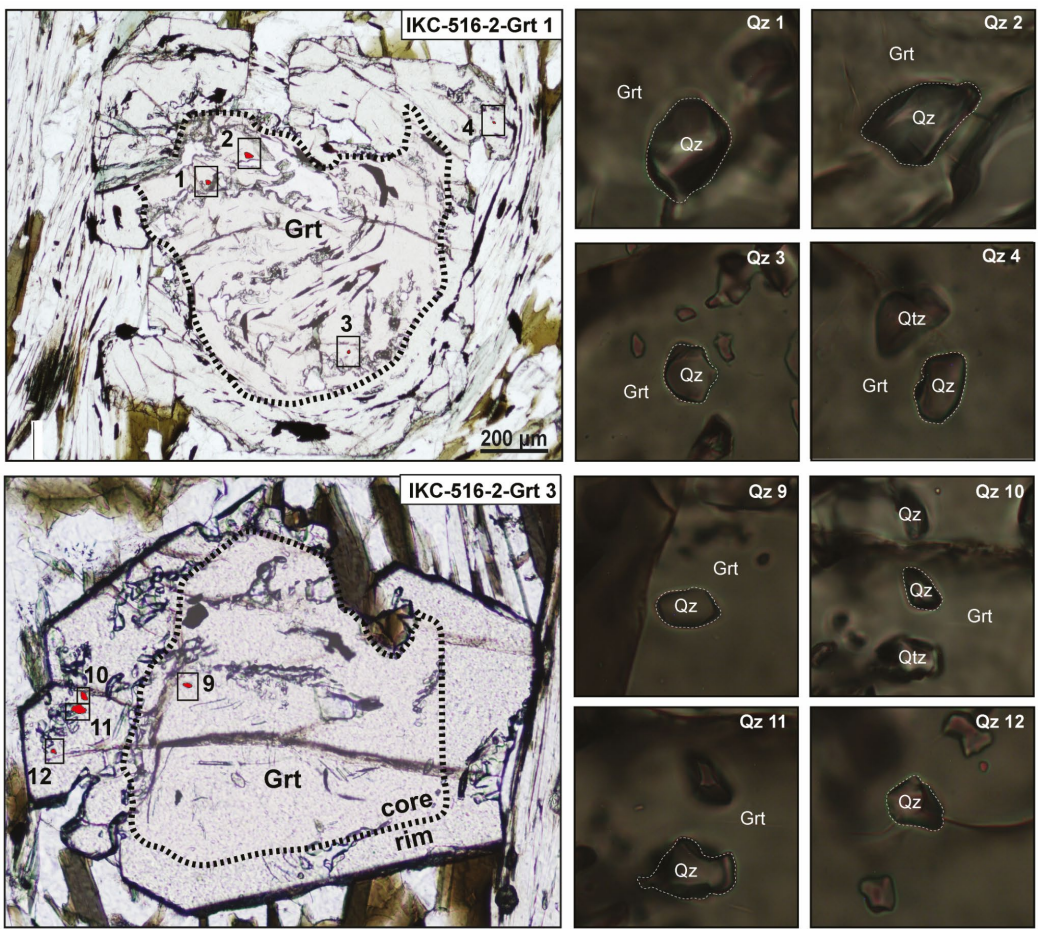
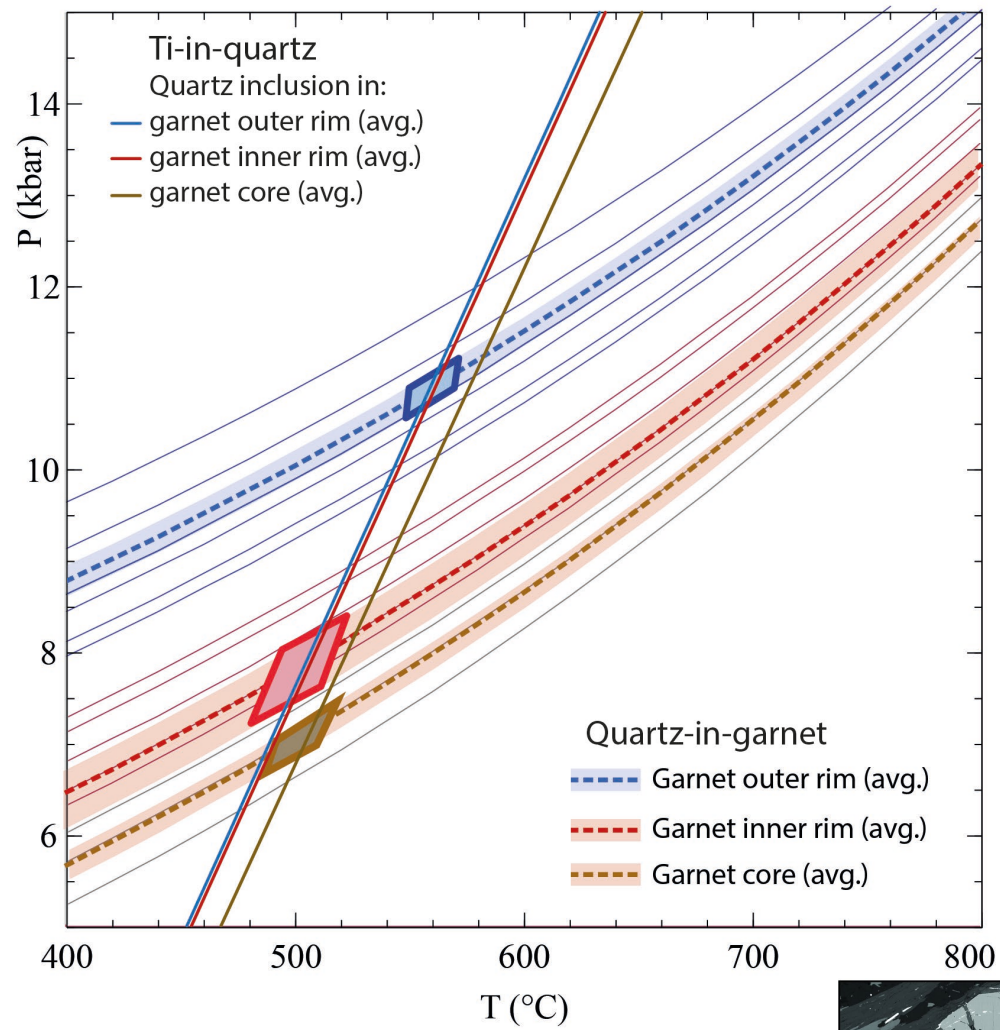
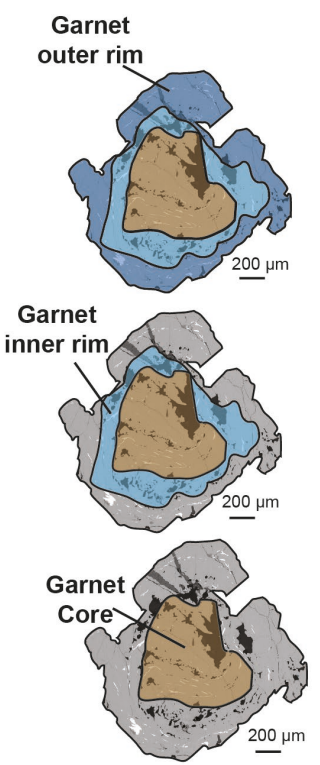
- age of zircon cores
- pre-Silurian magmatic event
- described for the first time for the Seve Nappe Complex



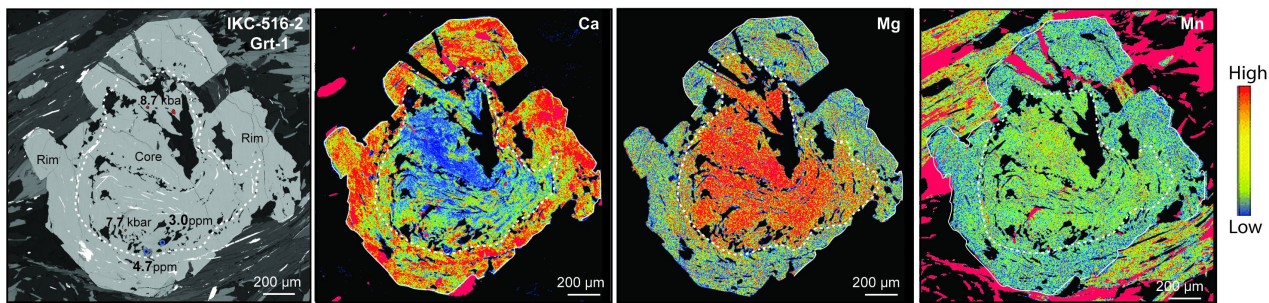
COSC-1 mica schist - petrography and microstructures



COSC-1 mica schist – P-T estimates

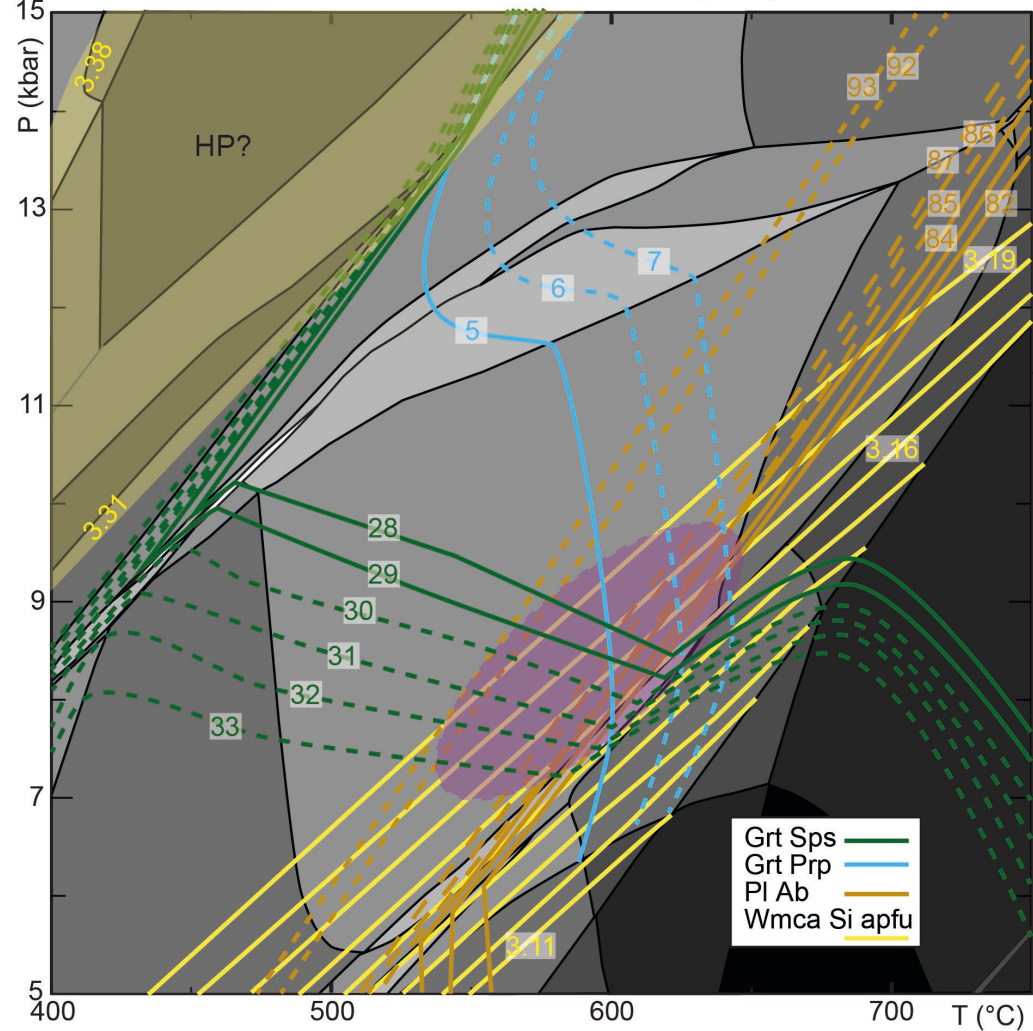
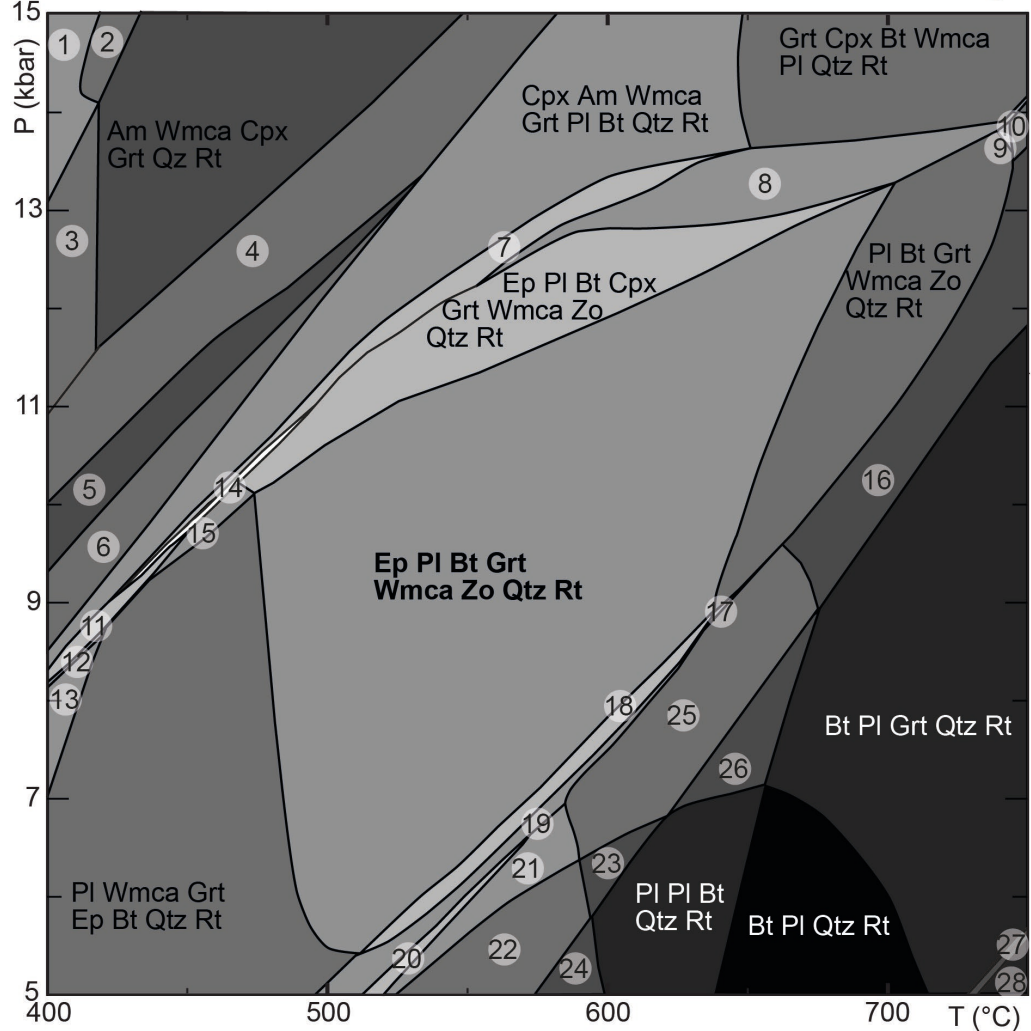


Prograde P-T path based on a combination of Quartz-in-garnet and Ti-in-quartz geothermobarometry



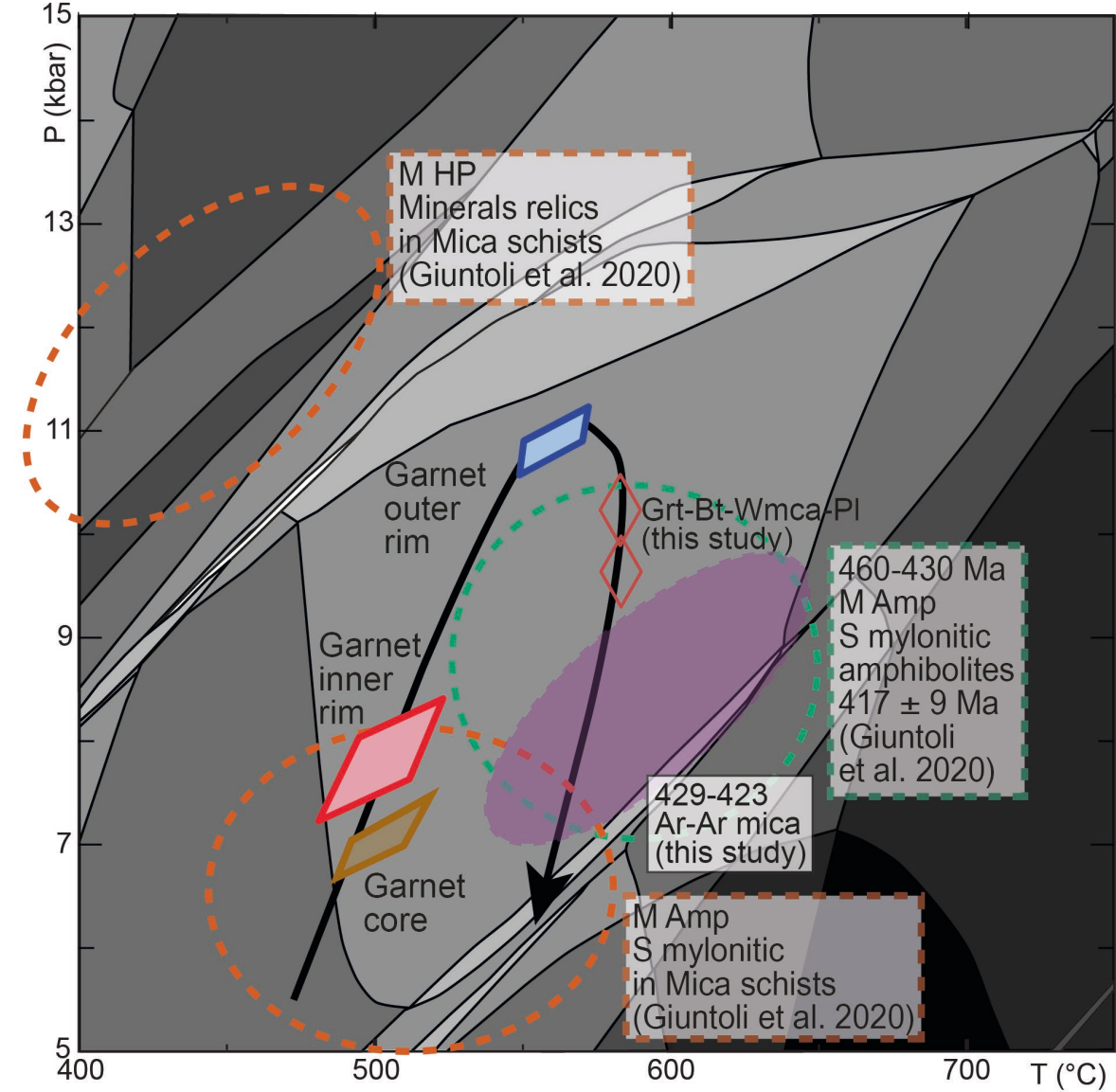
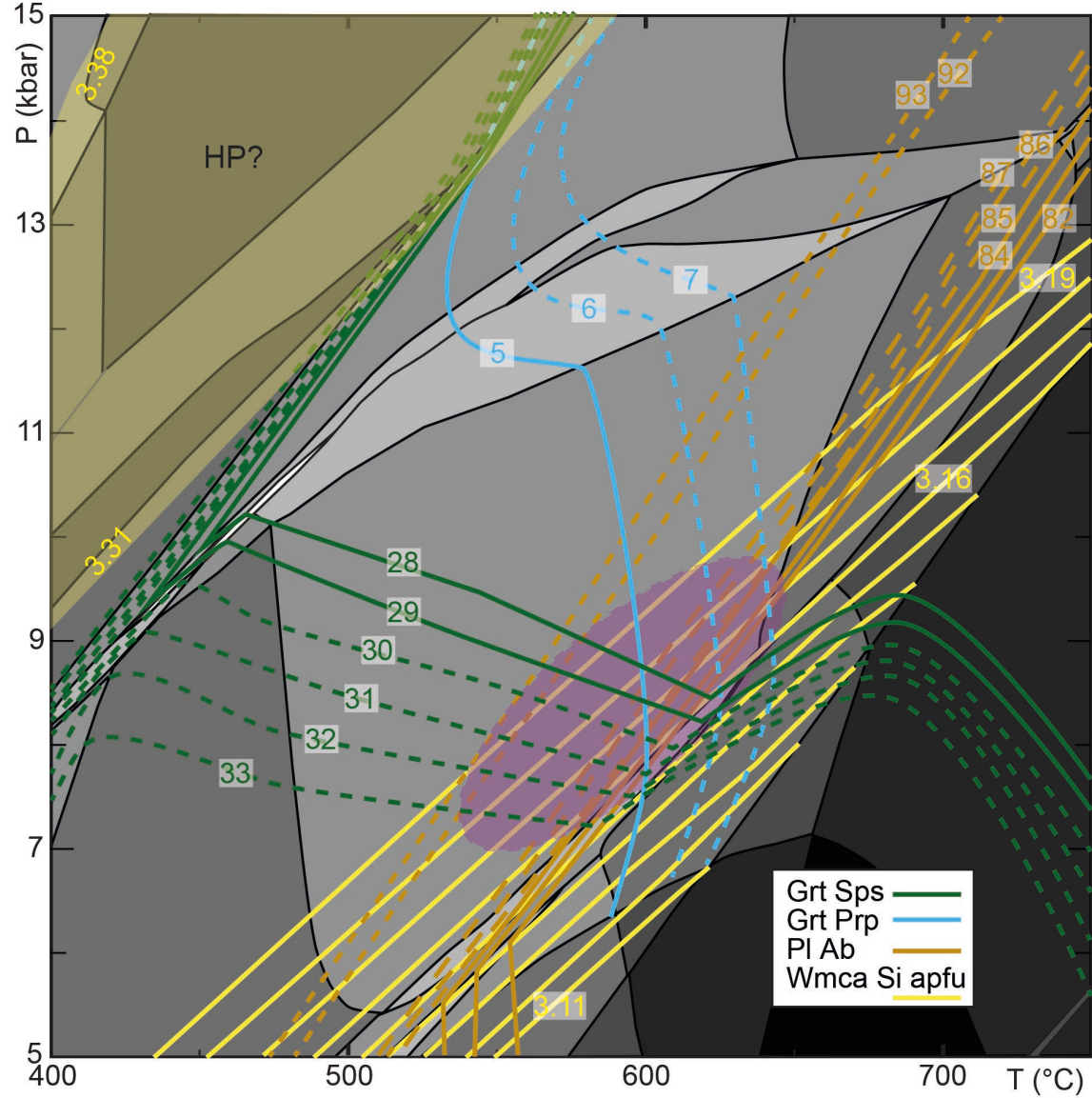
COSC-1 mica schist – P-T estimates

MnO=0.219 Na₂O=6.323 CaO=2.272 K₂O=3.748 FeO=5.187 MgO=3.004 Al₂O₃= 20.262 SiO₂=58.151 TiO₂=0.824 O₂=0.01 (wt.%) H₂O sat.

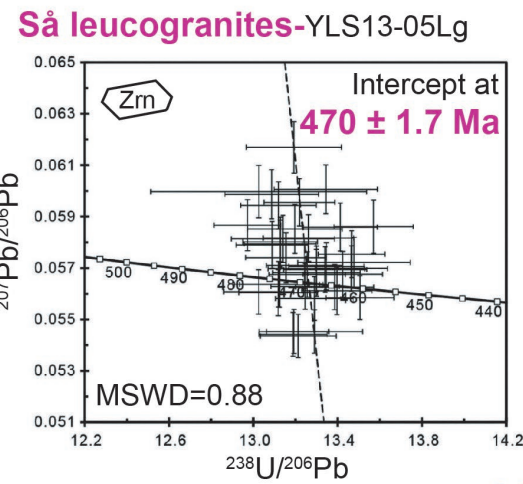
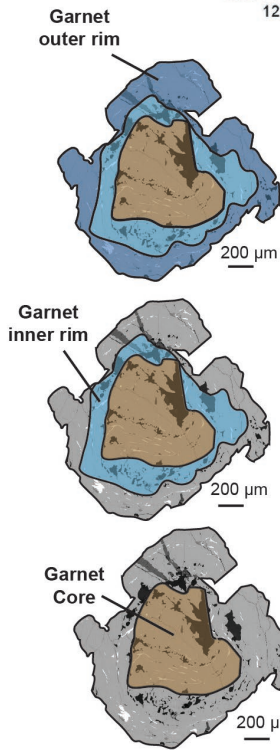
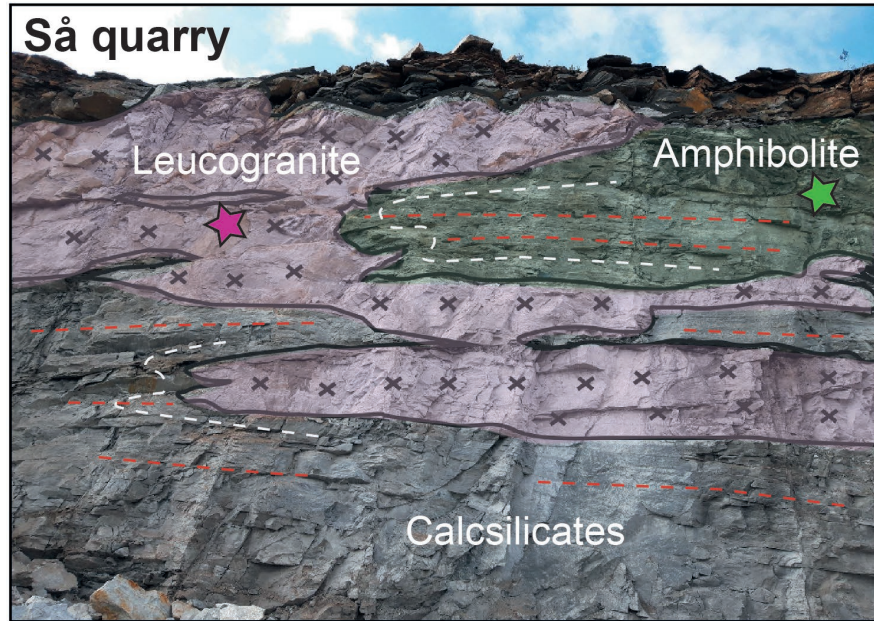
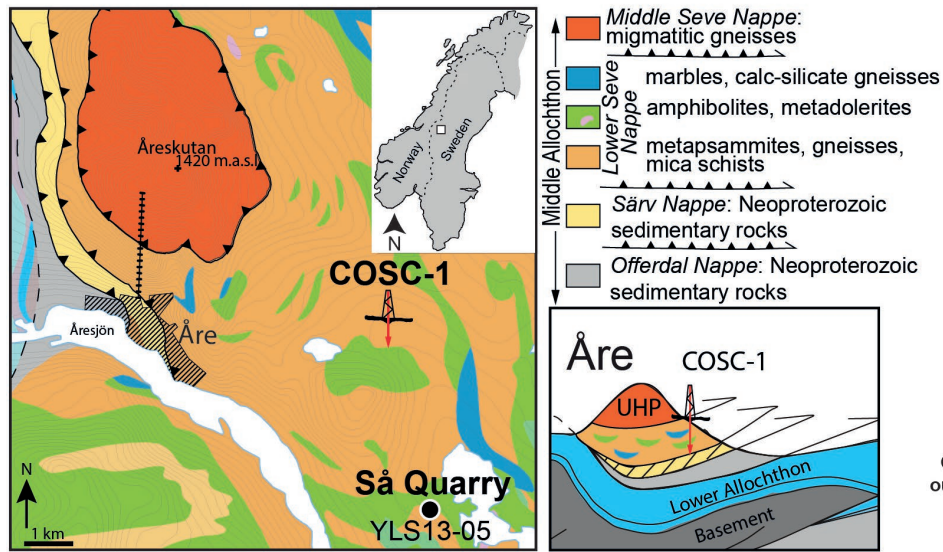


1 - Cpx Cpx Wmca Am Grt Lws Qtz Rt, 2 - Cpx Grt Am Wmca Lws Qtz Rt, 3 - Am Wmca Grt Cpx Cpx Qtz Rt, 4 - Am Cpx Pl Wmca Grt Qtz Rt, 5 - Pl Cpx Am Grt Wmca Rt, 6 - Cpx Am Bt Wmca Grt Pl Rt, 7 - Pl Cpx Am Am Bt Grt Wmca Qtz Rt, 8 - Bt Cpx Pl Wmca Grt Zo Qtz Rt, 9 - Grt Bt Pl Am Wmca Zo Qtz Rt, 10 - Grt Bt Am Pl Wmca Qtz Rt, 11 - Am Cpx Ep Wmca Bt Pl Grt Qtz Rt, 12 - Pl Bt Wmca Ep Am Grt Qtz Rt, 13 - Wmca Ep Pl Bt Chl Grt Qtz Rt, 14 - Grt Pl Cpx Am Ep Wmca Bt Zo Qtz Rt, 15 - Ep Pl Bt Cpx Wmca Grt Qtz Rt, 16 - Bt Grt Pl Wmca Qtz Rt, 17 - Pl Pl Bt Grt Wmca Zo Qtz Rt, 18 - Ep Pl Pl Bt Grt Wmca Zo Qtz Rt, 19 - Ep Pl Pl Bt Wmca Grt Qtz Rt, 20 - Pl Pl Pl Bt Ep Grt Wmca Qtz Rt, 21 - Pl Pl Pl Grt Wmca Bt Qtz Rt, 22 - Pl Pl Pl Wmca Bt Qtz Rt, 23 - Pl Pl Bt Wmca Qtz Rt, 24 - Pl Pl Pl Bt Qtz Rt, 25 - Pl Pl Bt Wmca Grt Qtz Rt, 26 - Grt Pl Pl Bt Qtz Rt, 27 - Pl Bt Ilm Grt Qtz Rt, 28 - Pl Bt Grt Ilm Qtz

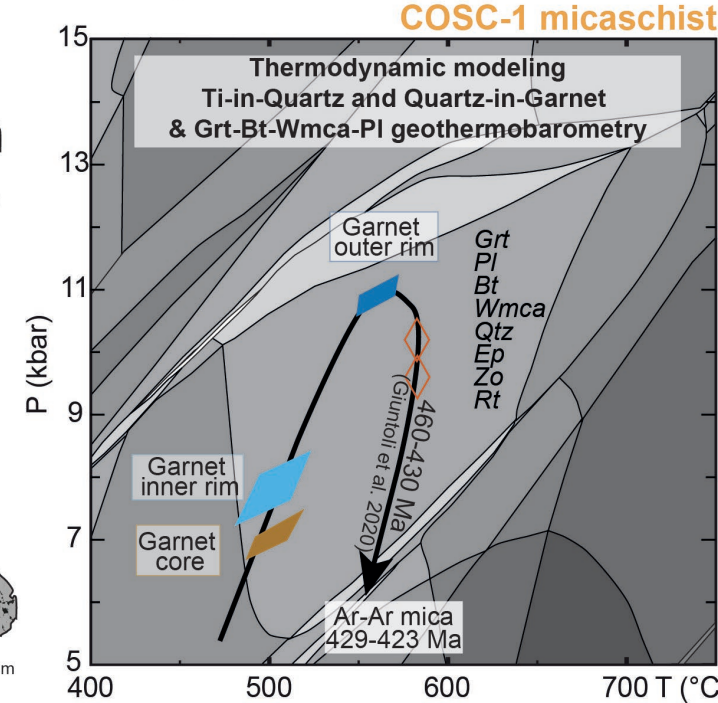
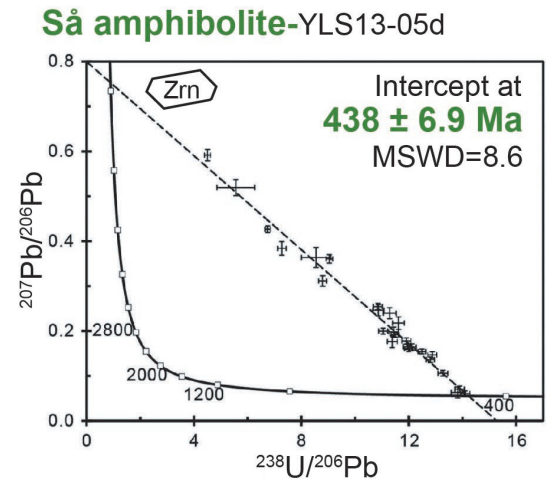
COSC-1 mica schist – P-T-t path



The exact age of the high-pressure metamorphism is not known so far; however, it predates the 460-430 Ma amphibolite facies deformation recorded by titanites in the amphibolites (Giuntoli et al. 2020).



Li et al. (2021) GFF



Summary

- 470 ± 1.7 Ma**
Ordovician magmatic event (described for the first time from the SNC)
- 438 ± 6.9 Ma**
Early Silurian metamorphism related to deformation and isoclinal folding
- c. 429 - 423 Ma**
Exhumation to mid-crustal levels



This new evidence of early Caledonian deformation and metamorphism indicates that the Seve tectonothermal history in central Jämtland probably started early in the Ordovician, or before. Subduction and accretion along the Baltoscandian outer margin occurred prior to the Scandian continent-continent collision, with Siluro-Devonian emplacement of the Seve Nappe Complex across the foreland basins onto the Baltoscandian platform.

For more details, please see:

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ARTICLE



Timing of deformation, metamorphism and leucogranite intrusion in the lower part of the Seve Nappe Complex in central Jämtland, Swedish Caledonides

Yuan Li^a, David G. Gee^b, Anna Ladenberger^c and Håkan Sjöström^b

^aState Key Laboratory for Continental Tectonics and Dynamics, Chinese Academy of Geological Sciences, Beijing, China; ^bDepartment of Earth Sciences, Uppsala University, Uppsala, Sweden; ^cDepartment of Mineral Resources, Geological Survey of Sweden, Uppsala, Sweden