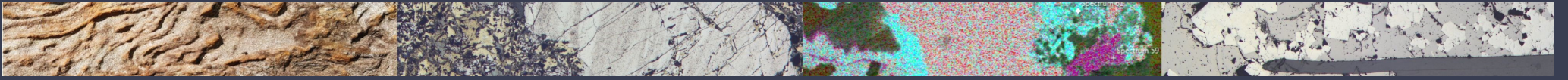




LUNDS
UNIVERSITET

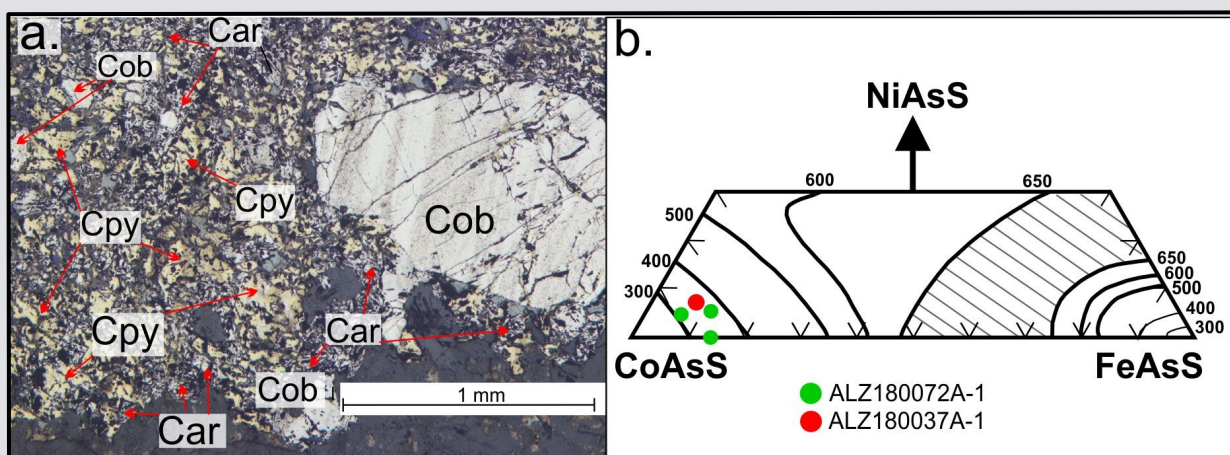
Temporal and Genetical constraints of the Cu-Co Vena-Dampetorp deposit, Bergslagen, Sweden

Dino Leopardi | Lund University | Department of Geology | Sölvegatan 12, 22362 Lund
d.leopardin@gmail.com MSc. Thesis | 2020 | Supervisors: Charlotte Möller (LU) & Alex Lewerentz (SGU).



The Vena-Dampetorp deposit is part of a small fraction of Cu-Co sulphide deposits in the Bergslagen Province, known for the numerous ore occurrences including Fe-oxide skarns and base metal sulphide deposits. Previous studies have focused in the lithological and structural relationships, while the timing and evolution of the mineralization remains unconstrained.

Aim: 1) Determine the temporal relationships of the mineralization with the deposition of the metavolcanics and the regional metamorphism. 2) Understand the association of the ore minerals. 3) Constrain their conditions of formation and alteration. 4) Create a model of the genesis and evolution of the deposit.



Cu-Co-rich vein and cobaltite stability fields. a) Cobaltite (Cob), chalcopyrite (Cpy) and carrollite (Car) vein. b) Cobaltite compositions plotted in the Fe-Ni-Co-As-S system stability fields; temperatures in °C.

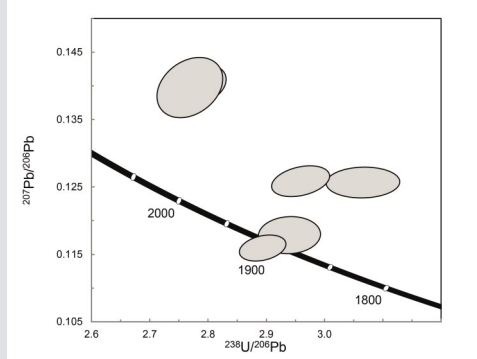
Ore and Metamorphic P-T Conditions

The absence of partial melting in the amphibolite rocks, with cordierite-andalusite-biotite assemblages and the presence of enstatite porphyroblasts in the metavolcanic rocks suggests **peak metamorphic** temperatures **612-680°C** and pressures **below 3.5 kbar**. In comparison, thermometry estimates of cobaltite crystals in **carrollite-chalcopyrite** associations within **veinlets** indicate that the Cu-Co-rich portion of the deposit **formed above 300°C**, possibly in a feeder-like **sub-seafloor hydrothermal system**.

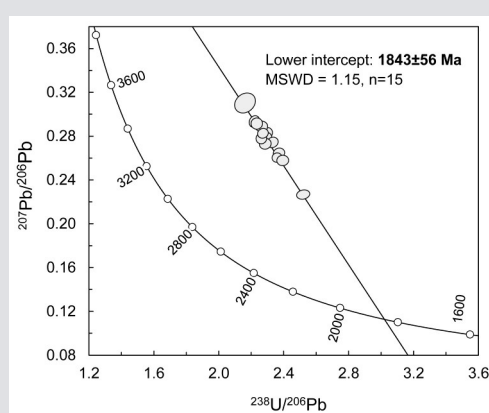
Titanite U-Pb LA-ICPMS Ages

The geochronological results are mostly discordant, with only the skarn sample showing 2 concordant analyses. The latter have a mean $^{207}\text{Pb}/^{206}\text{Pb}$ date of 1882 ± 16 Ma, whereas the lower intercept date obtained from one of the metavolcanic rocks is 1843 ± 56 Ma. Chemical and textural data show that the cores are metamorphic in origin and related them to prograde metamorphism. Thus, the mean $^{207}\text{Pb}/^{206}\text{Pb}$ age of ~ 1.87 Ga for the skarn titanites is interpreted as the **onset of metamorphism**, as metamorphic temperatures remained at the boundary of the U-Pb isotopic closure conditions, whereas the **discordant age (~ 1.84 Ga)** can be either a **metamorphic or cooling age**.

Sample ALZ180089A-1 titanite mean $^{207}\text{Pb}/^{206}\text{Pb}$ age: 1882 ± 16 Ma



Titanite cores in sample ALZ180089A-3



Re-mobilisation

Metamorphism helped re-mobilise sulphides: 1) **Hydrothermally** through desulfidation reactions that **scavenged** metals like **Co** and generated **secondary veins**. 2) **Sulphide melting** that helped **concentrate** low fusion point elements (**Pb-Sb-Bi**) and **Co** in mineralogical and texturally **complex aggregates**.

