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Trace elements in magmatic and hydrothermal micas as geochemical tracers

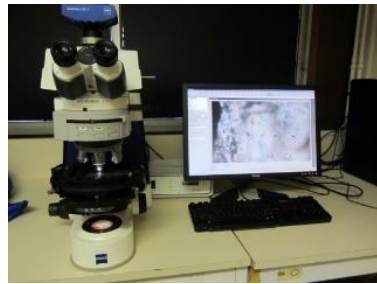
Marie-Christine Boiron, Michel Cathelineau,
Chantal Peiffert, Ivo Martins, Icaro Dias Silva,
Antonio Mateus

Materials and Methods

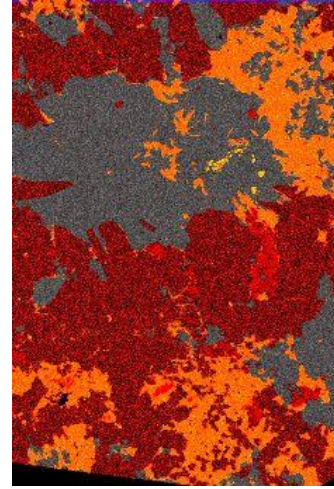
Field work



Petrography



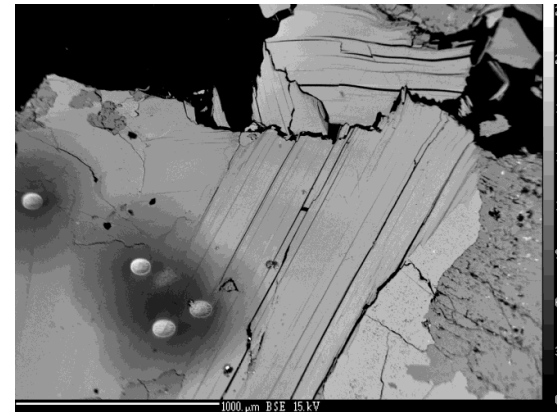
microXRF



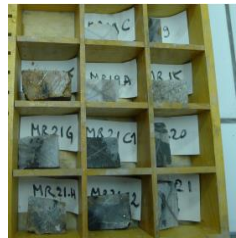
SEM and EPMA
Major elements



LA-ICPMS
Trace elements

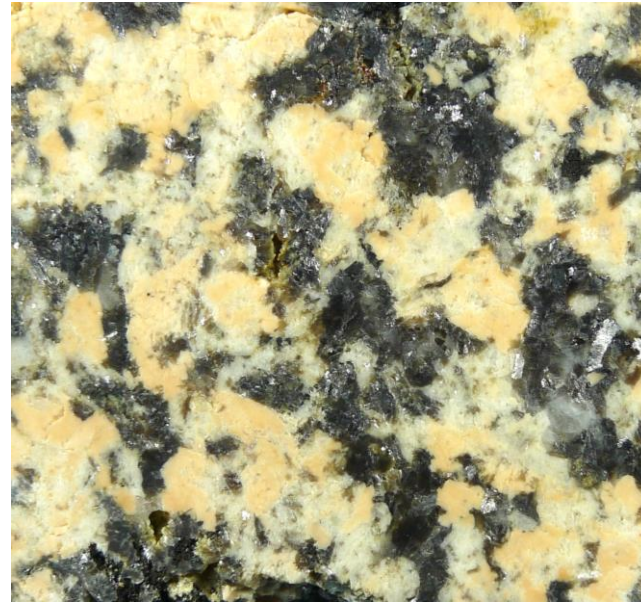
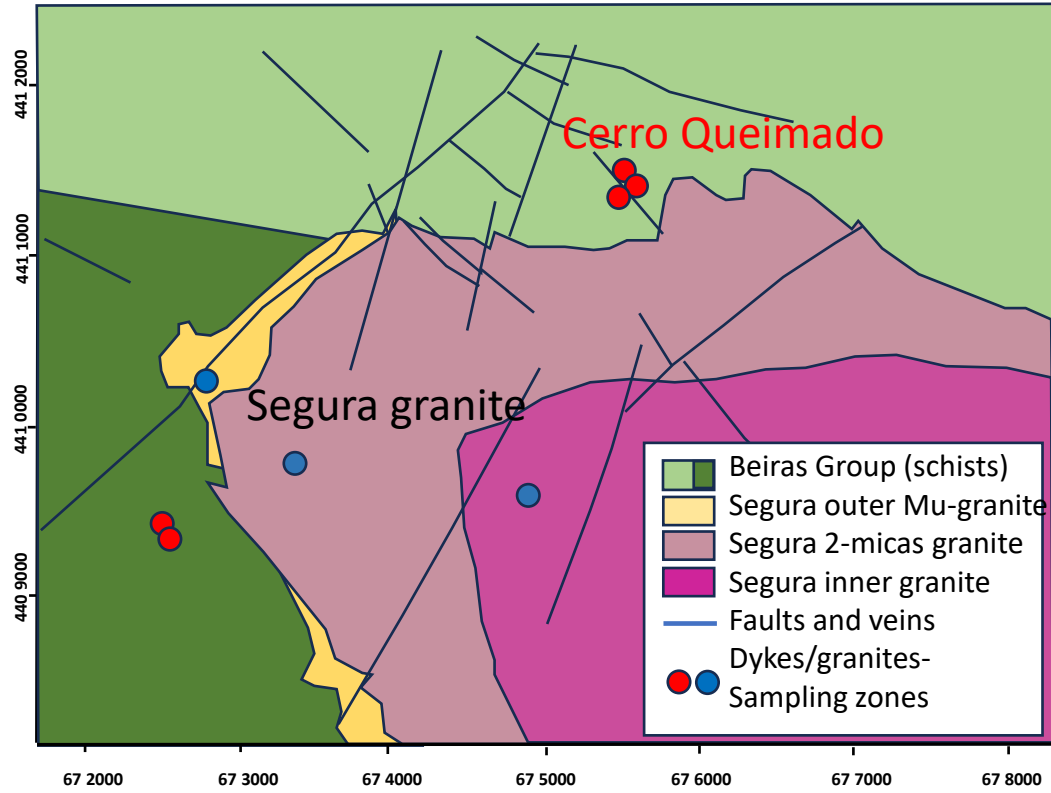


Chemistry of micas
Geochemical tracers

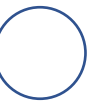


Rock preparation

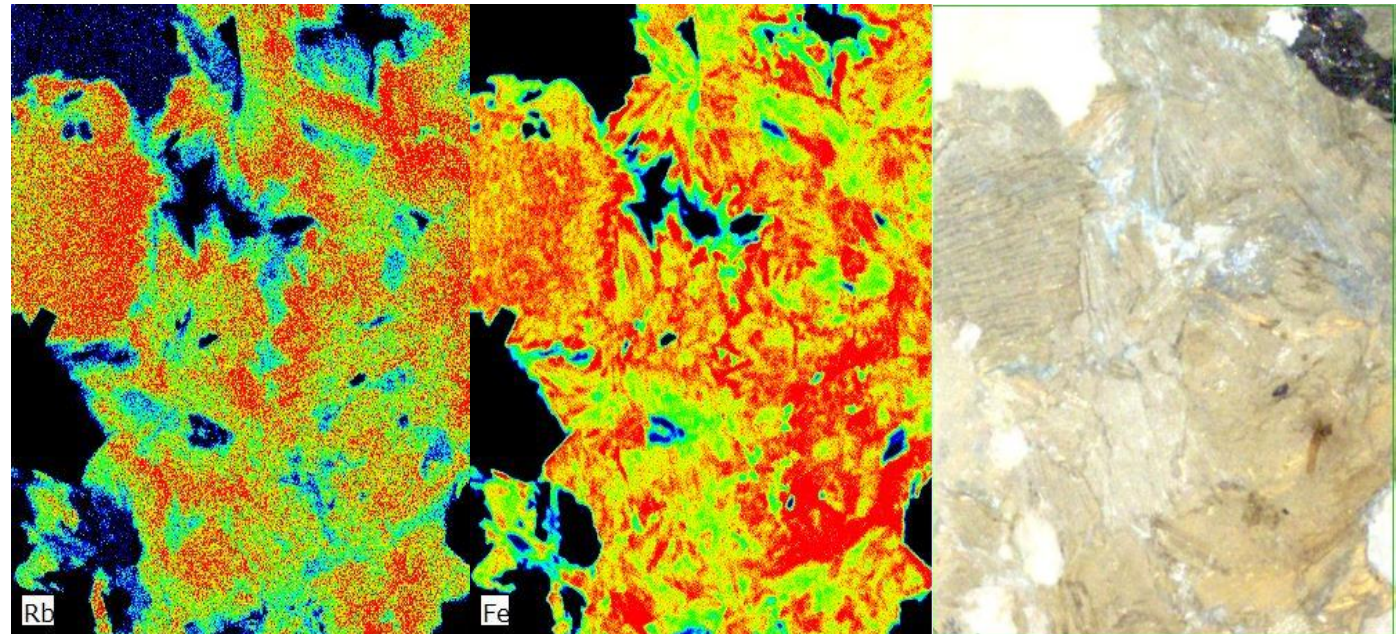
Segura. – The 3 facies of the Cabeza de Arraya pluton



SEG-I-G- Cordierite granite

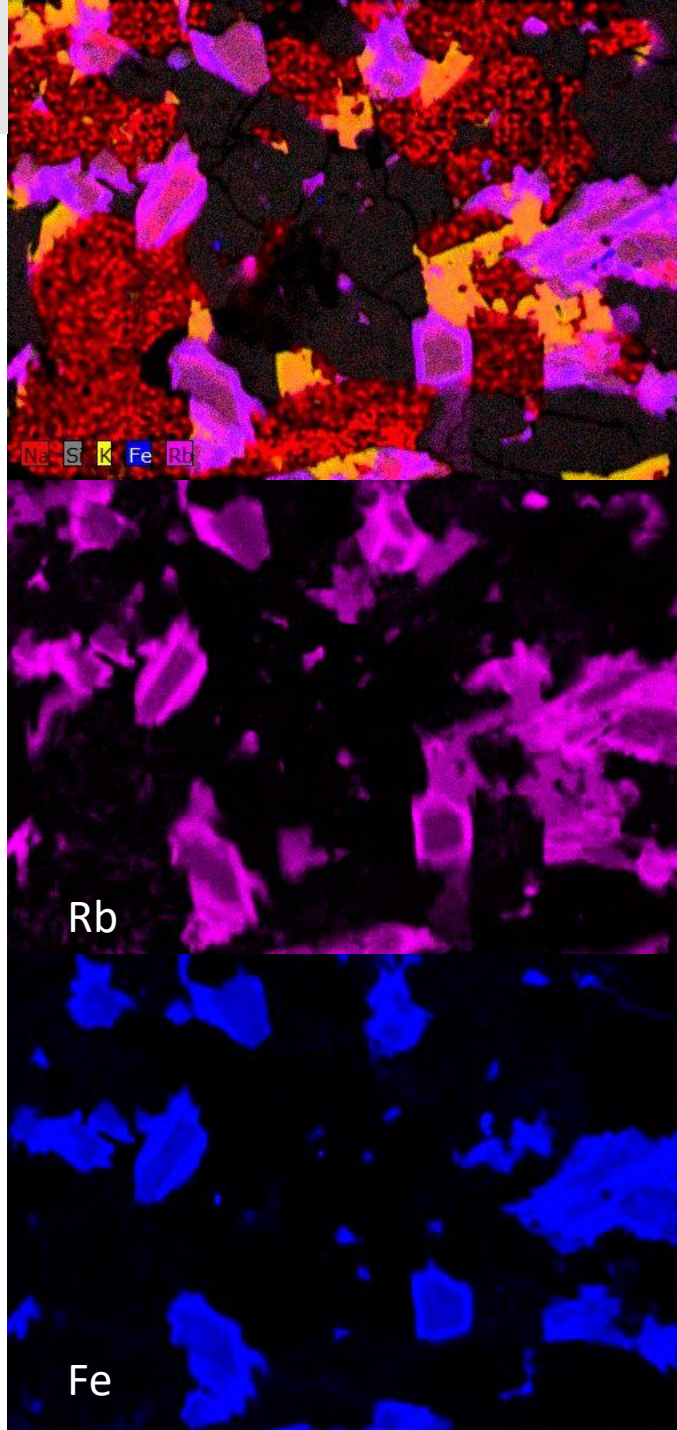
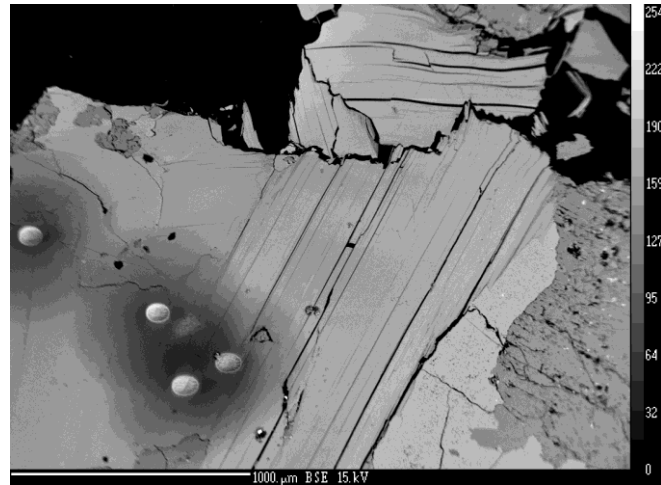
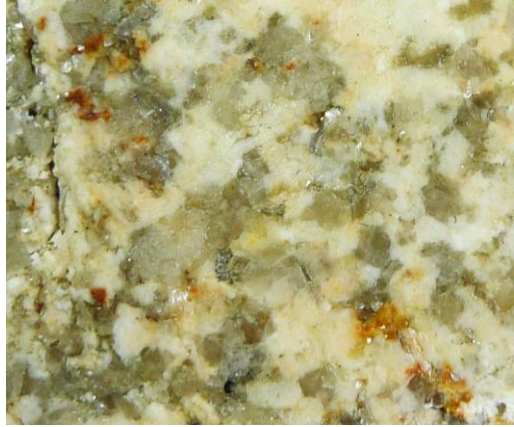


SEG Muscovite granite



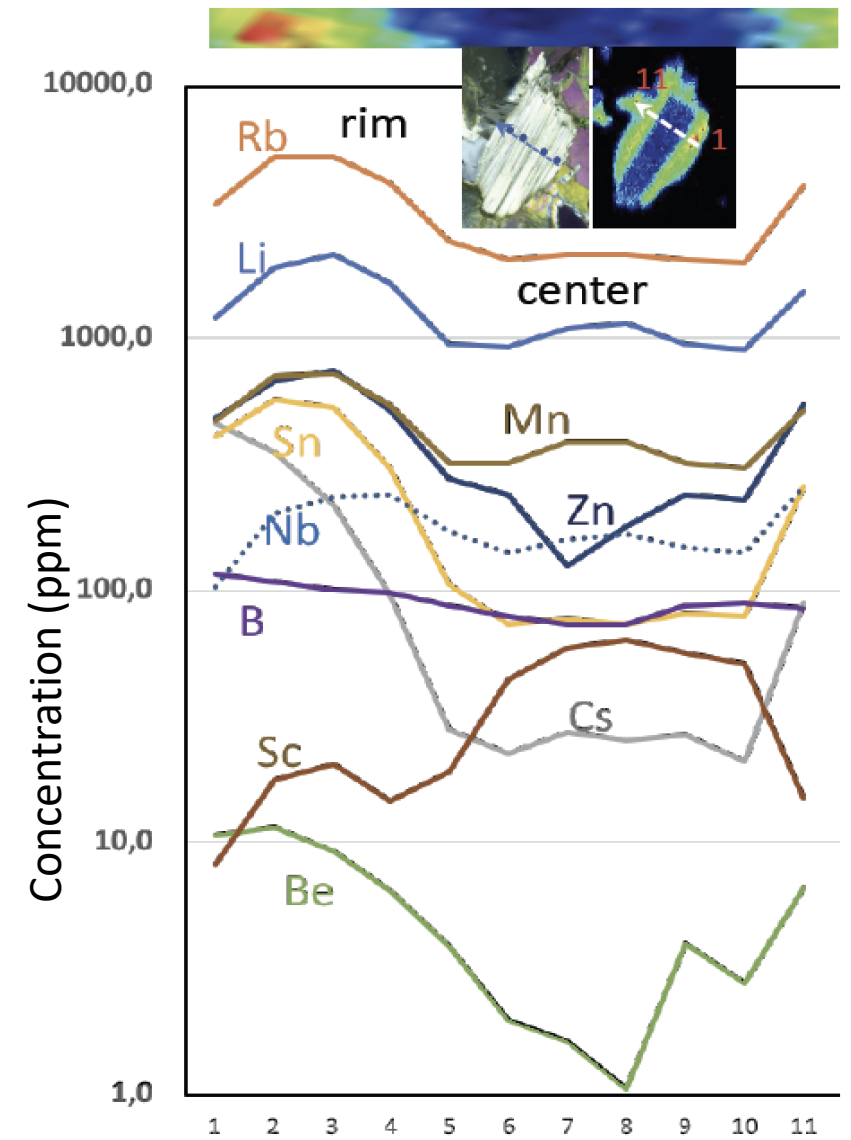
Segura

Muscovite granite

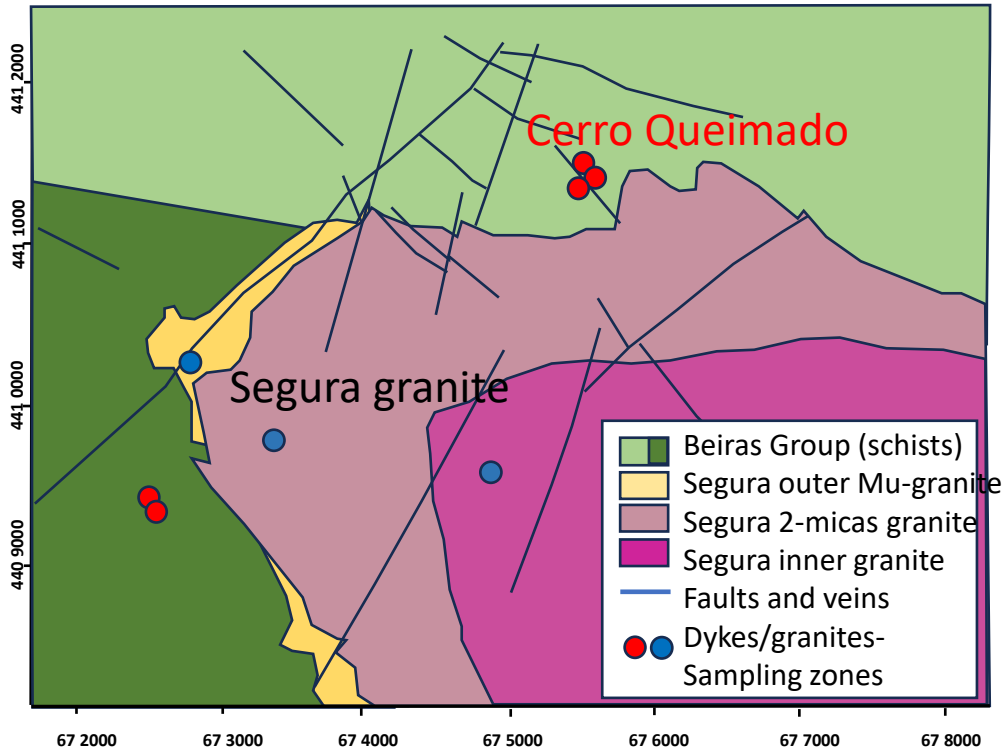


SEG Mu

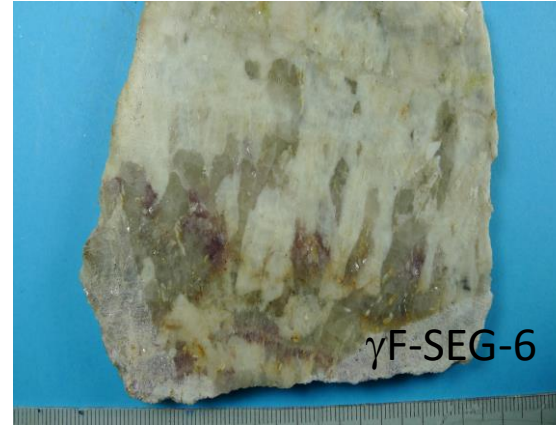
SEGURA



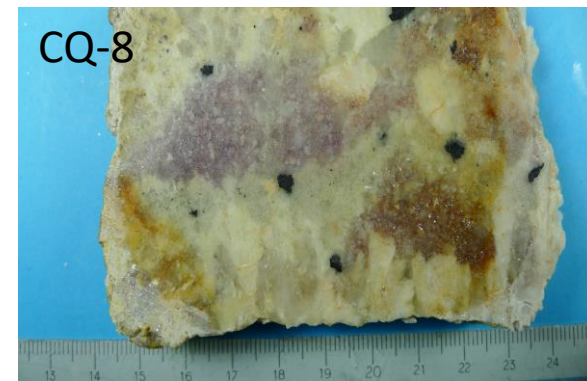
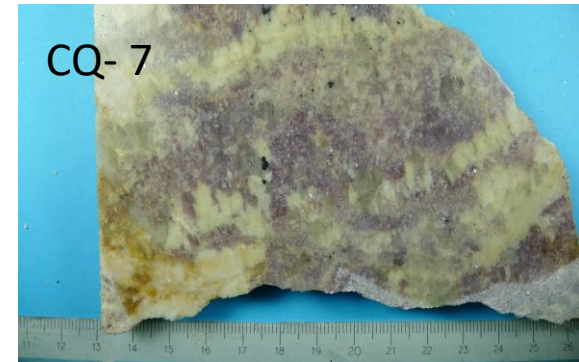
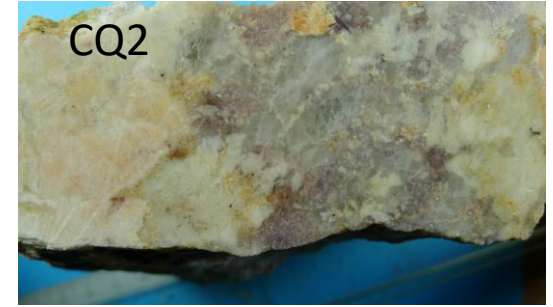
North Segura - Cerro Queimado



Stage 1



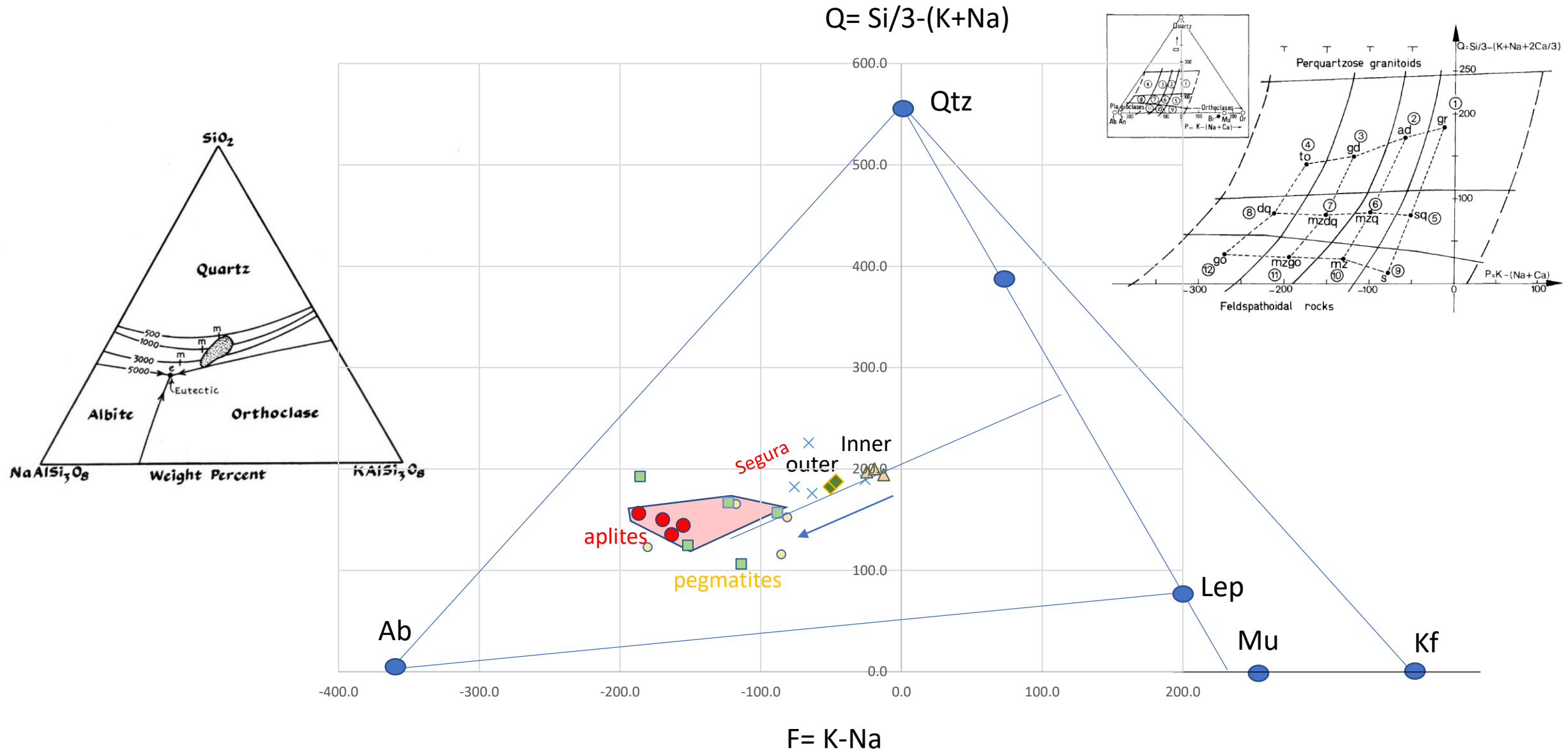
Stage 2



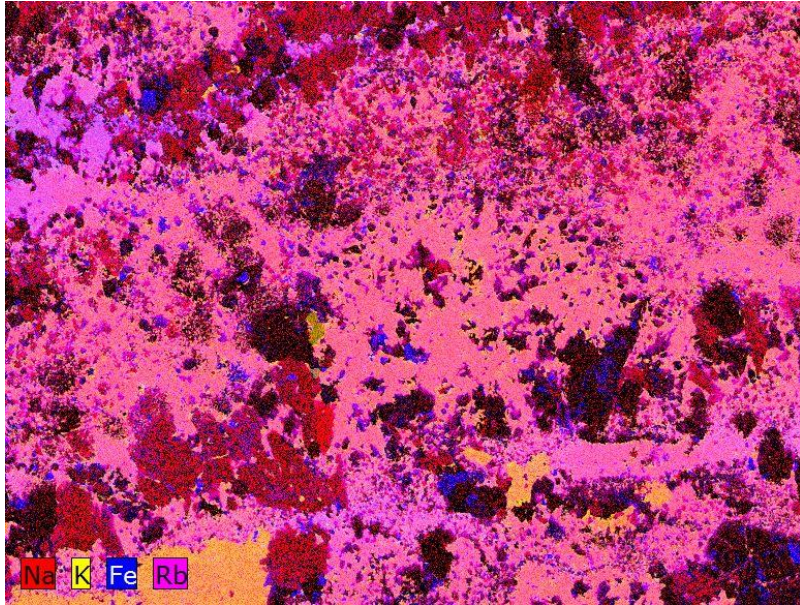
Aplite and pegmatite

Lepidolite facies

Segura - Bulk rock geochemistry



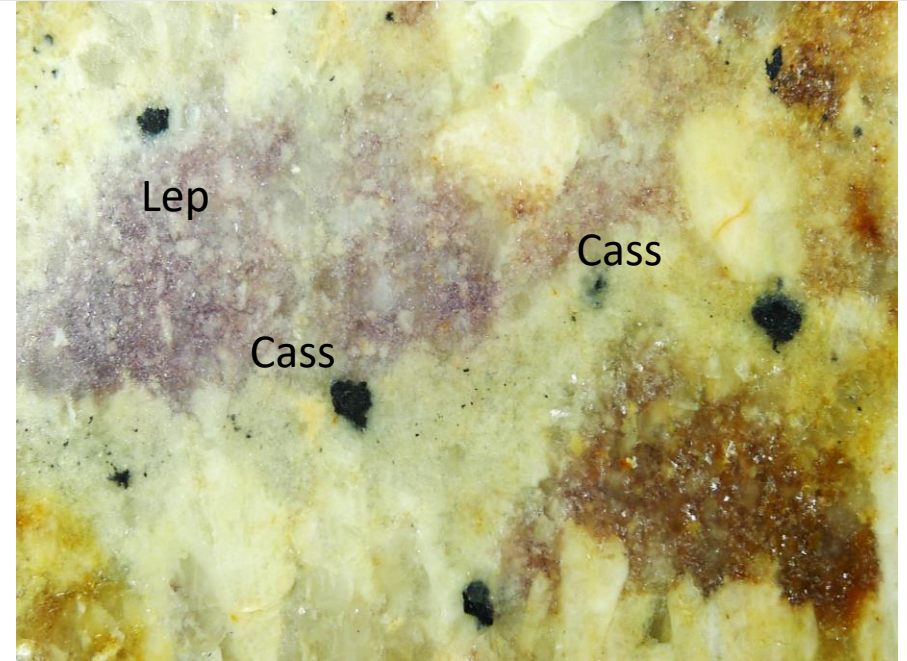
North Segura – Cerro Queimado



**Lepidolite stage
Samples from
Cerro Queimado**

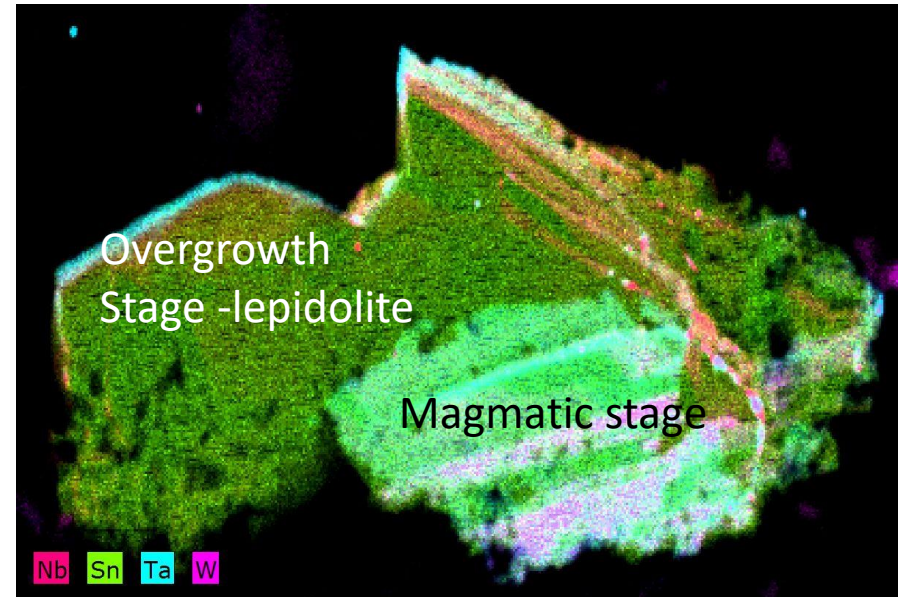
Invading and albite
replacement by fine
grained micas

and locally lepidolite



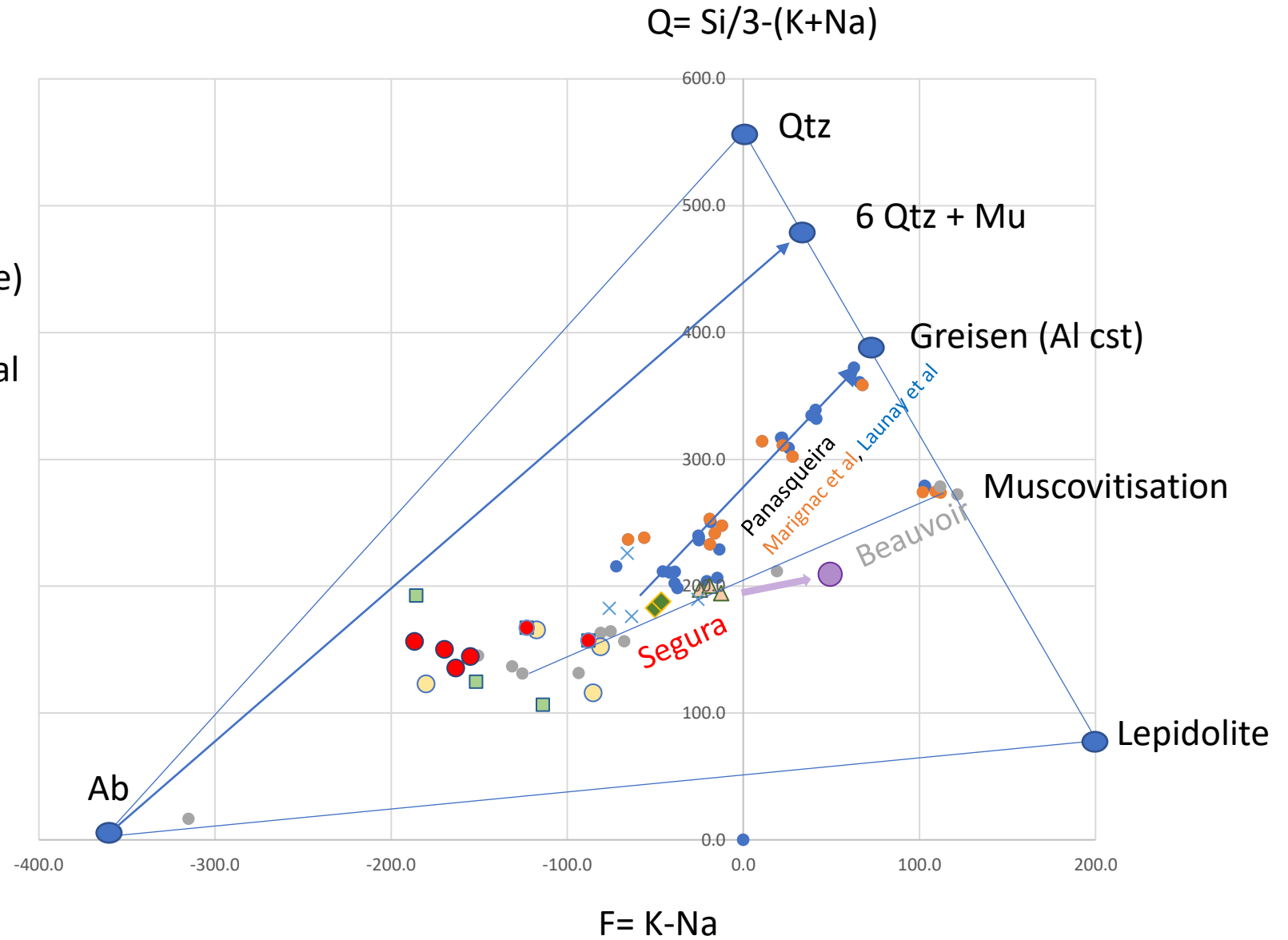
Remobilisation of Sn

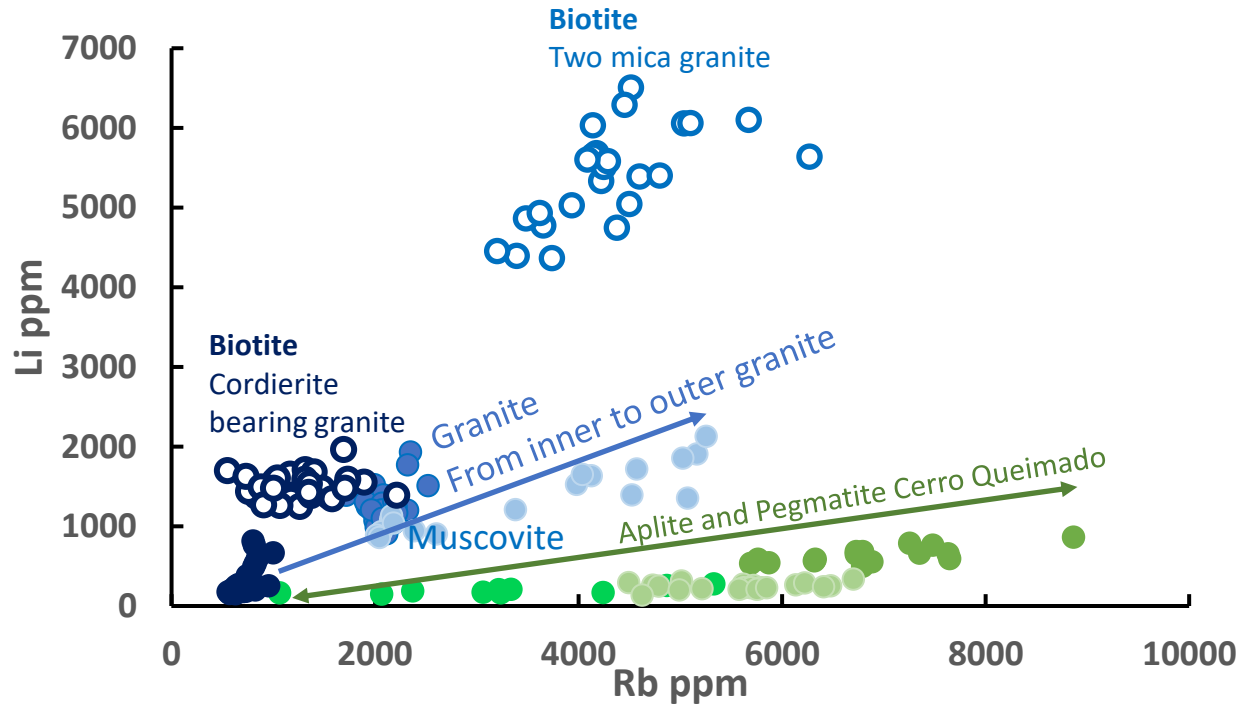
→ cassiterite
overgrowths



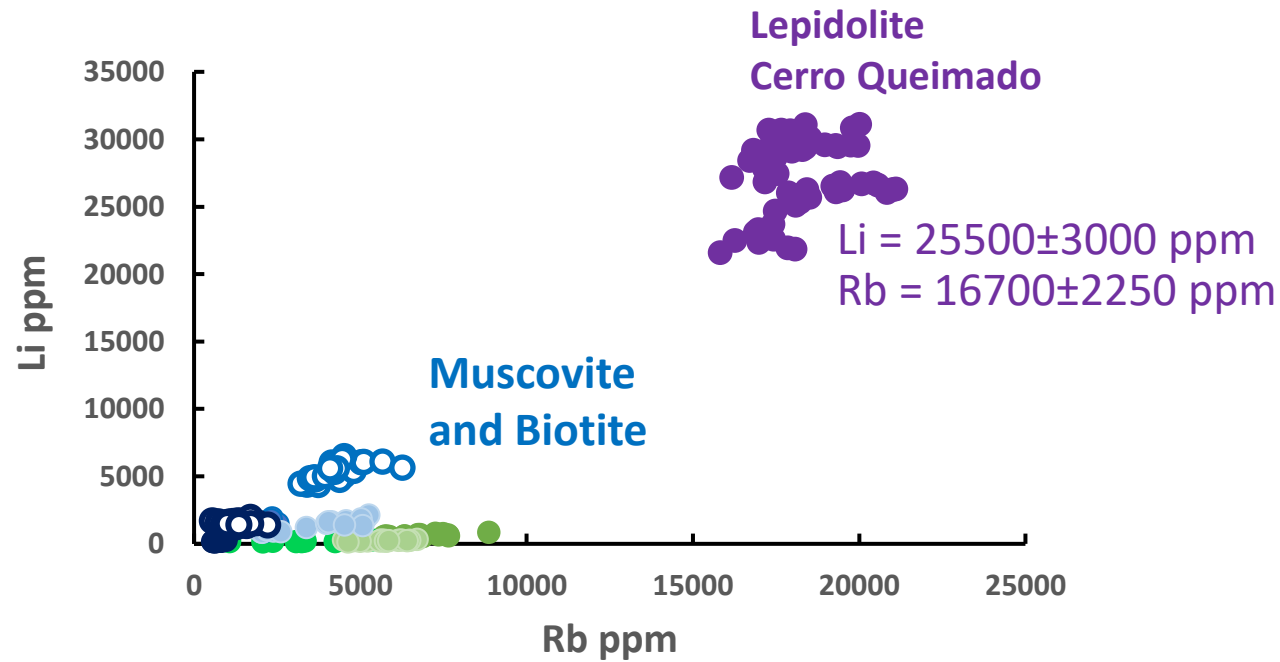
Segura - Bulk rock geochemistry

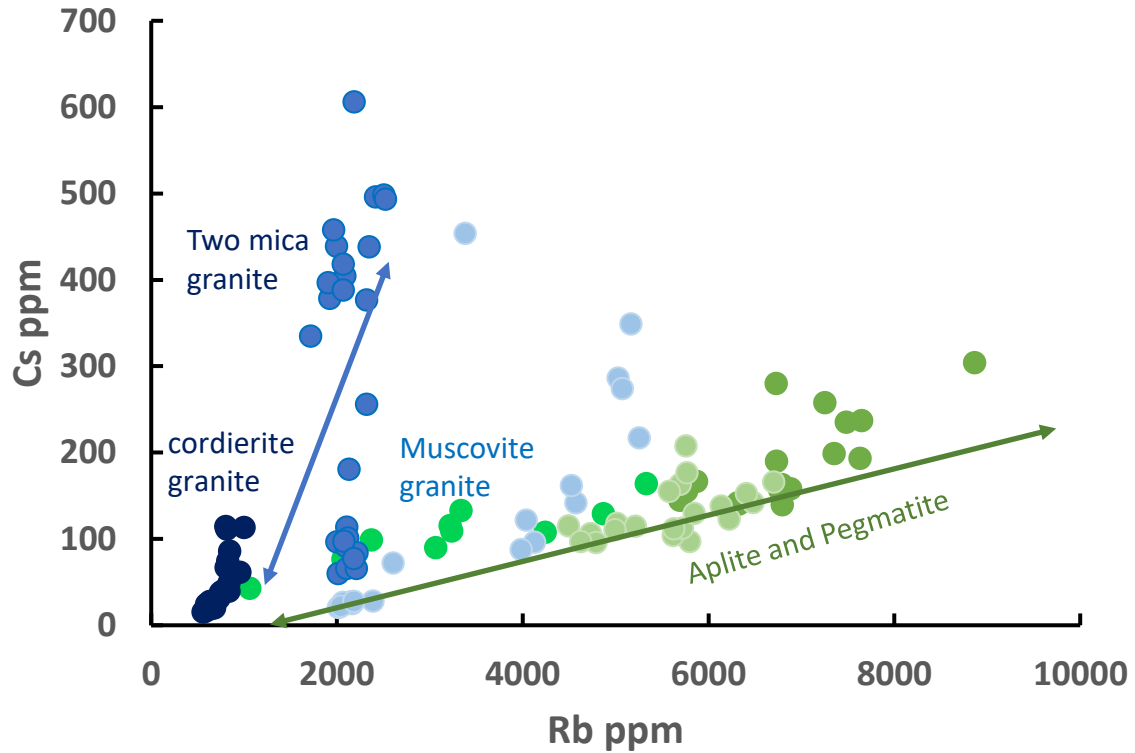
Mica development (Lepidolite)
in Cerro Queimado
Late magmatic or hydrothermal



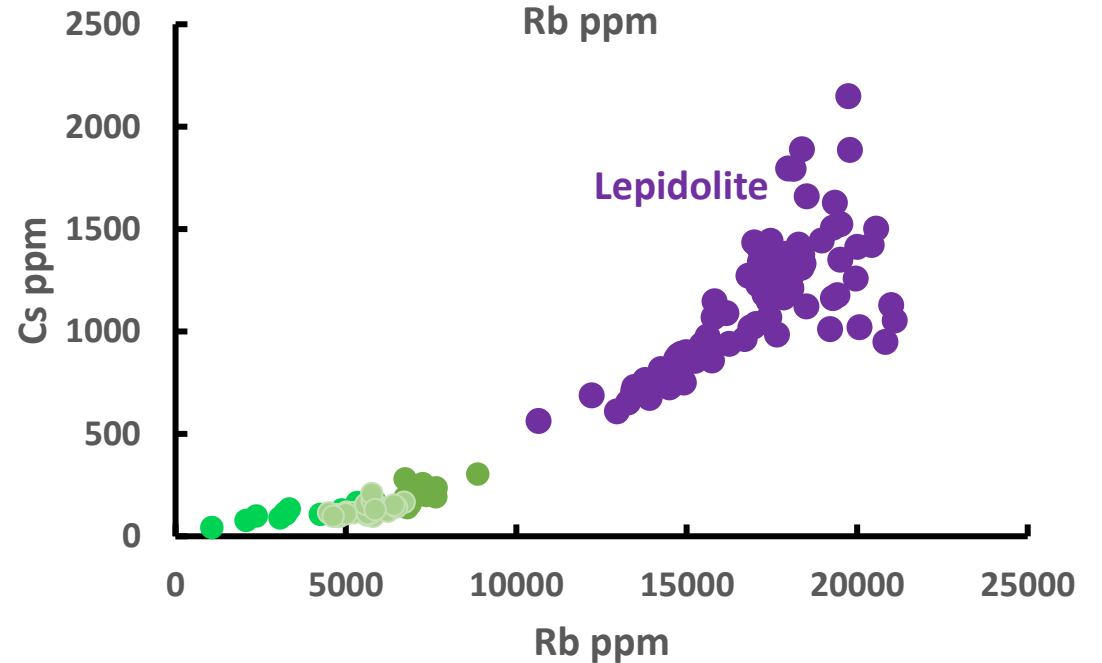
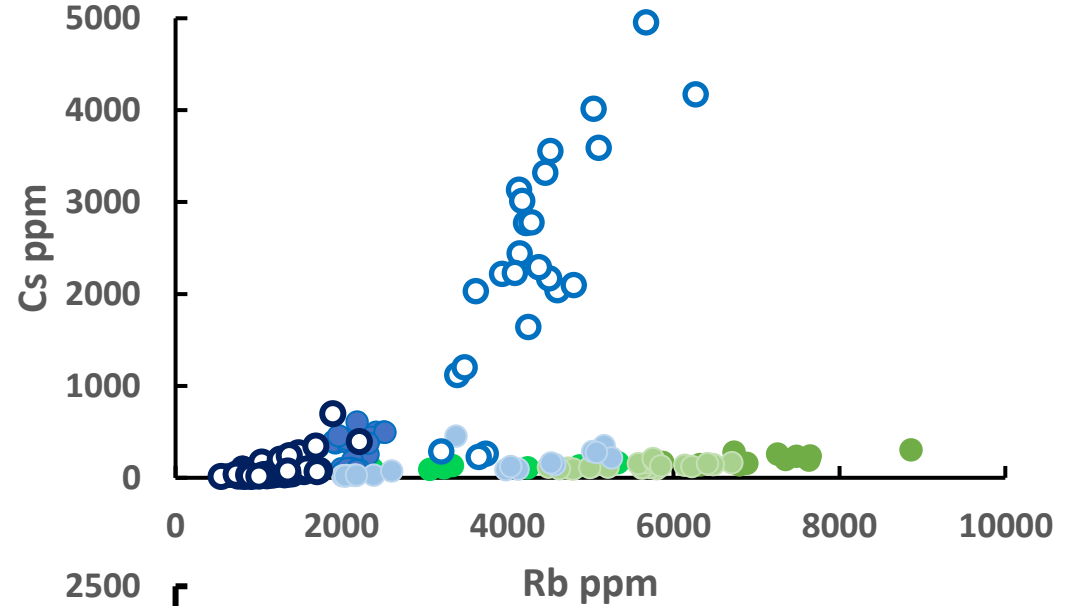


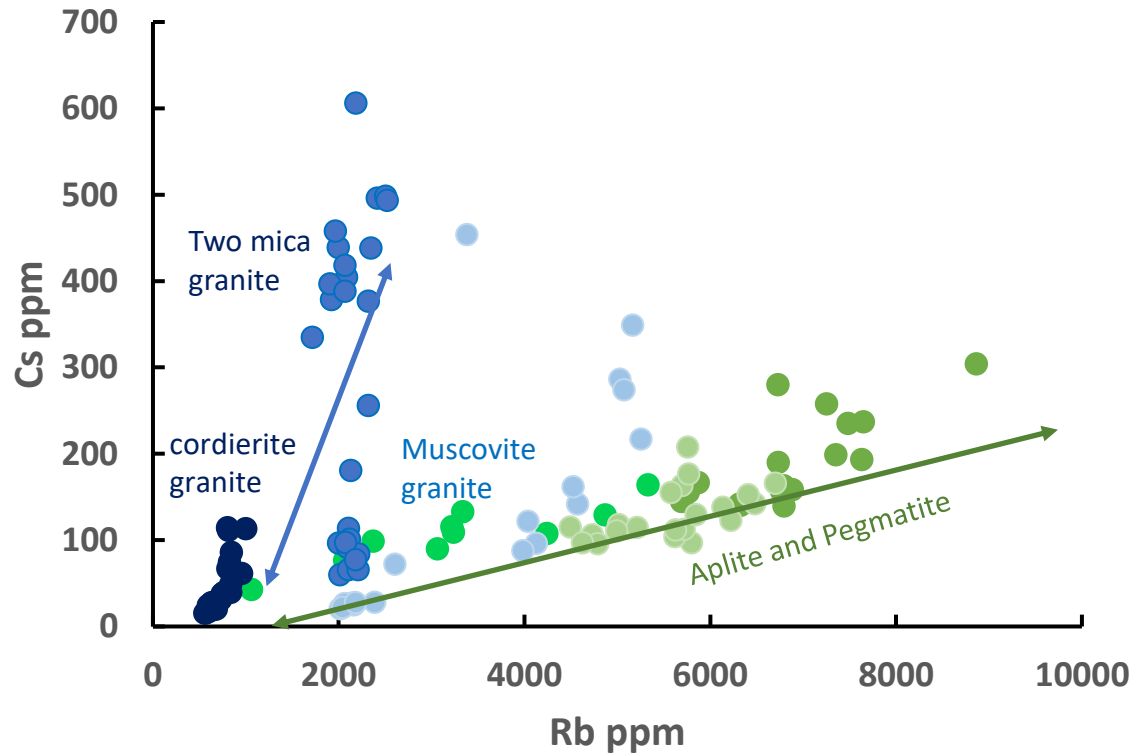
Muscovite : full symbols
Biotite : empty symbols





Muscovite : full symbols
Biotite : empty symbols

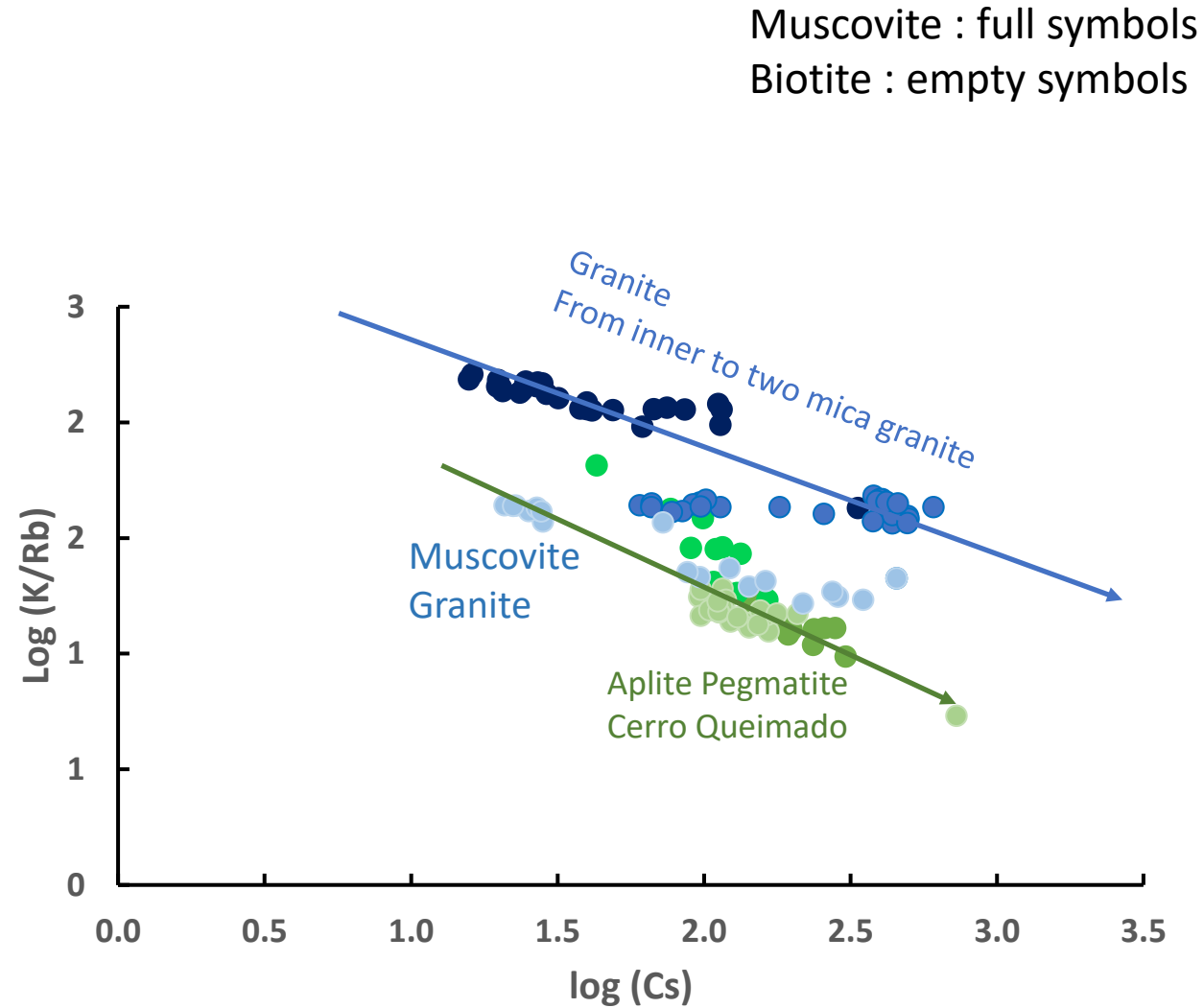




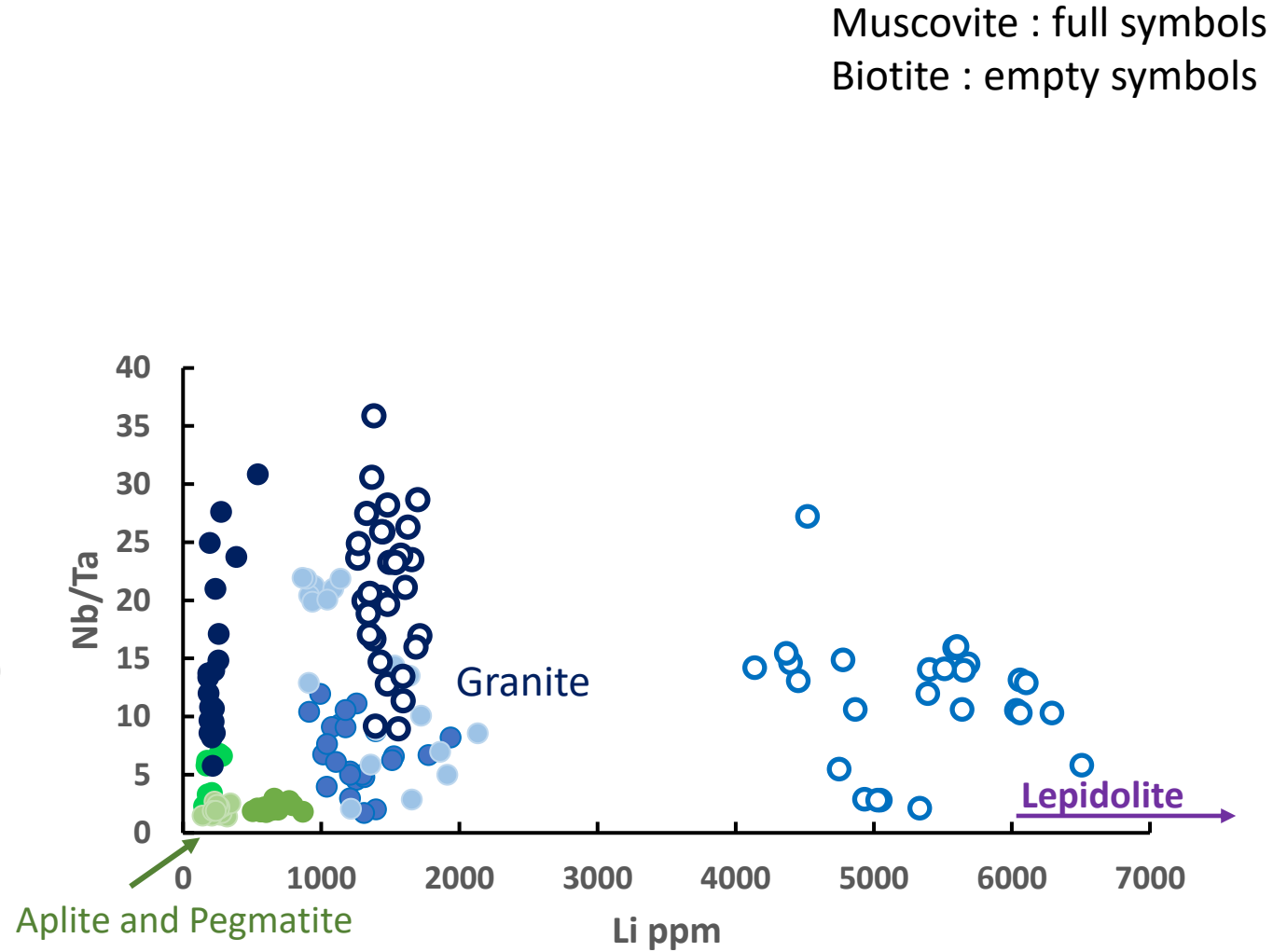
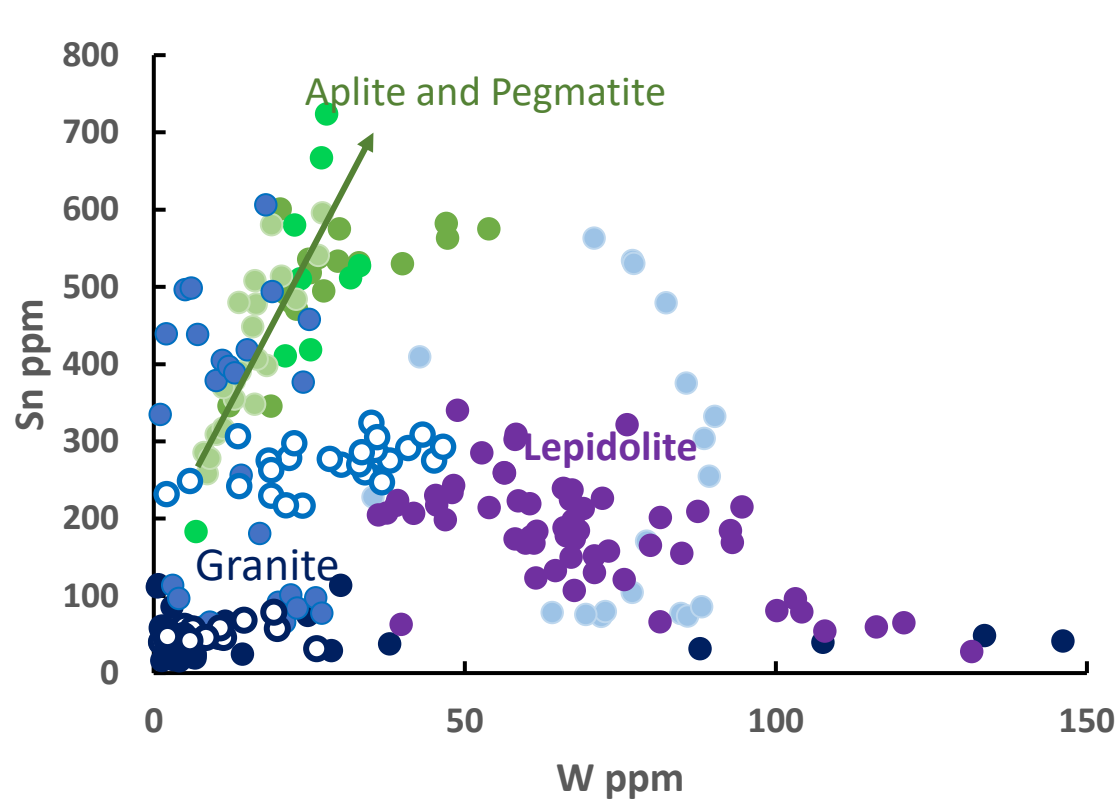
Two differentiation trends

- Cordierite bearing granite and two mica granite
- Muscovite granite and aplites pegmatite

Enrichment of Rb and Cs linked to the crystallisation of K feldspars in the initial granite



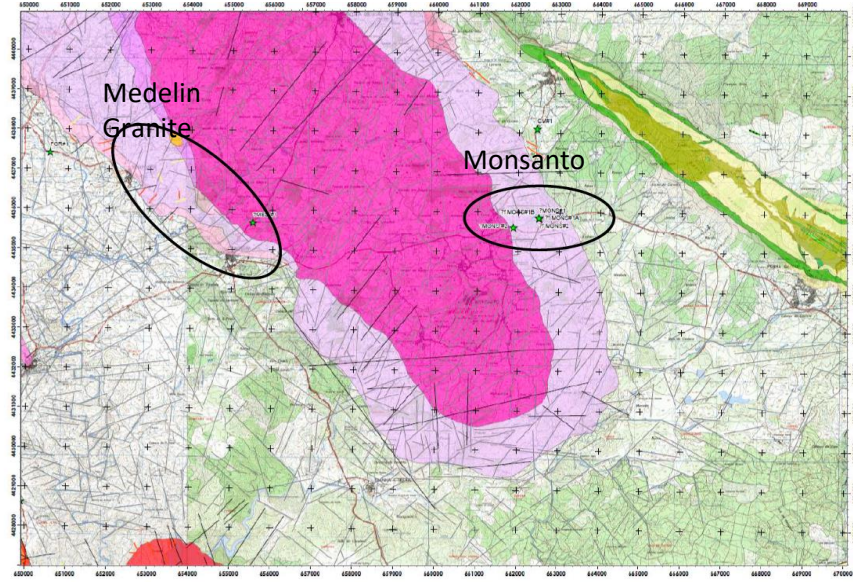
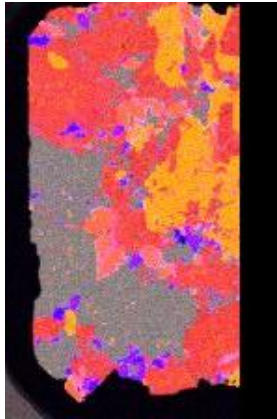
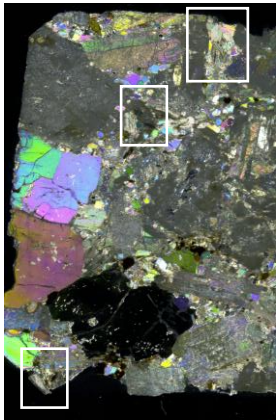
Muscovite : full symbols
Biotite : empty symbols



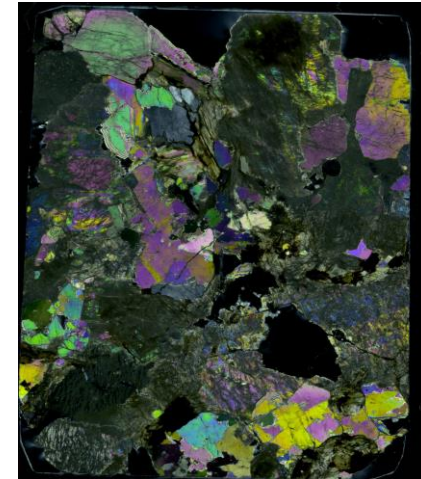
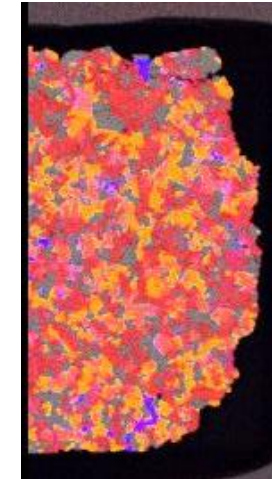
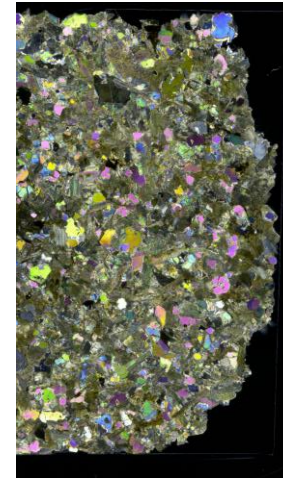
Muscovite : full symbols
Biotite : empty symbols

Monsanto - Medellin

MEDELIN



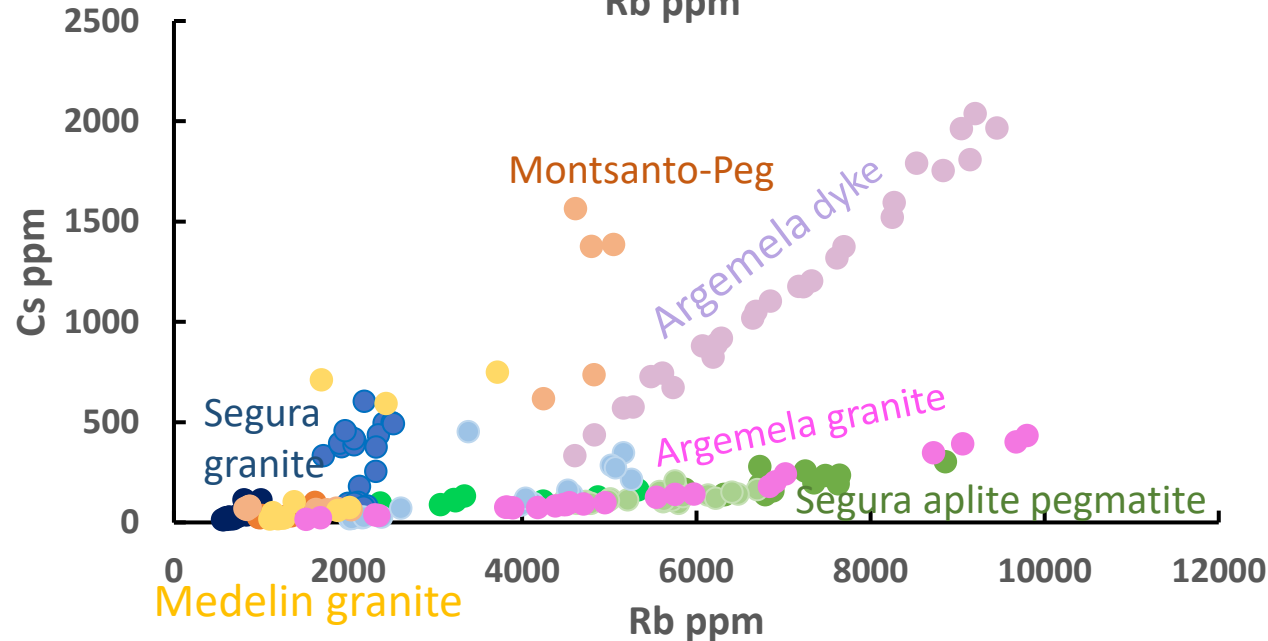
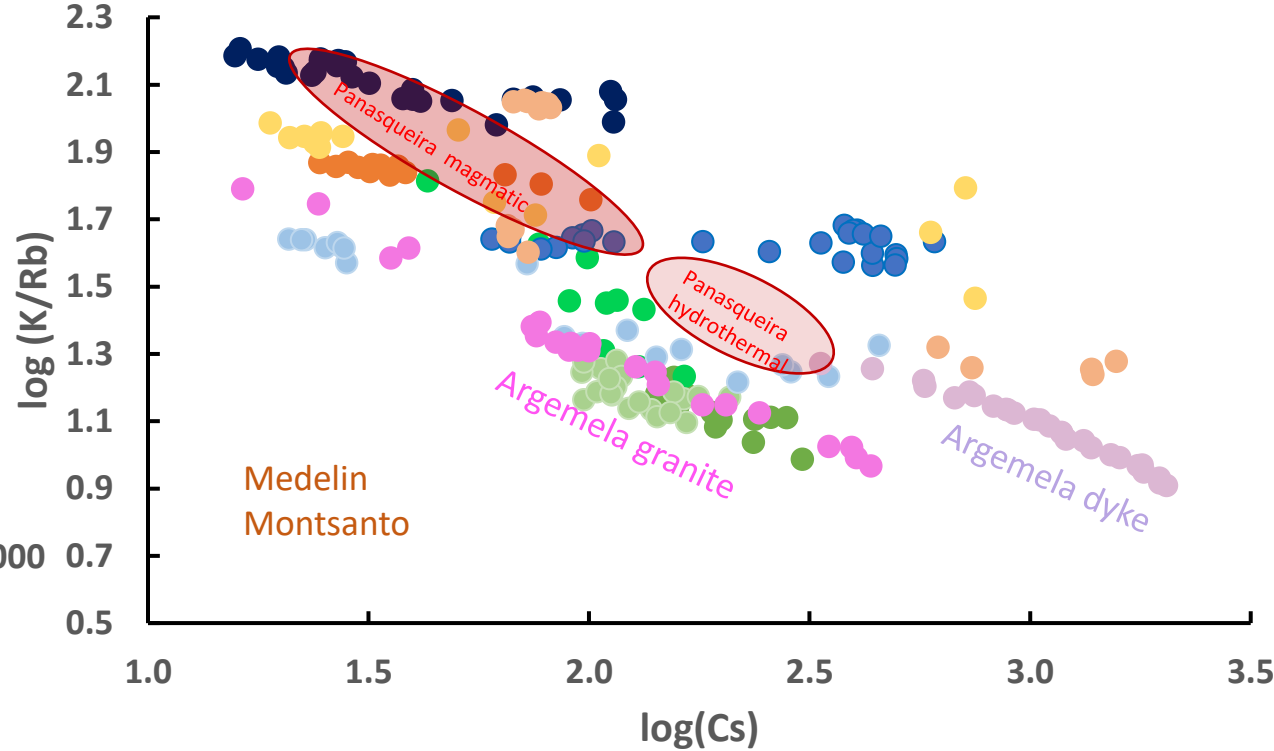
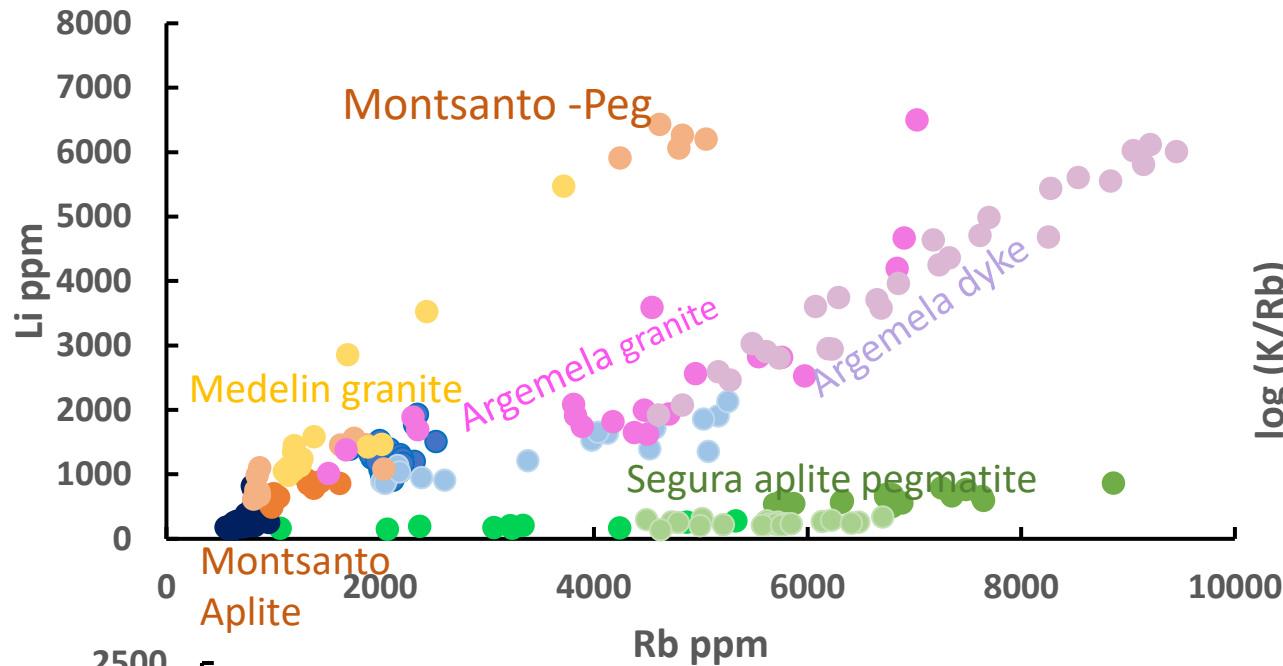
MONSANTO



Monsanto Pegmatite

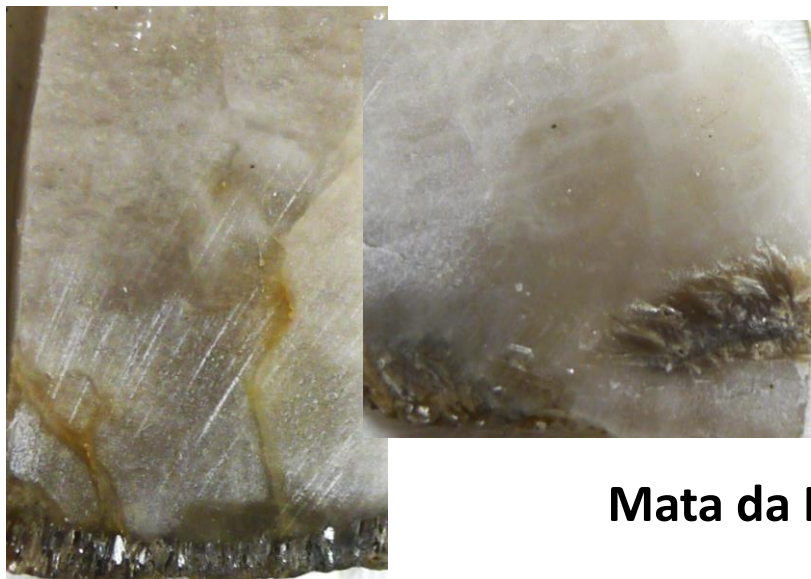
Segura - Monsanto - Medelin – Argemela

Muscovite

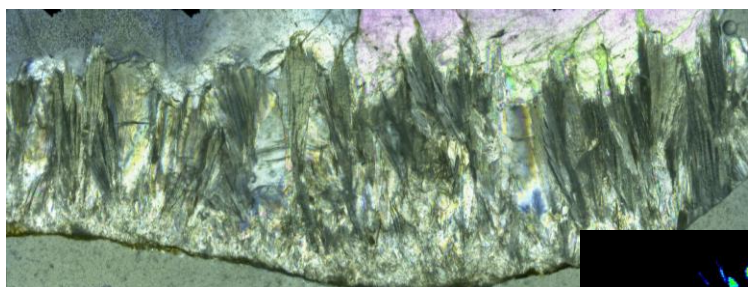


Panasqueira envelopes from Launay

Mata da Rainha - Argemela- Panasqueira



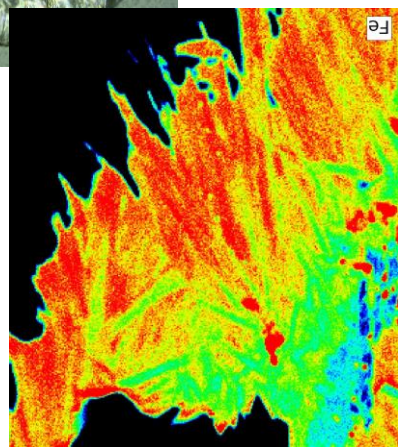
Mata da Rainha



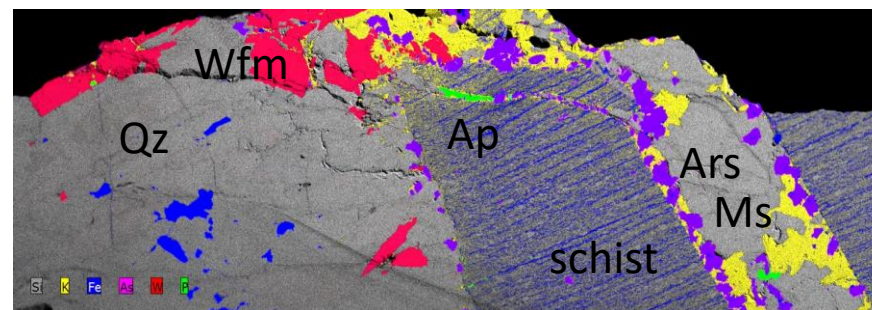
Qtz-mu-to veinlets

(W ?)

Fe-rich micas

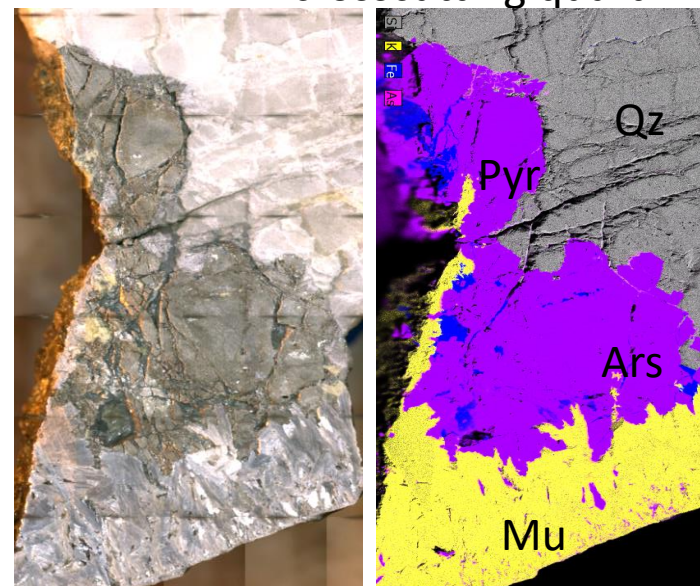


Muscovite from the veins



Vein with muscovite –arsenopyrite crosscutting quartz –wolframite vein

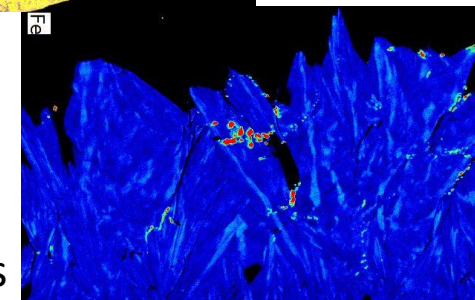
Panasqueira



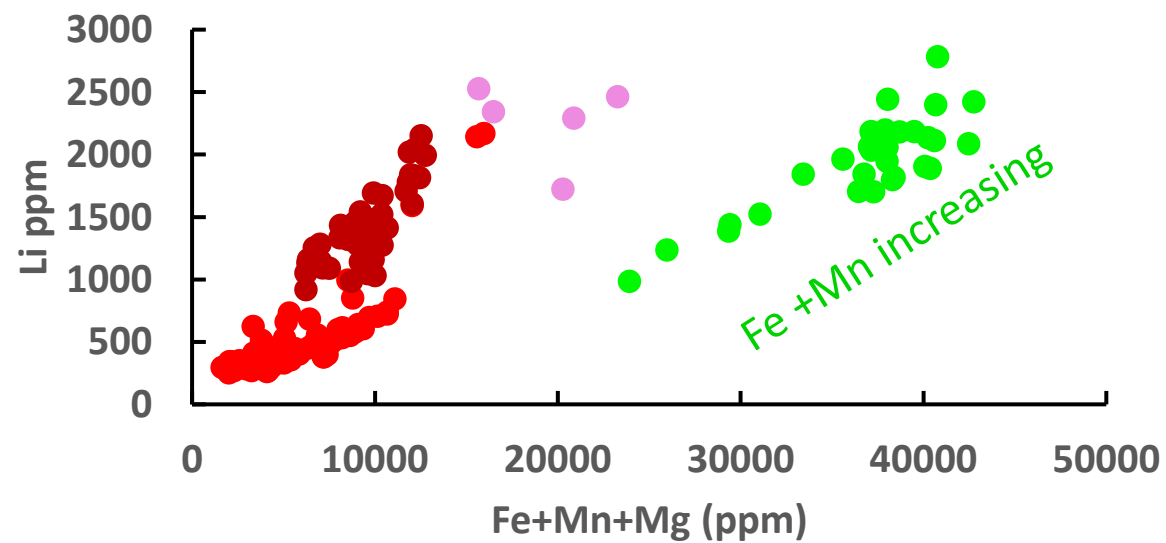
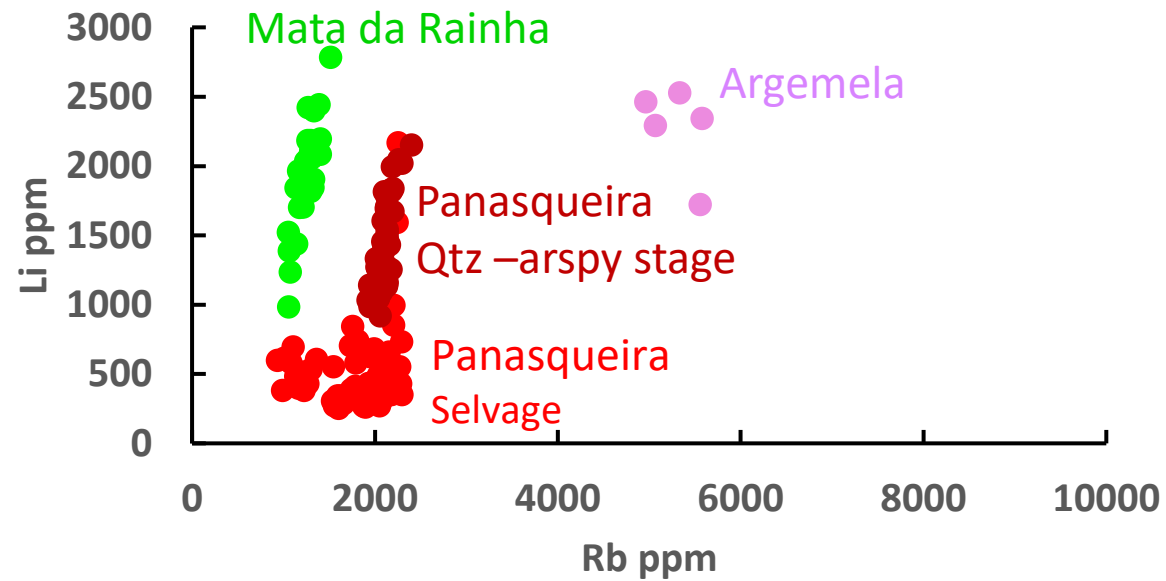
Selvage (re-opening)

(Mu-ars)

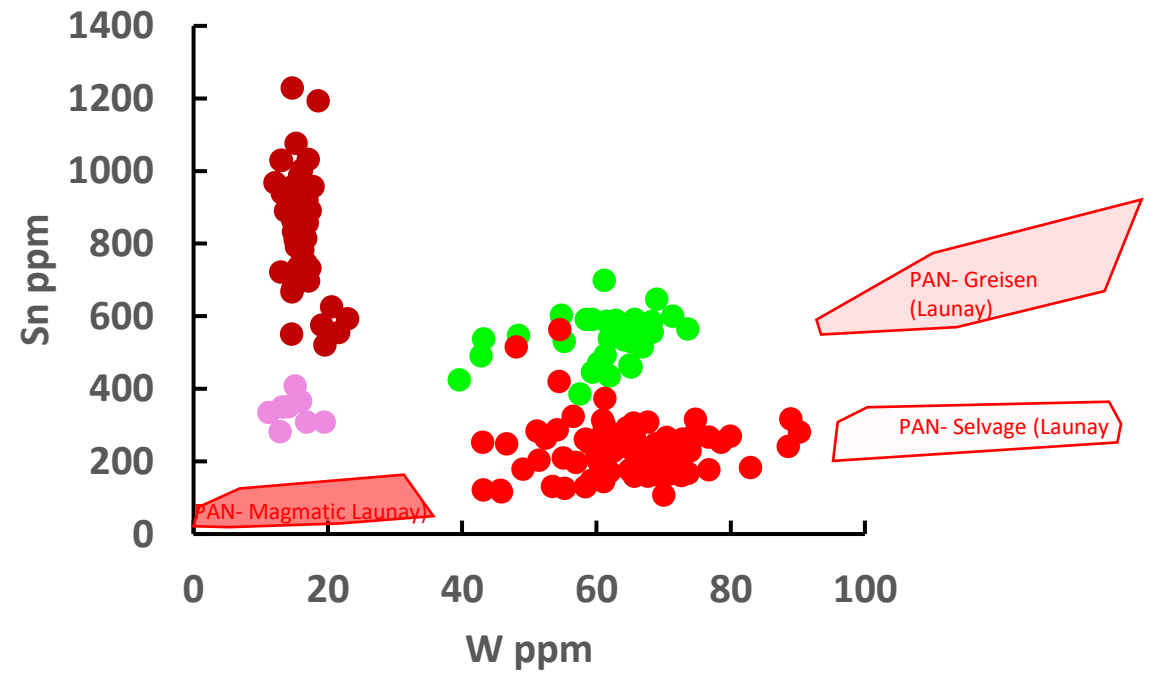
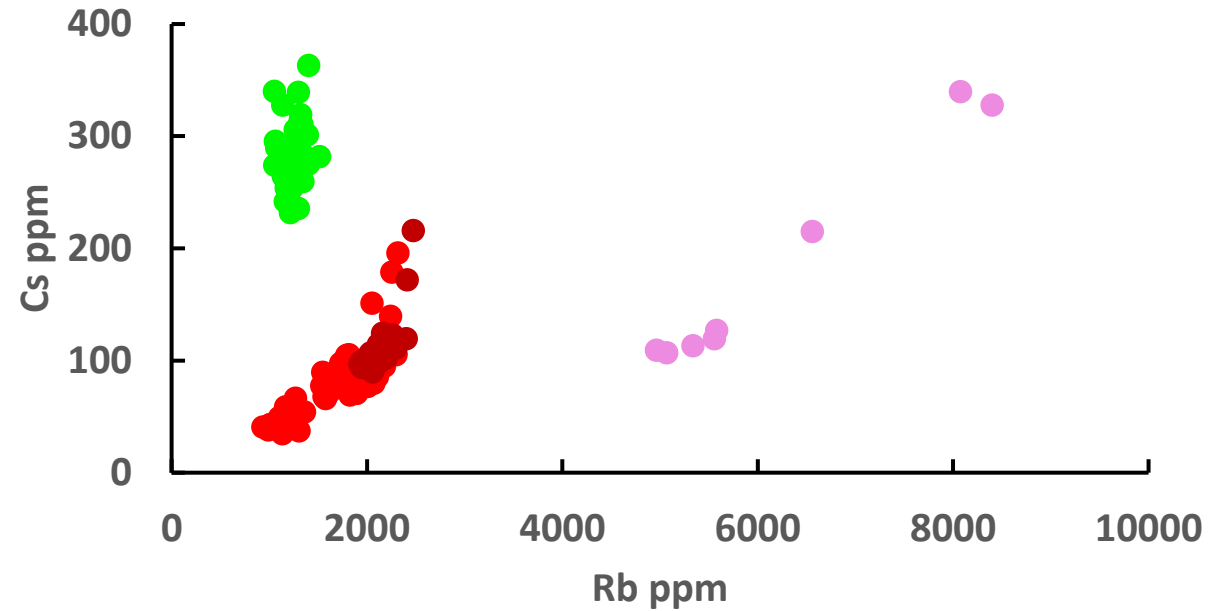
Fe-rich micas



Mata da Rainha - Argemela- Panasqueira

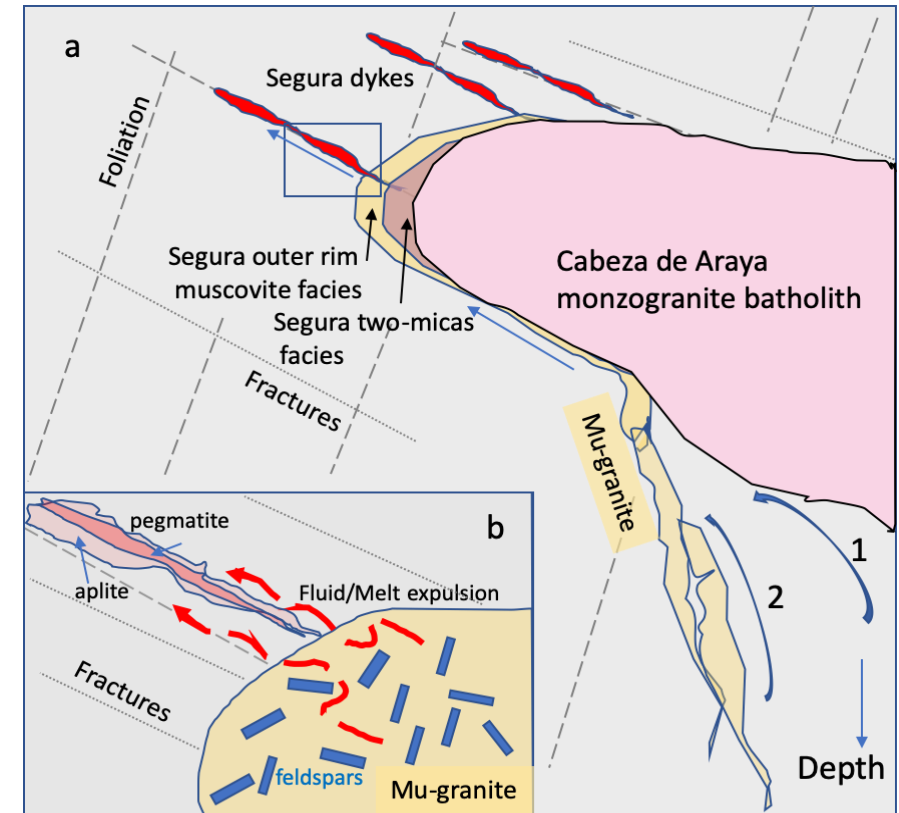


Muscovite from the veins



Conclusions on the mica crystal-chemistry of the differentiated intrusions in the Panasqueira-Segura area

- Micas are well known good markers of the evolution of fluids during magmatic differentiation, and magmatic-hydrothermal transitions. Confirmed by our study which completes works from former authors on Panasqueira and Argemela.
- Segura granite: contrasted magmatic differentiation trends confirm the existence of two distinct magmatic episodes (the Mu-granite+ aplite-pegmatite vs inner-outer facies of the Cabeza de Araya)
 - Rayleigh fractional crystallisation as a principal differentiation mechanism (correlation between K/Rb and Cs)
 - The extreme Rb- and Cs-enrichment in pegmatites requires at least > 95% fractionation of the initial Mu-granite composition
- There are great similarities between micas from Segura and those from Argemela. Specific feature of the Segura area is the development of lepidolite pseudo-greisen which forms at the expense of the albite-Li-phosphate pegmatites. Fluids could be either linked to a second stage, or to the ultimate evolution of the initial fluids released by the Mu-granite.
- Micas from selvages at Panasqueira and Mata da Rainha share similar chemistry, confirming the similarities between the two deposits



Cathelineau et al., 2024, Minerals