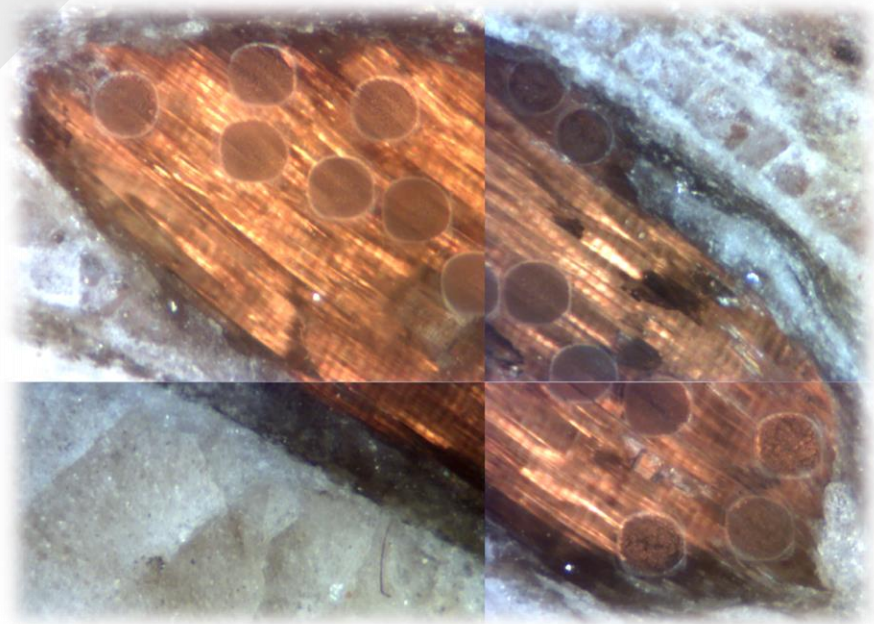
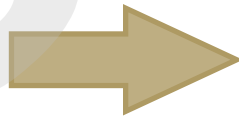


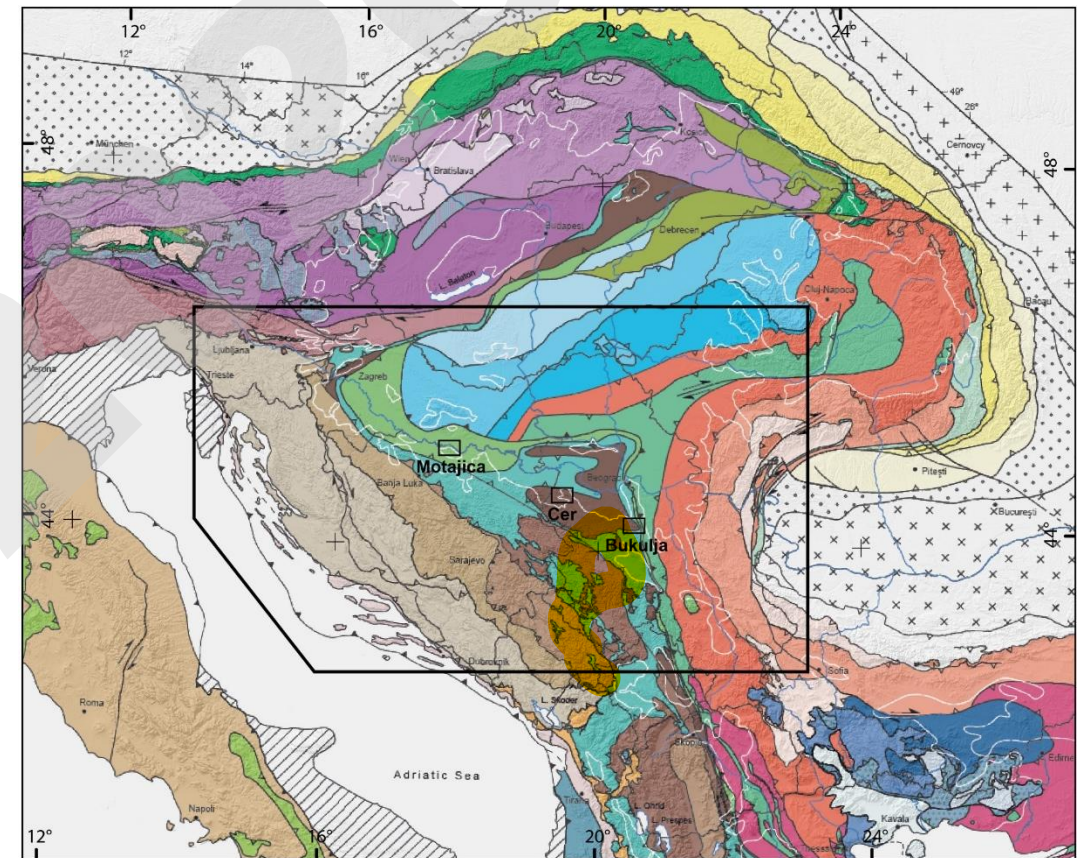
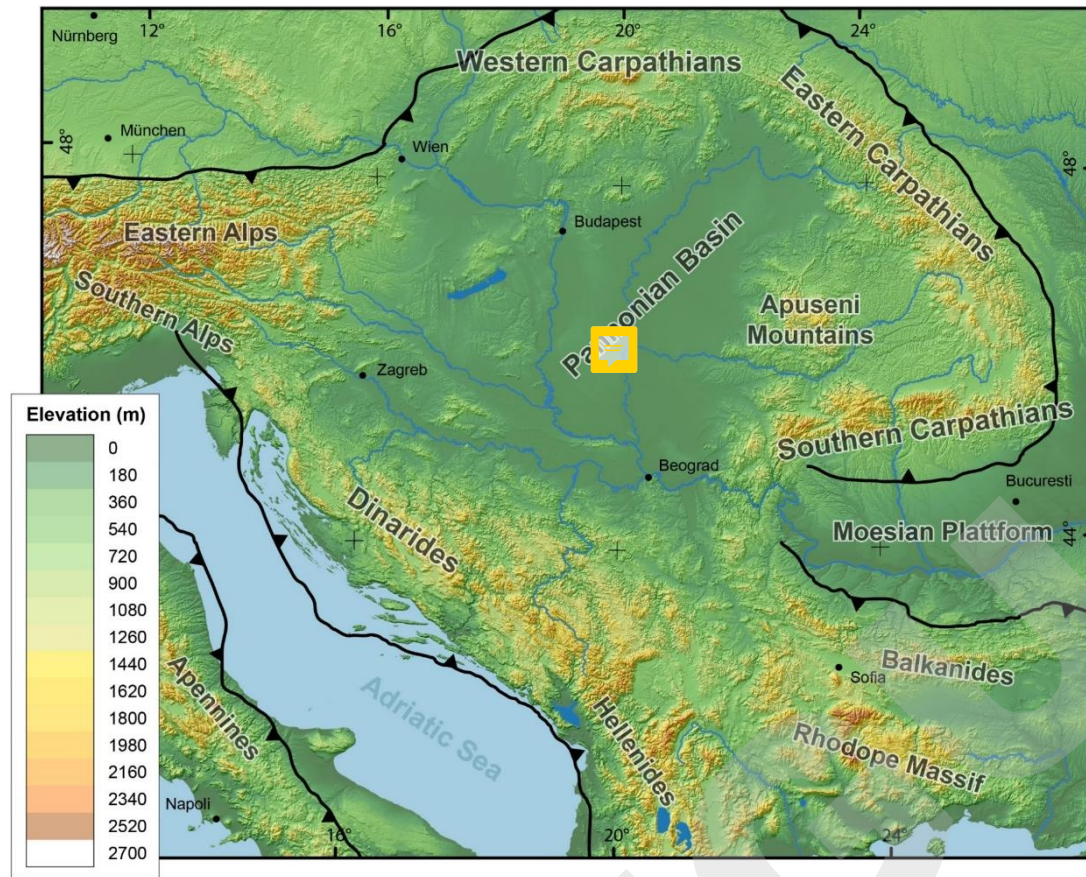
# Dating extensional deformation to unravel exhumation patterns in the Internal Dinarides

*Georg Löwe, Susanne Schneider, Jörg A. Pfänder, Kamil Ustaszewski*

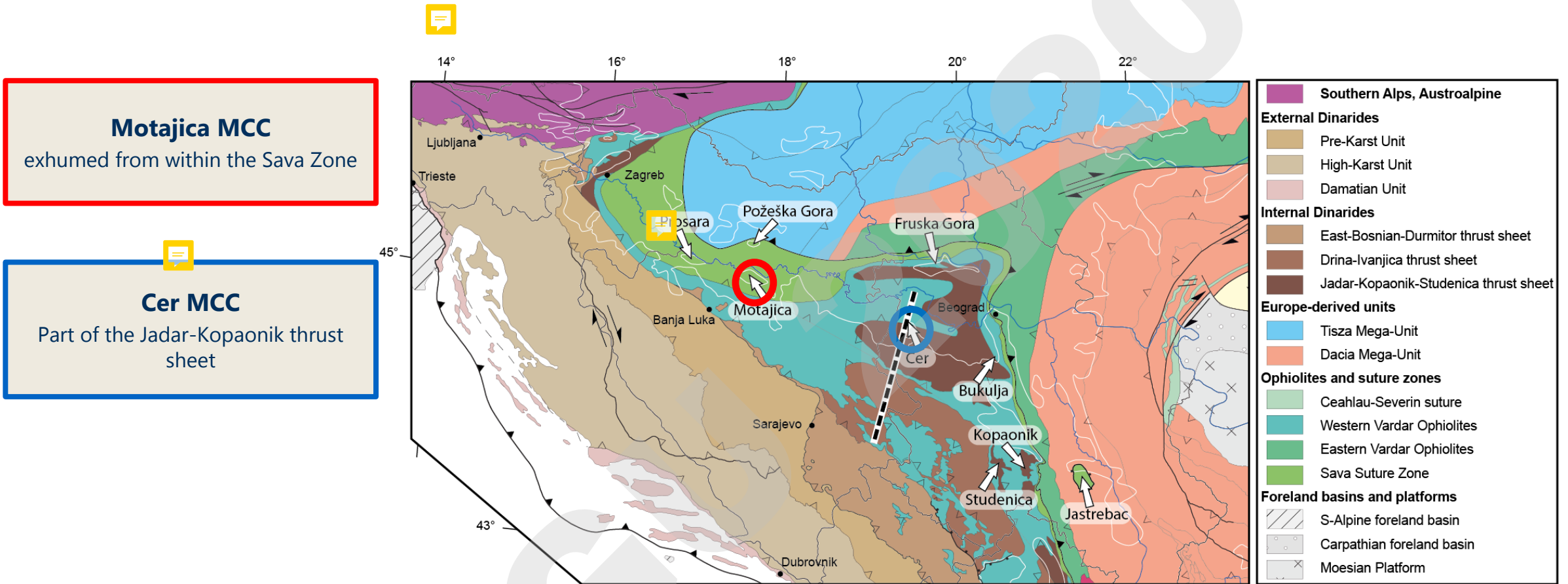




# Where are the Internal Dinarides?



# How can two core complexes help to constrain extension?

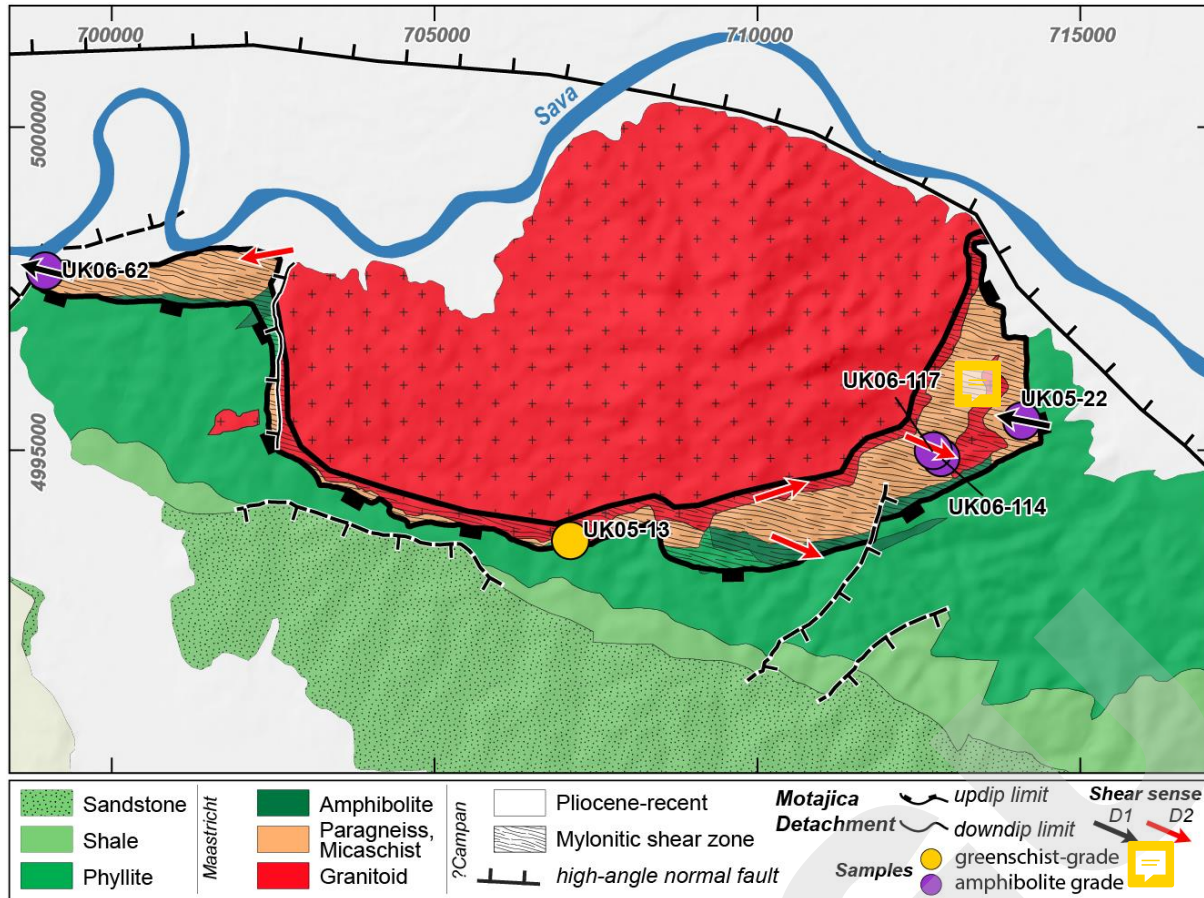


## Oligo-Miocene Extension

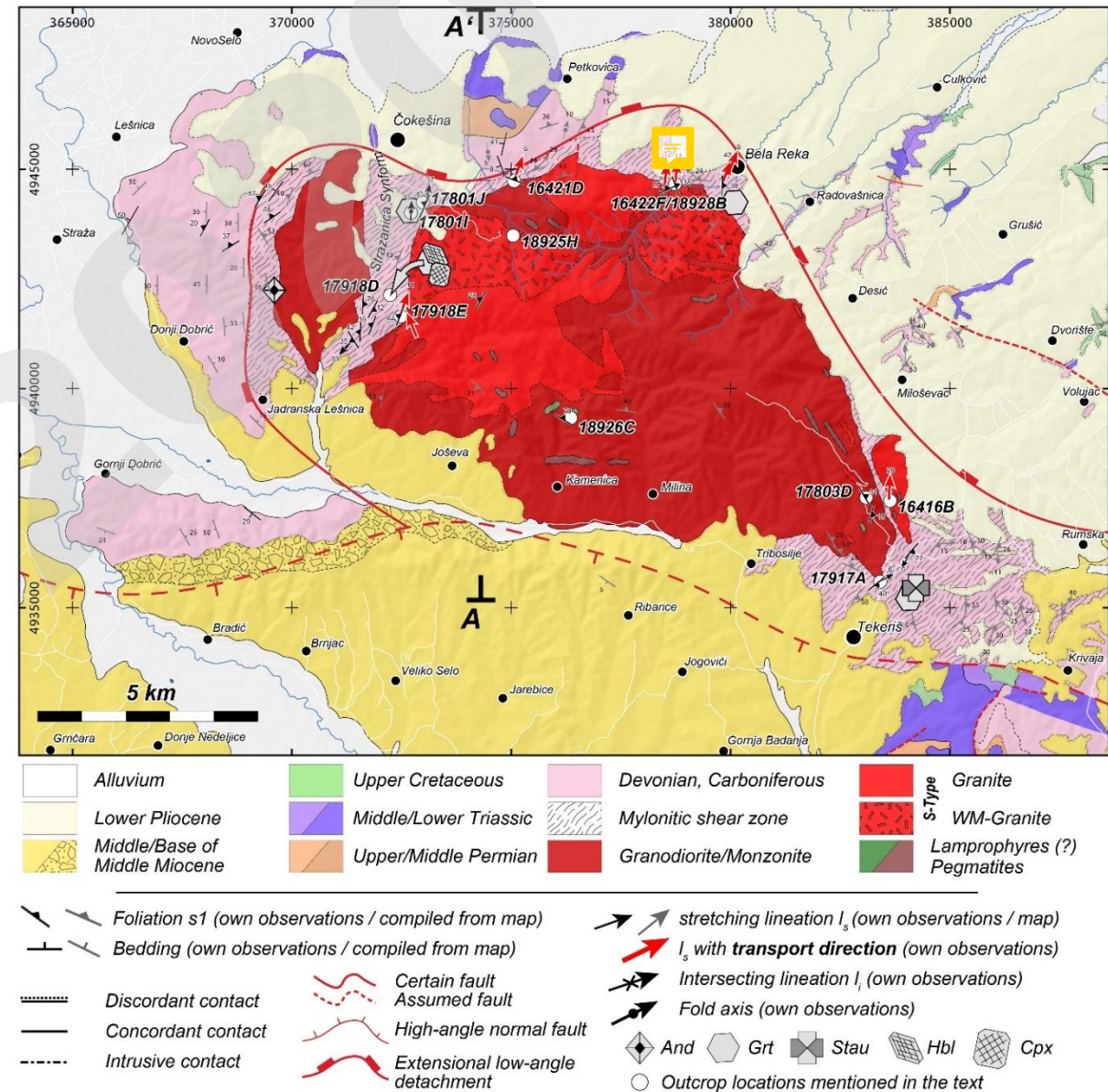
Exhumation of several metamorphic core complexes from within the Sava Zone and most internal Adria-derived thrust sheets



## Motajica MCC - exhumed from within the Sava Zone

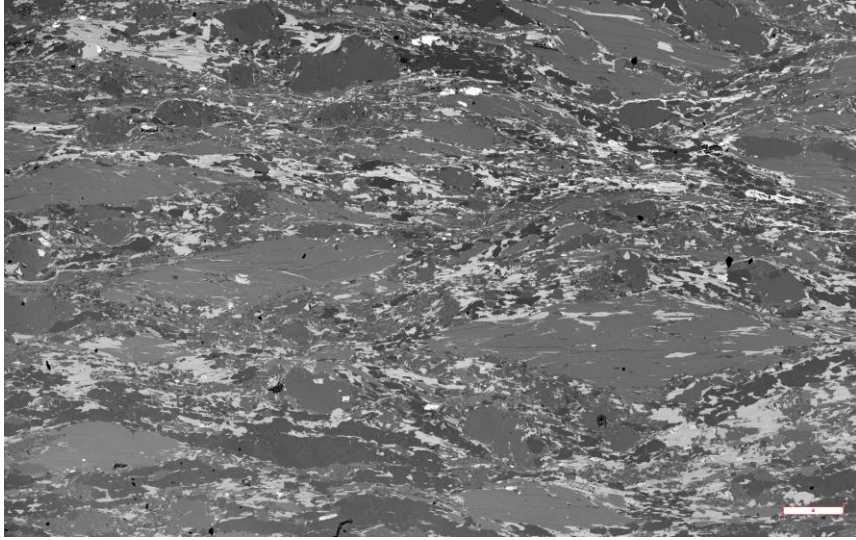


## Cer MCC - Part of the Jadar-Kopaonik thrust sheet



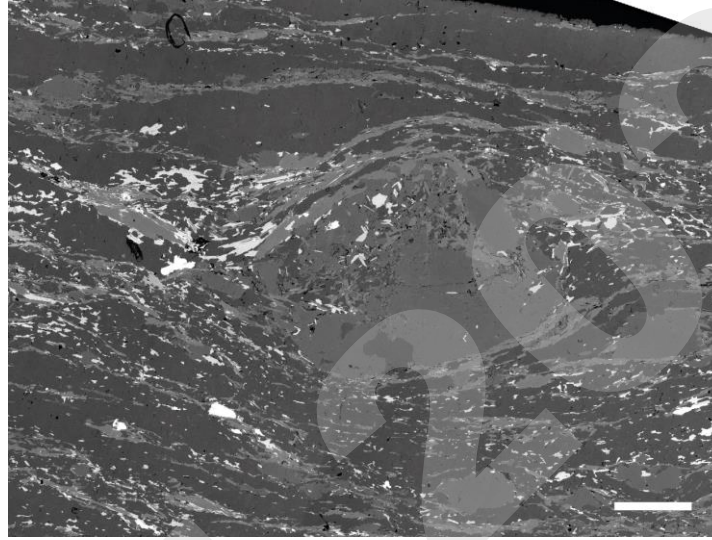


# Types of white mica used for Ar-Ar in-situ geochronology:



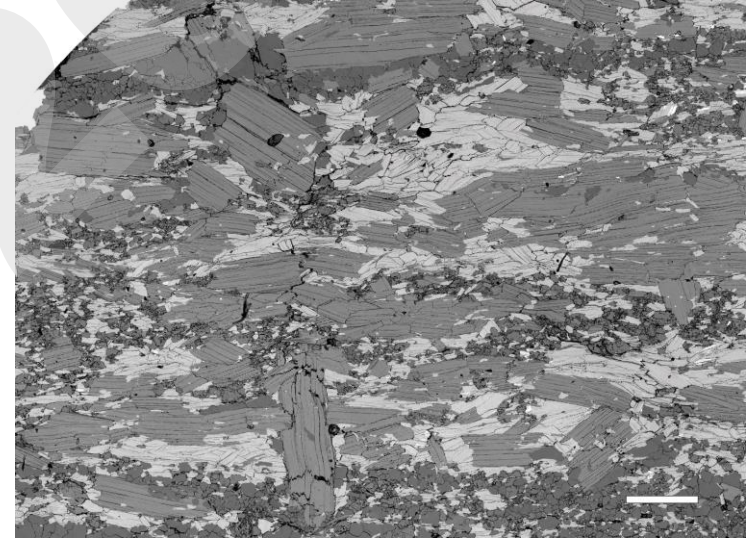
## Prekinematic:

Large, deformed grains



## Synkinematic:

Fine-grained aggregates, usually grown in strain shadows



## Postmagmatic:

Growth triggered by intrusion, grains overgrow a pre-existing foliation

# Results from Motajica MCC:

## Postmagmatic grains:

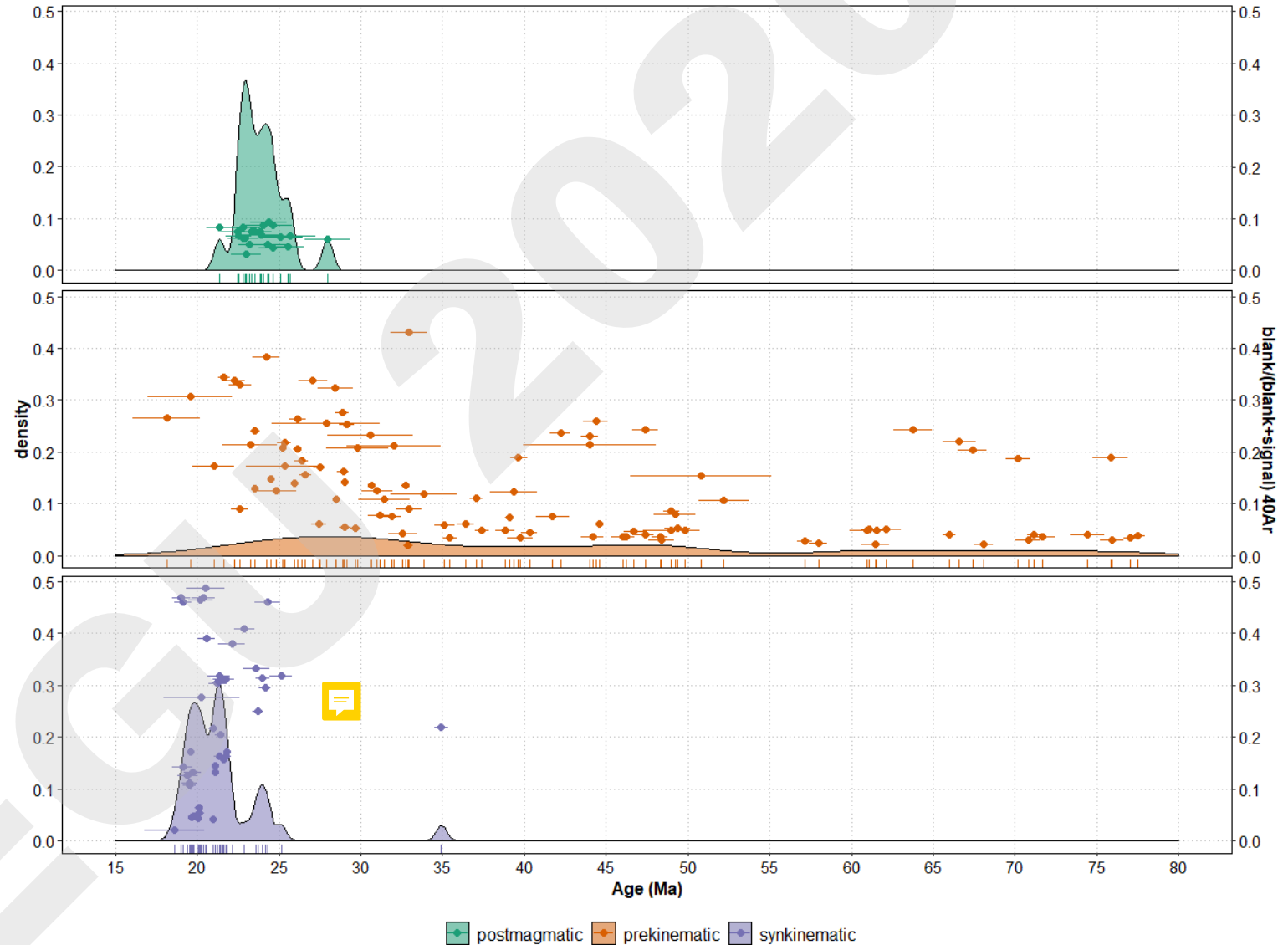
Static crystallization due to contact metamorphism, i.e. intrusion of the Motajica pluton at  $\approx 27$  Ma (U/Pb-Zr)

## Prekinematic grains:

Large scatter due to diffusion/partial resetting since  $\approx 75$  Ma

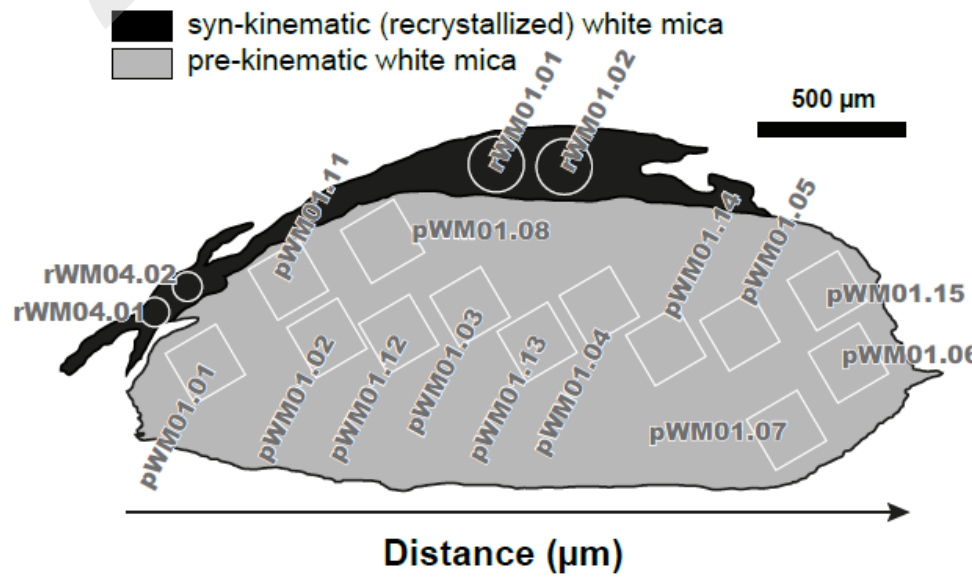
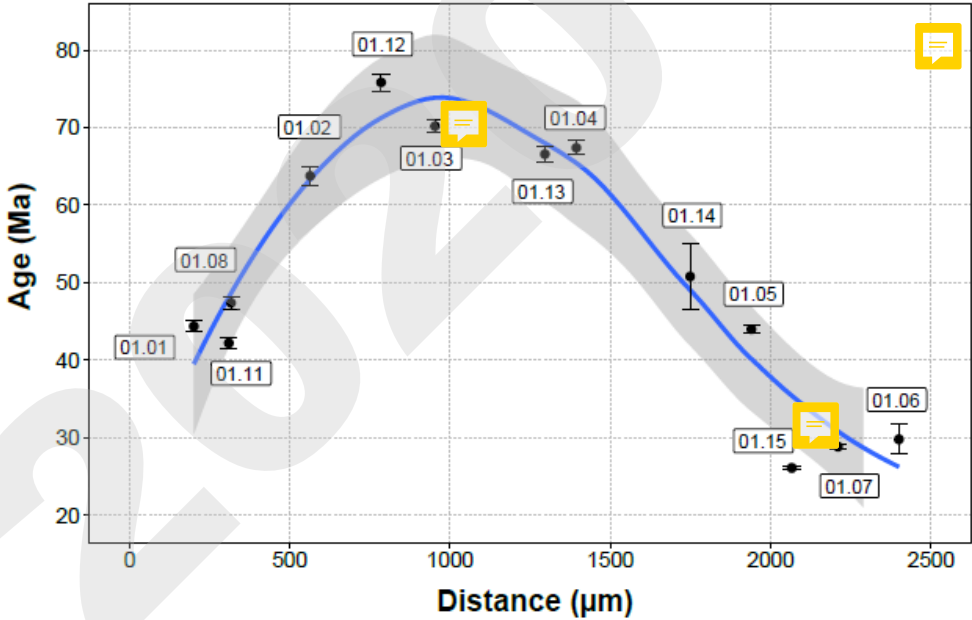
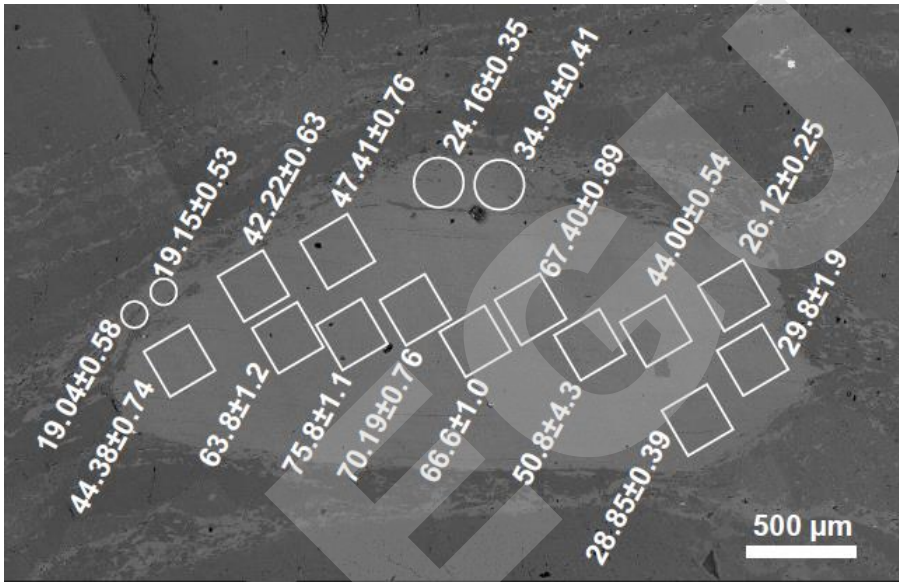
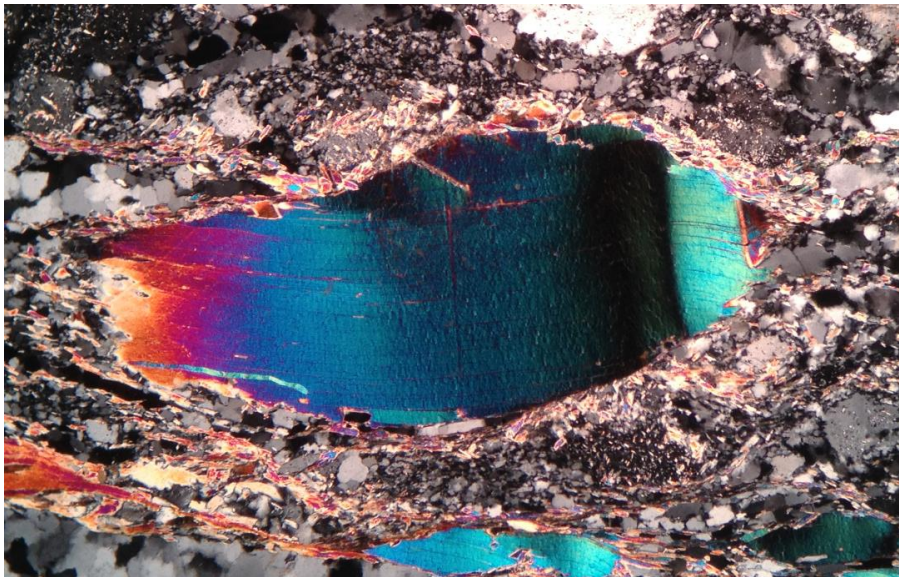
## Synkinematic grains:

(re-) crystallization ages between **20-25 Ma** - Activity of extension



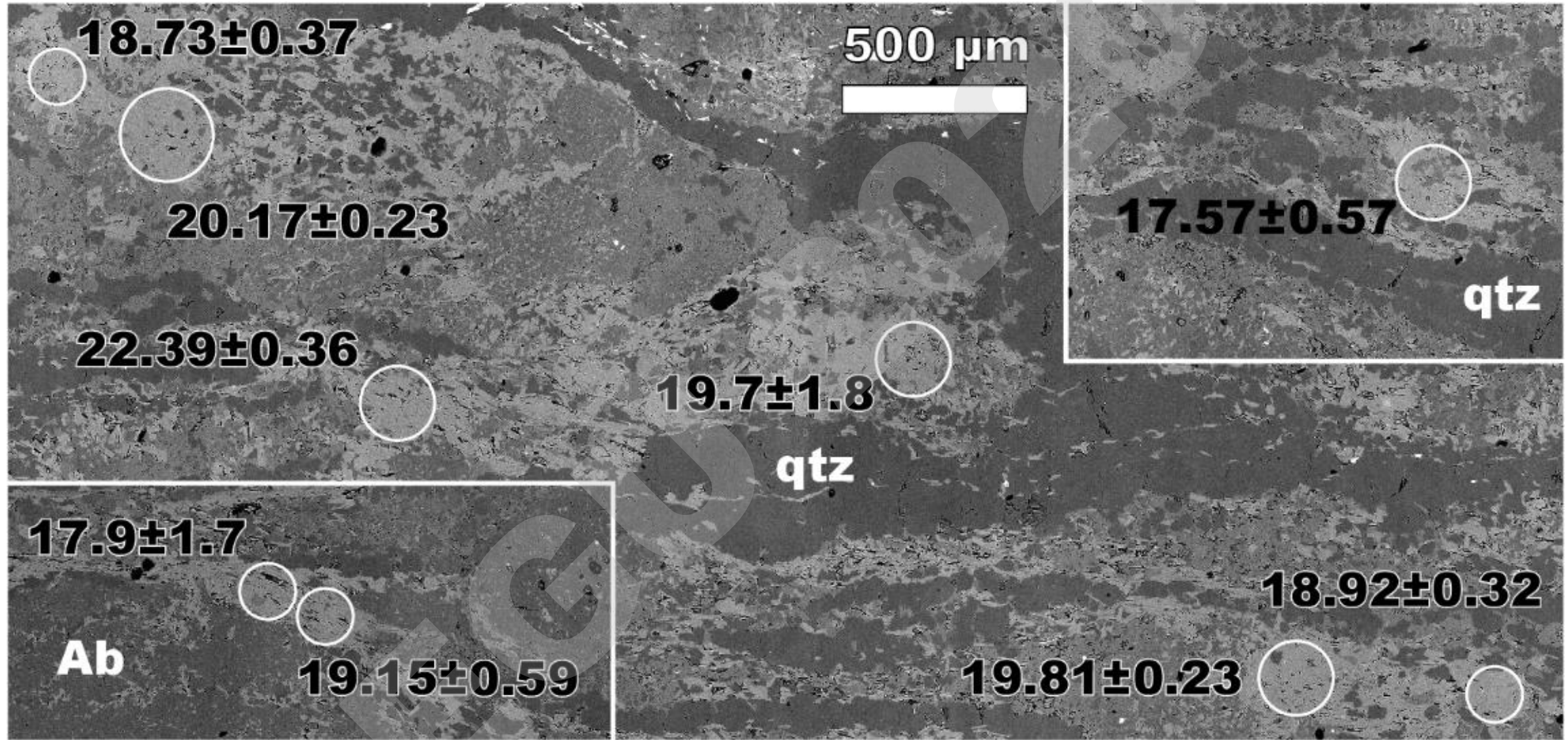


# Prekinematic white mica:





# Synkinematic white mica:





# What's going on at Cer MCC?

## Multiphase pluton:

- S-type granite intrudes I-type granodiorite

## Paleozoic metasediments:

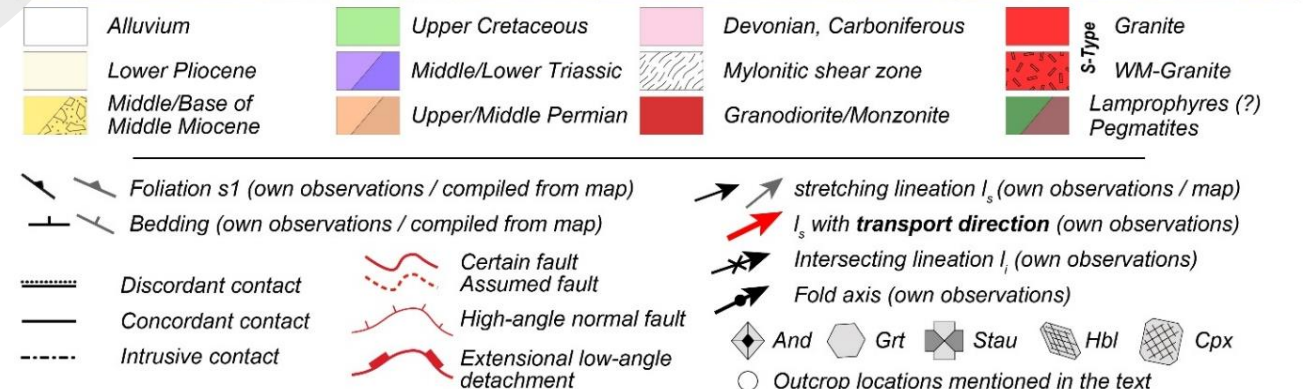
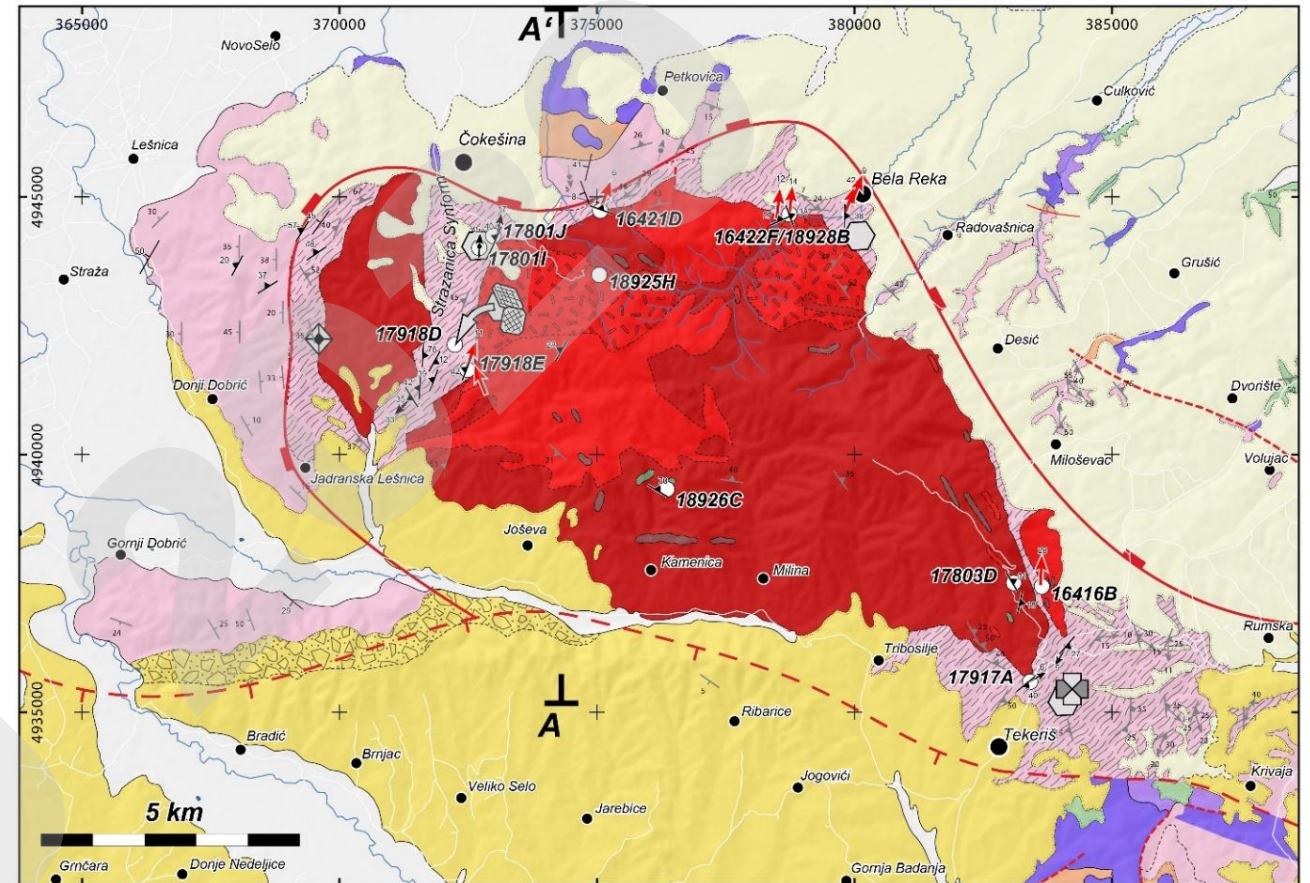
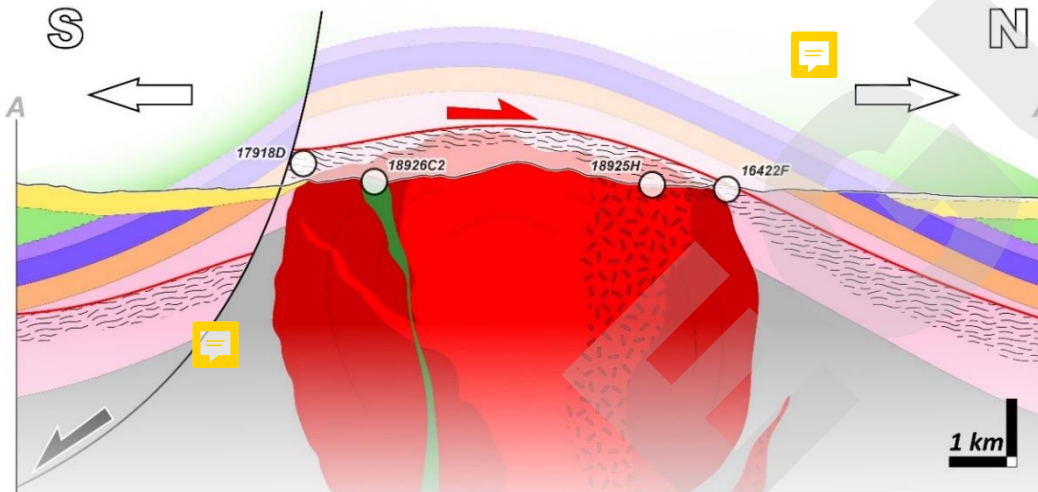
- show contact metamorphic overprint of varying degree
  - Pressure-dominated: Grt-St-Mica schists
  - Temperature-dominated: And-schist, Hornfels

## I-Type granitoid age:

- U/Pb (Zr)  $\approx$  32 Ma (Matenco, 2014)
- K/Ar (Bt, Fsp, Hbl)  $\approx$  17-21 Ma (Koroneos, 2010)

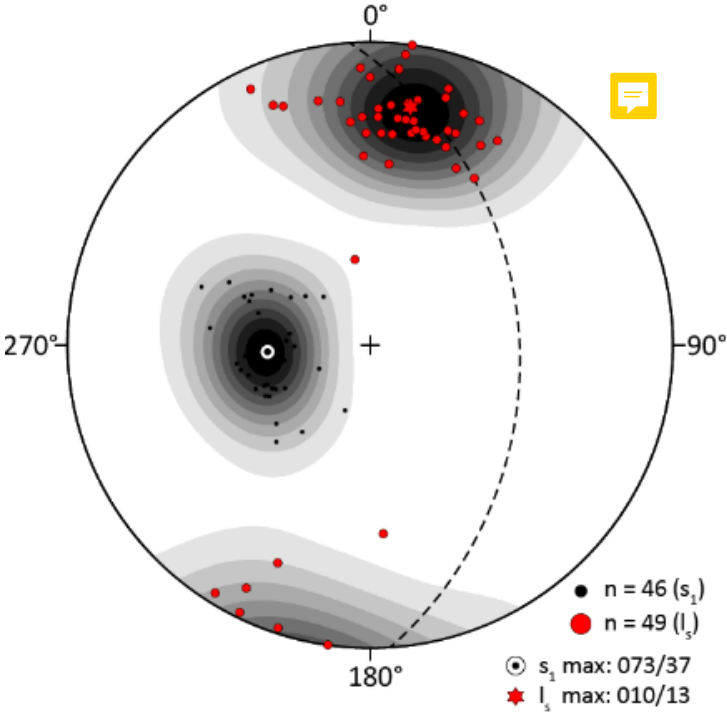
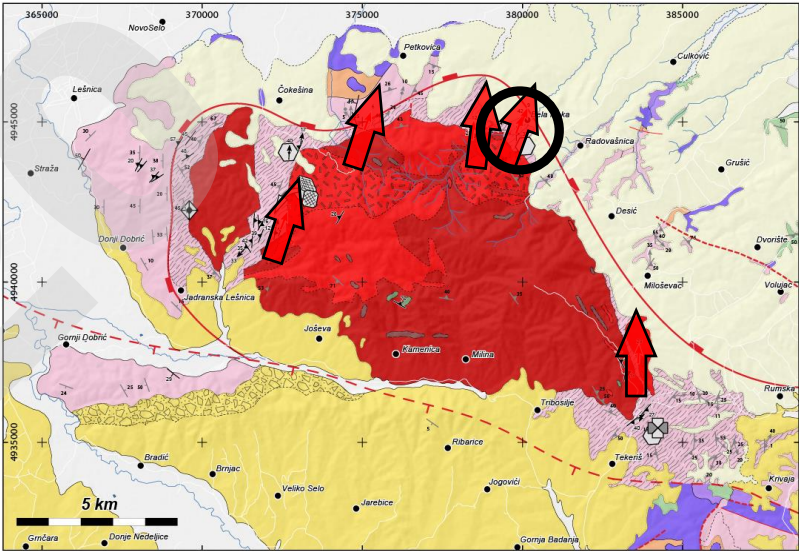
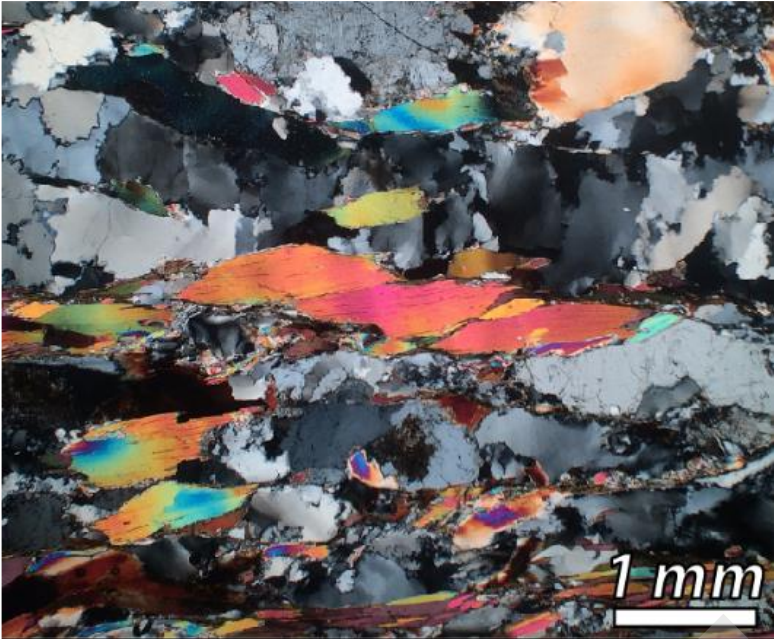
## S-Type granitoid age: (Koroneos, 2010)

- K/Ar (Bt, WM, Fsp)  $\approx$  15-16.5 Ma
- **Cooling** of the main magmatic body



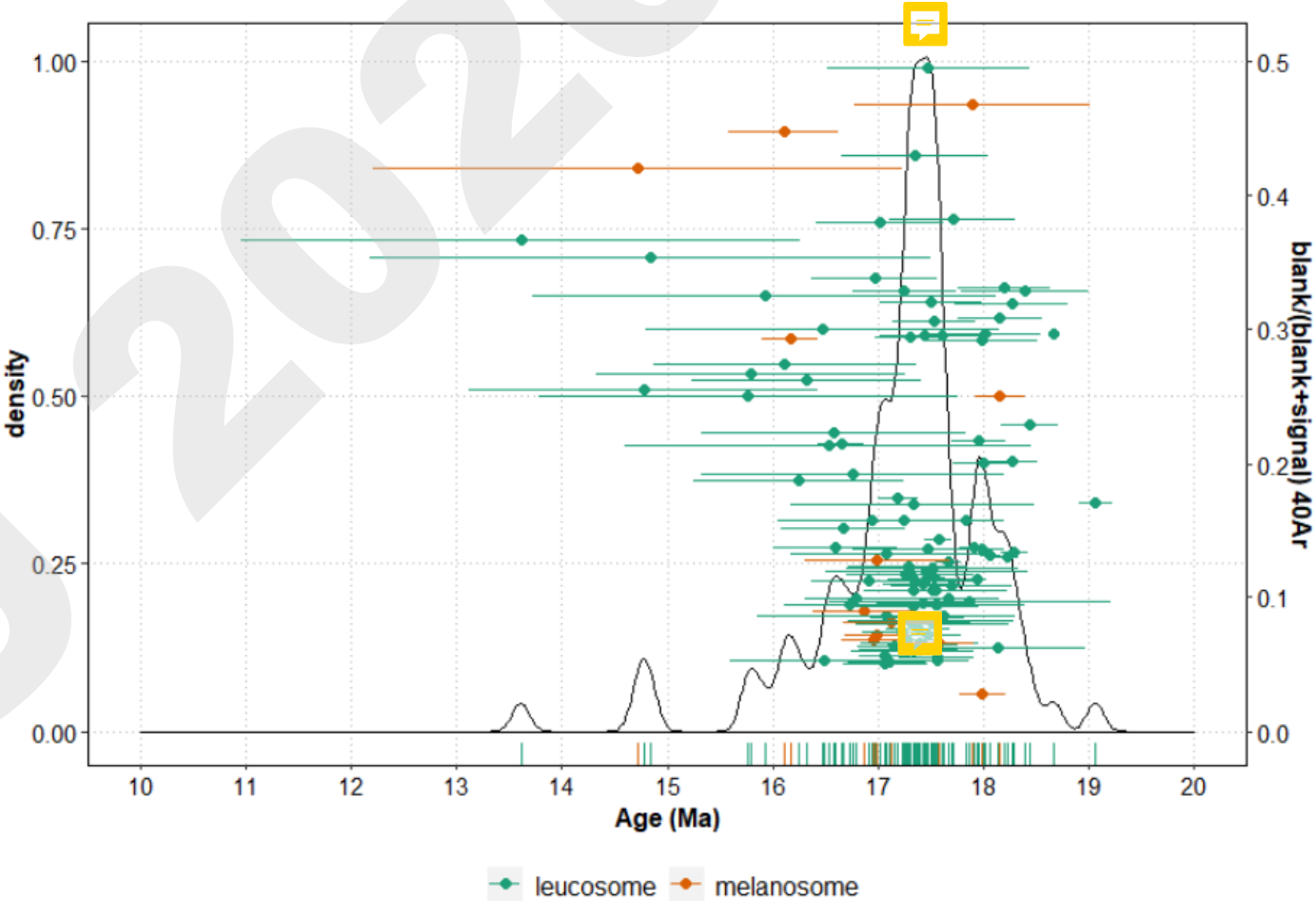
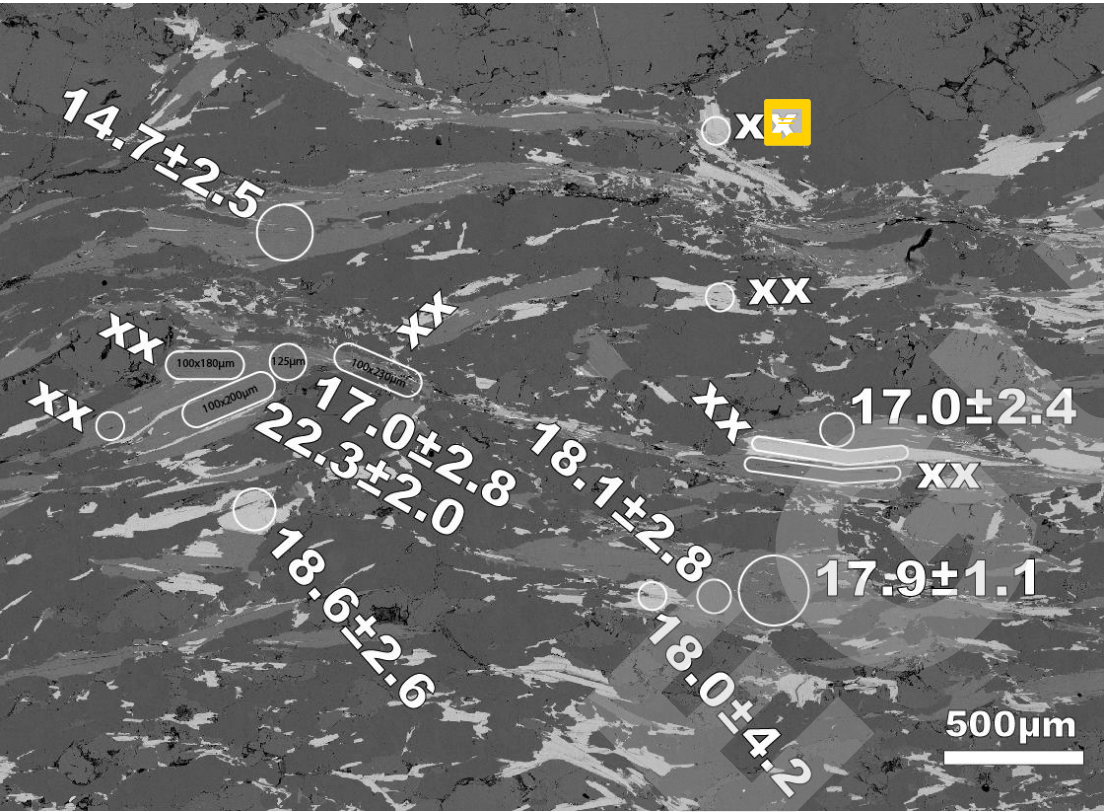
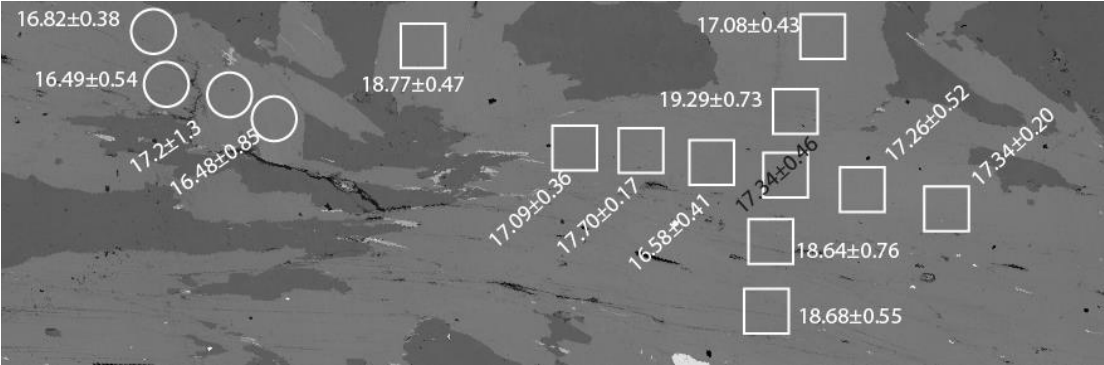


# What's going on at Cer MCC?





# Results of Ar-Ar in-situ geochronology for white mica:



# Conclusions:

- Extension in the Pannonian Basin affects innermost Adriatic thrust sheets
- Breakaway-fault for the detachment reactivates ramp segment of the nappe contact
- Extension along the detachment with top-N transport active at  $\approx 17\text{-}18\text{ Ma}$
- Exhumation controlled by high-angle normal faults that also exhume the detachment

