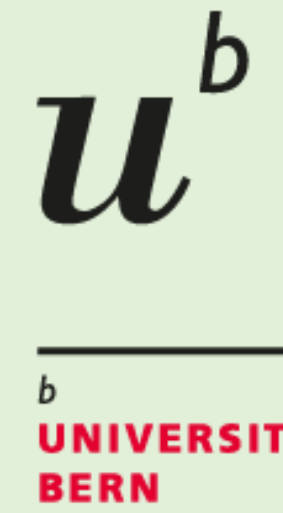


# Chemical composition and geochronology of epidote group minerals in high pressure rocks

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## Introduction

The Theodul Glacier Unit (TGU) near Zermatt is embedded within the ophiolites of the Zermatt-Saas Zone (ZSZ) and the two units have been subducted to eclogite facies during the Alpine orogeny. The high pressure rocks of the TGU have been previously investigated with garnet and zircon [1, 2]. We use epidote group minerals to further constrain the metamorphic history.

Analyses were carried out in mafic fels (**Z18TB13A**, **Z19TB03B**), garnet schist (**Z16TB35B**) and mafic schist (**Z16TB08B**, **Z17TB06A**, **Z17TB10B**) samples from TGU, a mica schist sample (**ZS21-54**) of unclear provenance and a calc schist sample (**Z16TB07**) from ZSZ.

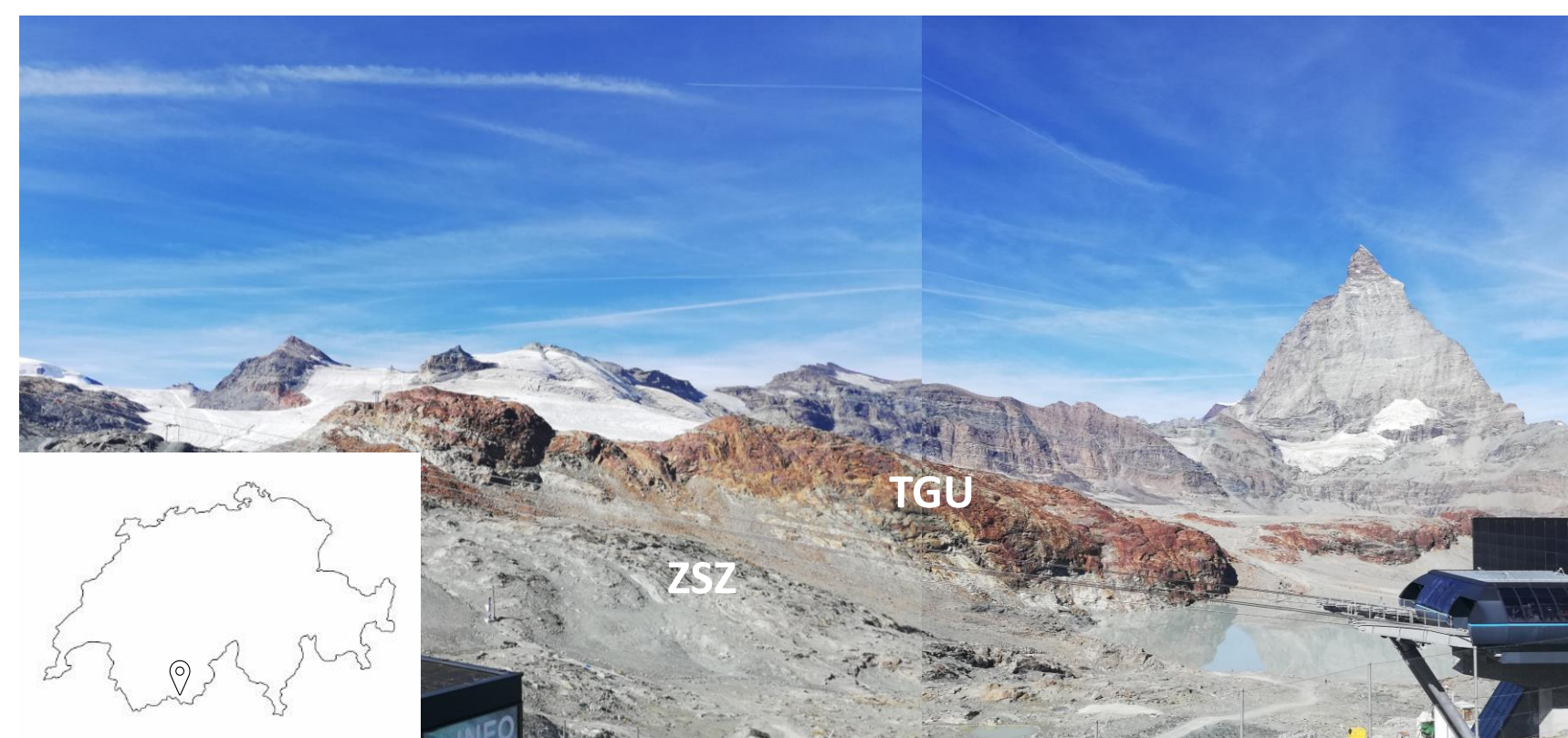


Fig.1: landscape view of TGU (brown) and surrounding ZSZ.

## Aims

- Use the trace element chemistry of epidote for tracing the protoliths of the TGU samples and for reconstructing the different generations of epidote.
- Use the age of epidote group minerals to constrain the timing of metamorphic and magmatic events in the TGU.

## Methods

- Light and scanning electron microscopy
- Laser ablation ICP-MS → U-Pb dating allanite & trace elements allanite and epidote

## Results

### Epidote: four textural categories

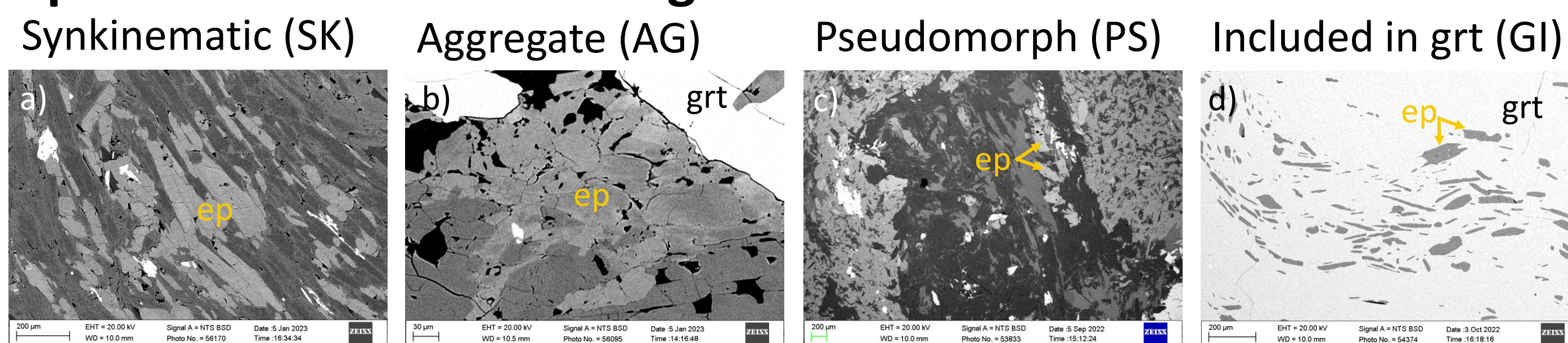


Fig. 2: epidote (ep) textures. a) synkinematic in mafic schist **Z17TB06A**, b) aggregate next to garnet (grt) in mafic fels **Z19TB03B**, c) pseudomorph after lawsonite in mafic schist **Z17TB10B**, d) epidote included in garnet (grt) in mafic schist **Z16TB08B**.

### Epidote: trace element pattern (A-F)

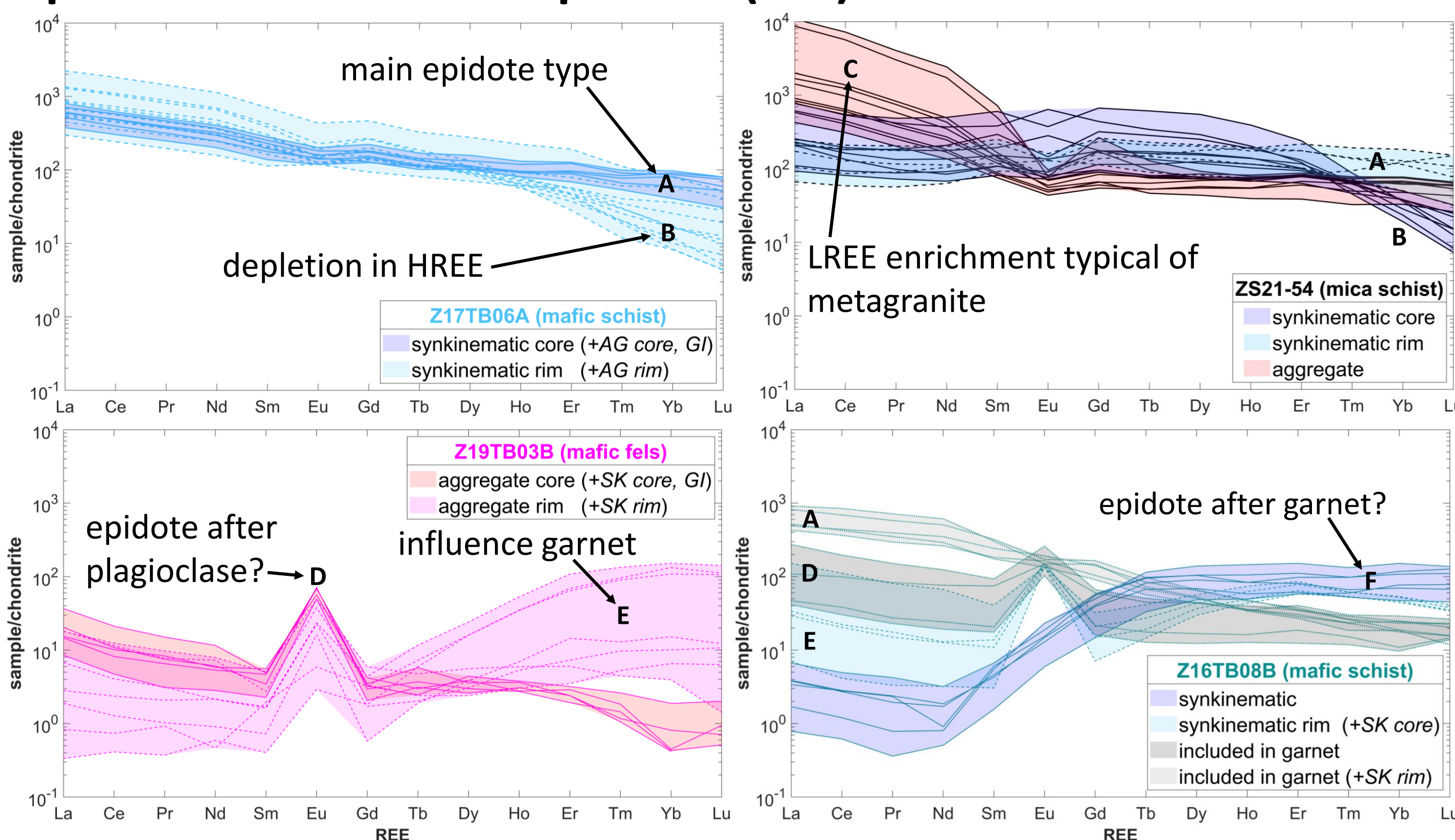


Fig. 3: trace element pattern of mafic schist **Z17TB06A**, mica schist **Z21-54**, mafic fels **Z19TB03B** and mafic schist **Z16TB08B**. The epidote types in brackets show similar pattern (not on figures). **A, B**: slightly enriched in LREE rel. to HREE, in **B** stronger depletion in HREE. **C**: LREE enrichment rel. to **A** and **B**. **D, E**: strong positive Eu anomaly. **E, F**: strong enrichment in HREE rel. to LREE.

### Epidote: Pb-Sr

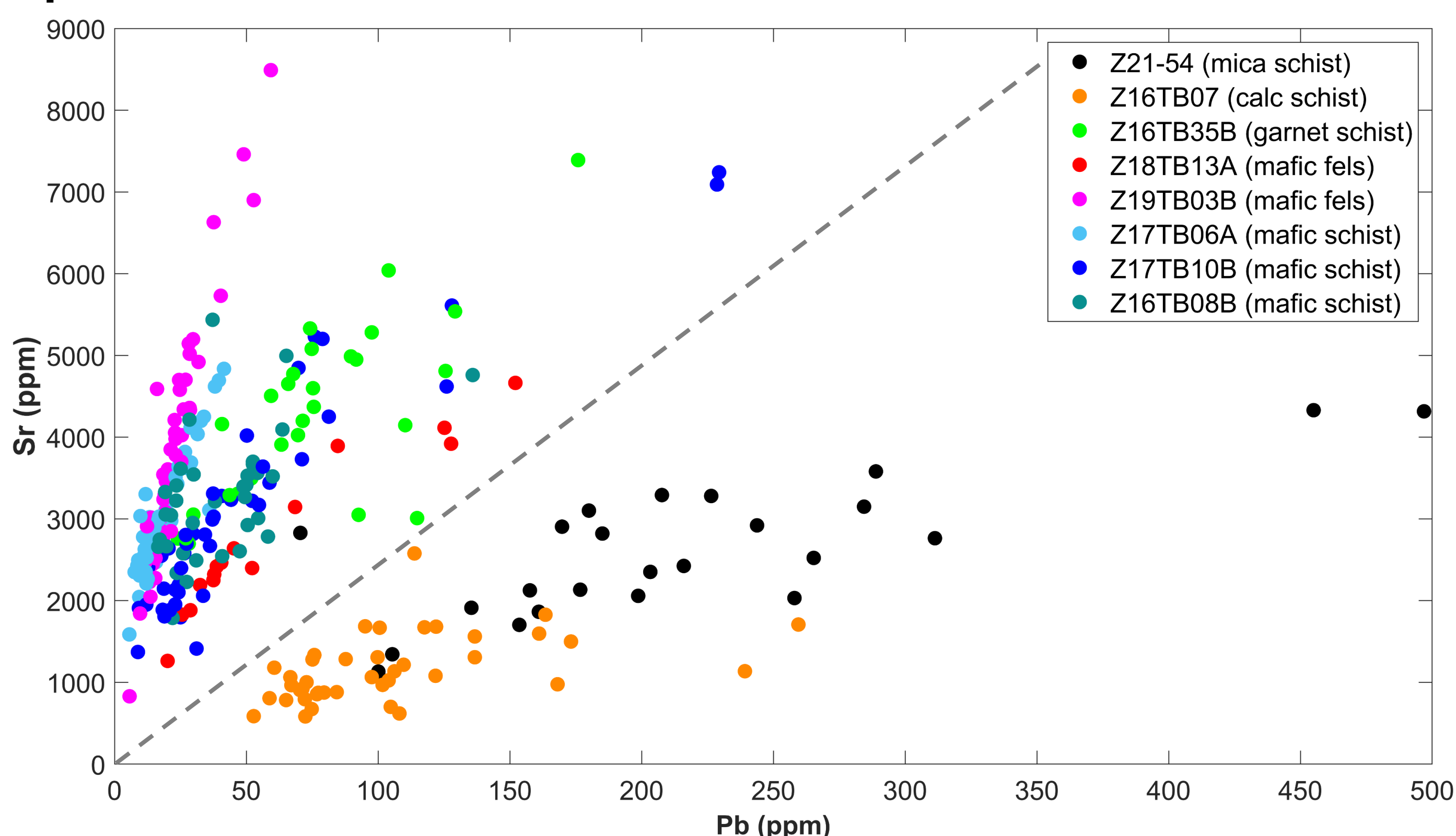


Fig. 4: Pb-Sr in epidote in TGU samples. Grey dashed line indicates two distinct groups.

### Allanite: two generations

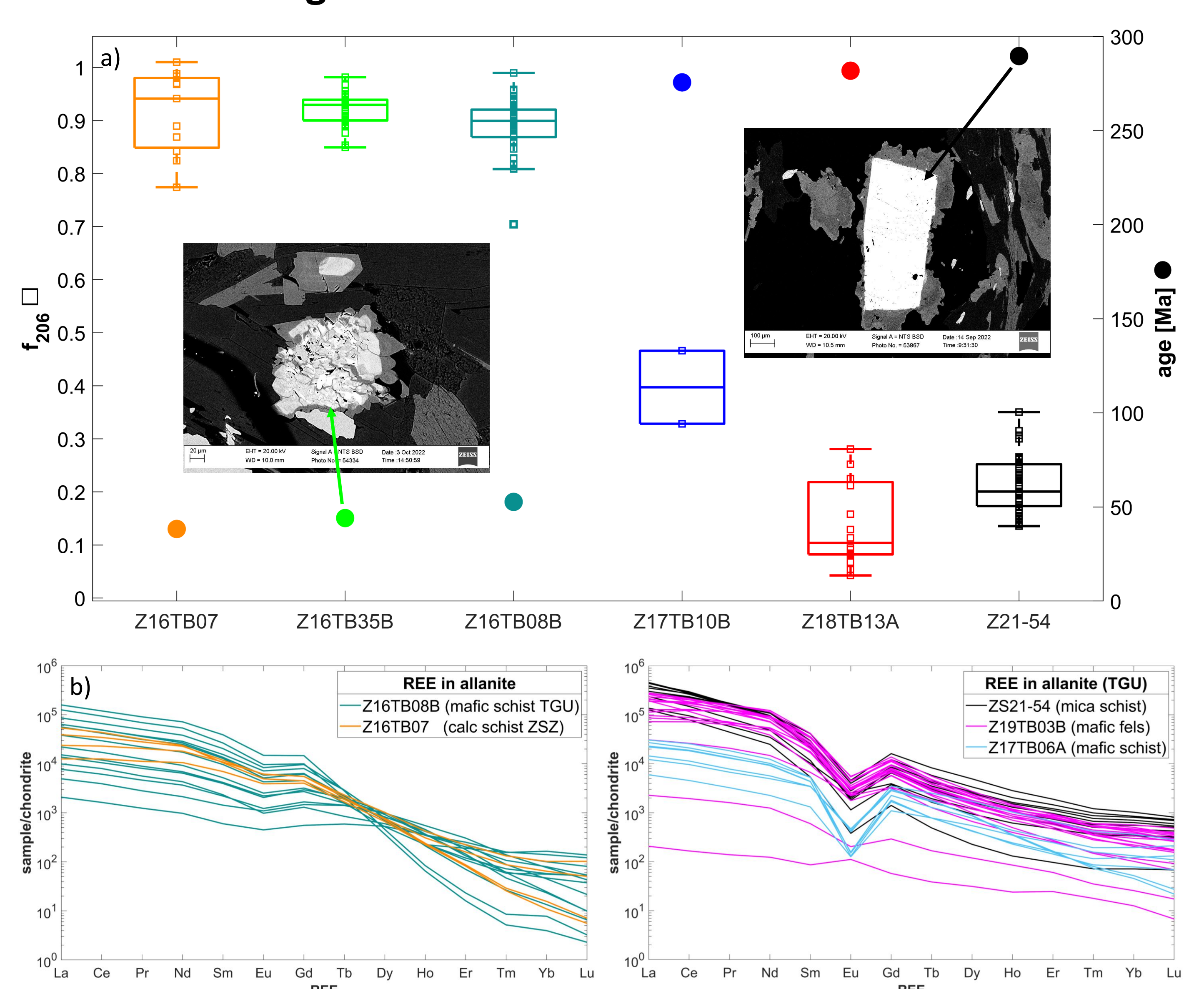


Fig. 5: a)  $f_{206}$  (fraction of common  $^{206}\text{Pb}$ ) and U-Pb age of allanite in TGU samples. The backscatter images of the texture are representative examples of each generation. b) trace element pattern of allanite in TGU samples.

## Discussion & conclusions

### Allanite: two generations

Alpine age with high  $f_{206}$  [3] and depletion of HREE rel. to LREE [4] → metamorphic allanite

Permian age with low  $f_{206}$  [3] and strong negative Eu anomaly [4] → magmatic allanite

### Epidote: trace element pattern

- No overall systematic link of trace elements to textural epidote categories or to different samples (pattern A and B are main epidote type in all samples except **Z19TB03B**).
- Distinct REE composition in specific samples:
  - related to bulk: LREE enrichment in pattern C
  - or to local mineral reactions: positive Eu anomaly in pattern D and E (after plagioclase), HREE enrichment in pattern E and F (influence garnet).

### Epidote: Pb-Sr

- Division in two groups with different sources. Mica schist **ZS21-54** closer to ZSZ (calc schist **Z17TB07**) than to TGU samples.
  - mica schist **ZS21-54** not TGU?

## References

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