

Atlas of macroscopic textures and μ -XRF compositional images of rock samples

Granites and their host rocks

MOSTMEG

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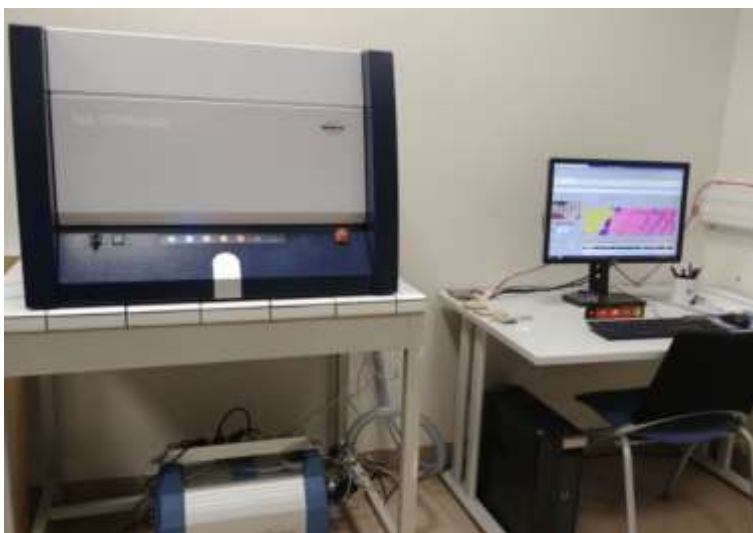


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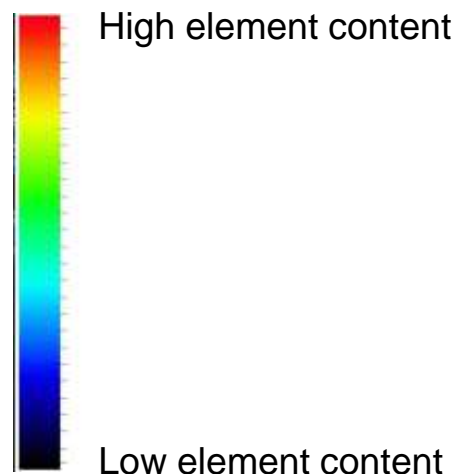
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Micro- X-Ray Microfluorescence (μ XRF)

Micro- X-Ray Microfluorescence (XRF) mapping was carried out using a Bruker-Nano M4 Tornado instrument (SCMEM, GeoRessources laboratory, Nancy, France). This system has a Rh X-ray tube with a Be side window and polycapillary optics, giving an X-ray beam with a 25-30 μ m diameter on the sample. The X-ray tube was operated at 50 kV and 200 μ A. A 30 mm² xflash[®] SDD detects X-rays with an energy resolution of <135 eV at 250,000 cps. All analyses were carried out at a 2 kPa vacuum. Main elements such as Ca, Mg, Mn, Fe, P, Al, K, Na and Si were mapped, and composite chemical images were generated. The micro-XRF mapping helps choosing the most representative assemblages for SEM and electron microprobe investigations.



Colour range of
elemental map intensities

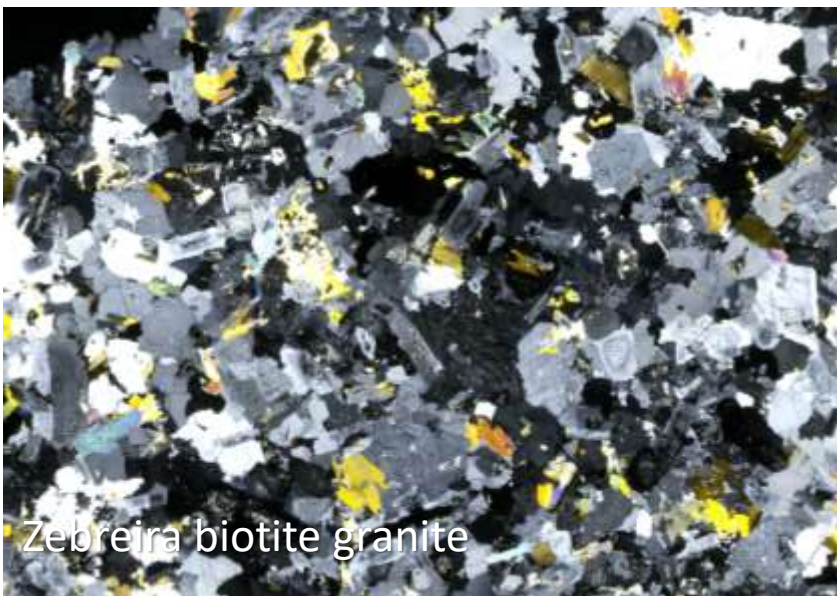
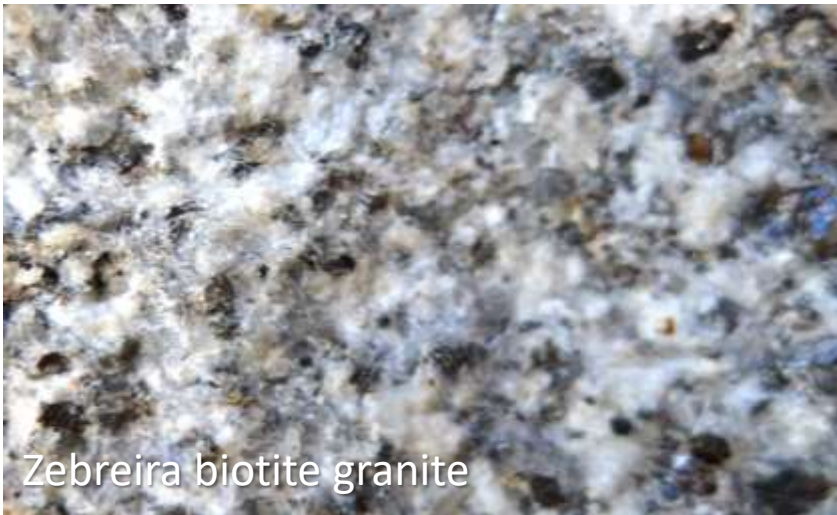


Micro-XRF at GeoRessources- Nancy

Cambrian-Ordovician event

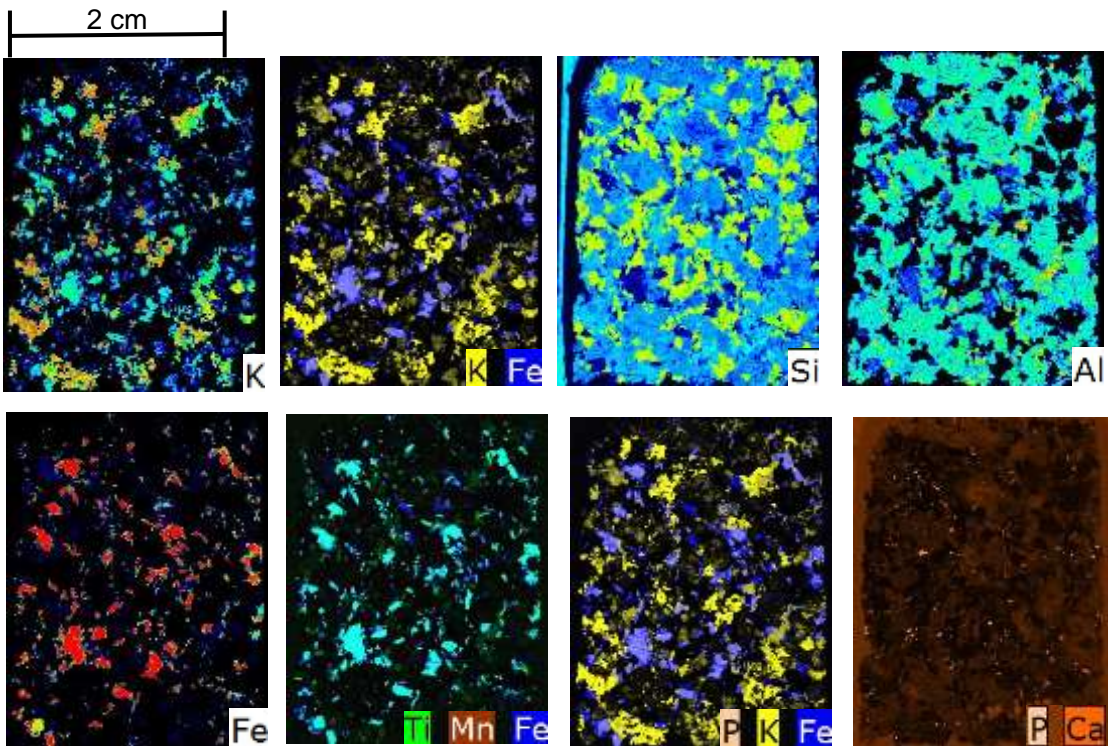
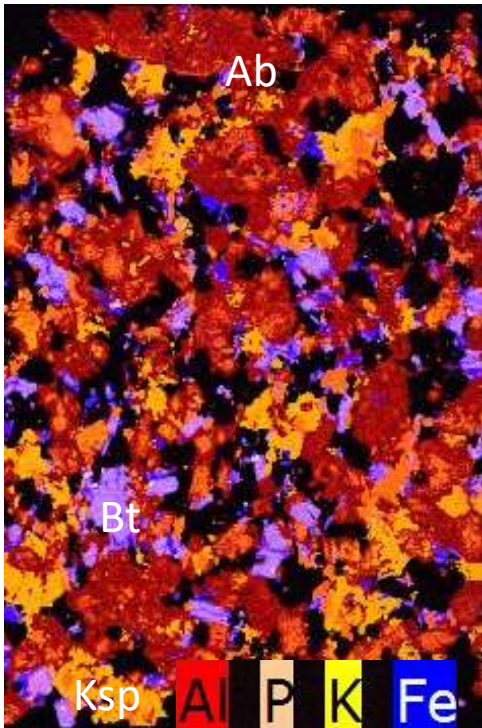
The example of the Zebreira pluton

Zebreira biotite granite (and aplite)



Granites – Cambrian-Ordovician event

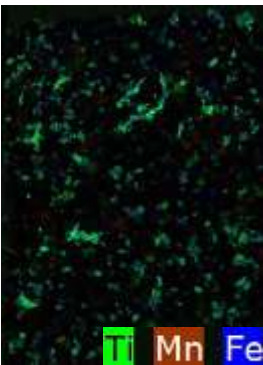
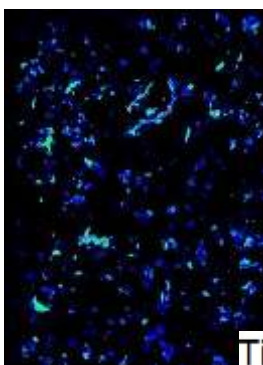
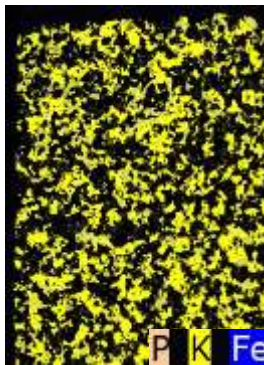
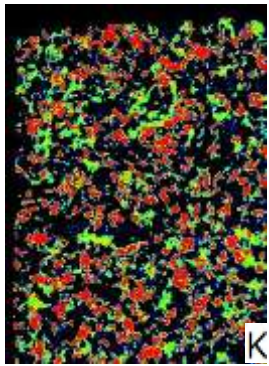
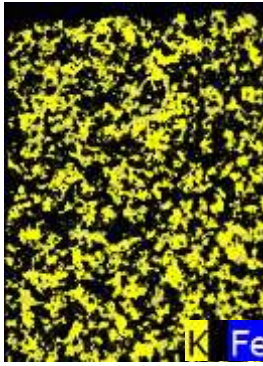
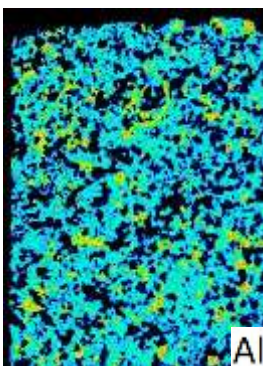
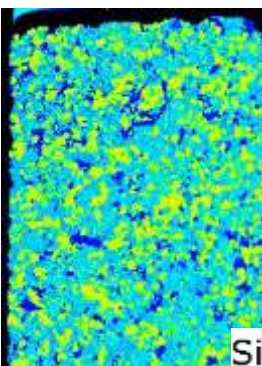
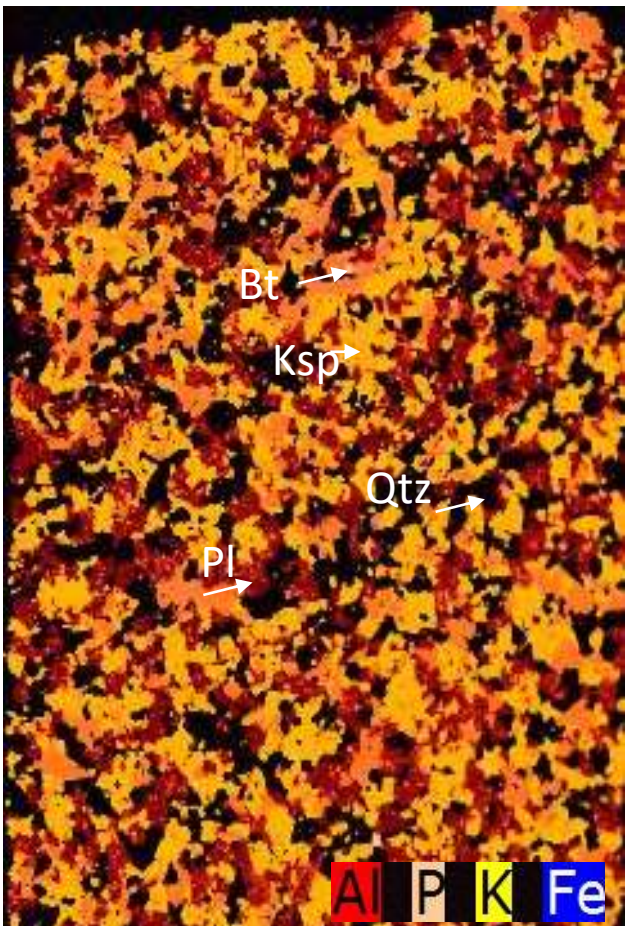
G-ZEB#1 (Zebreira Granite)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.24	500	4	134	12	18.4	283	6.90	1.13	6	-	3.16

Granites –
Cambrian-Ordovician event

G-ZEB#4 (Differentiated fácies
of Zebreira Pluton)



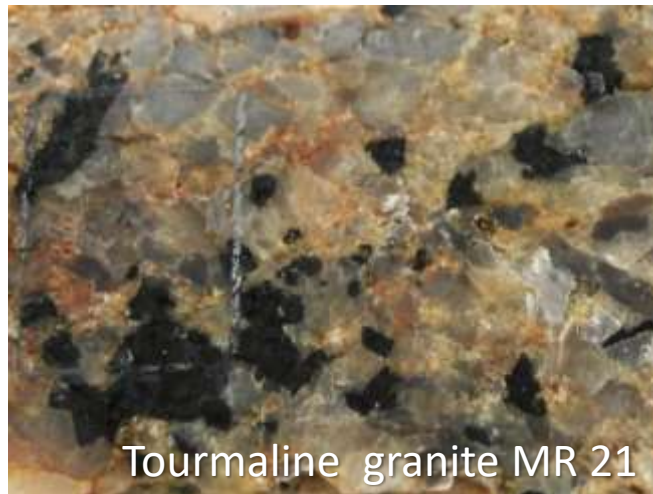
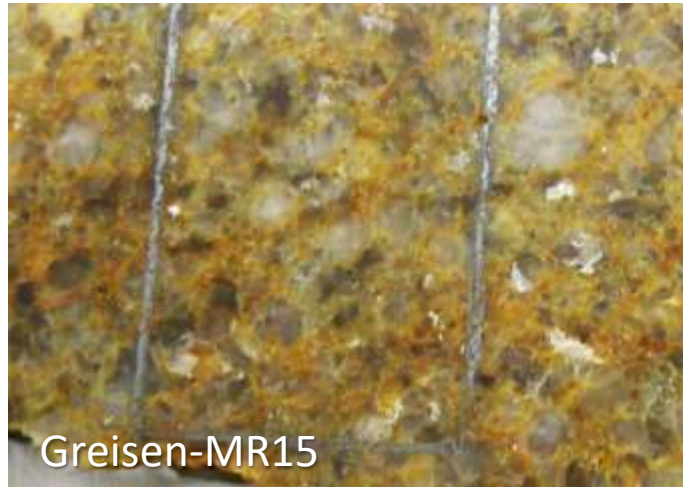
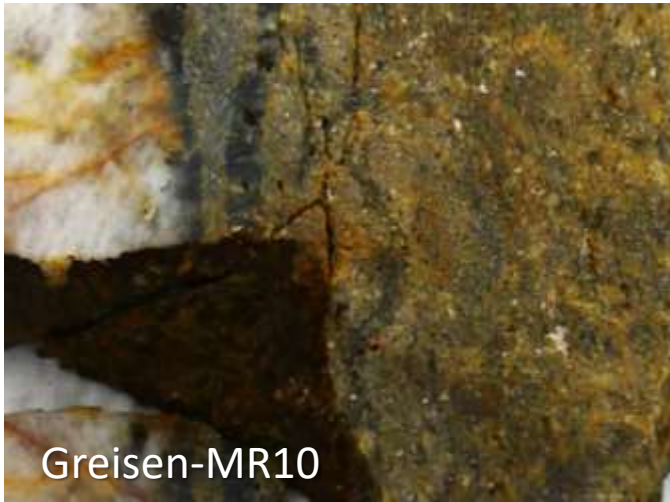
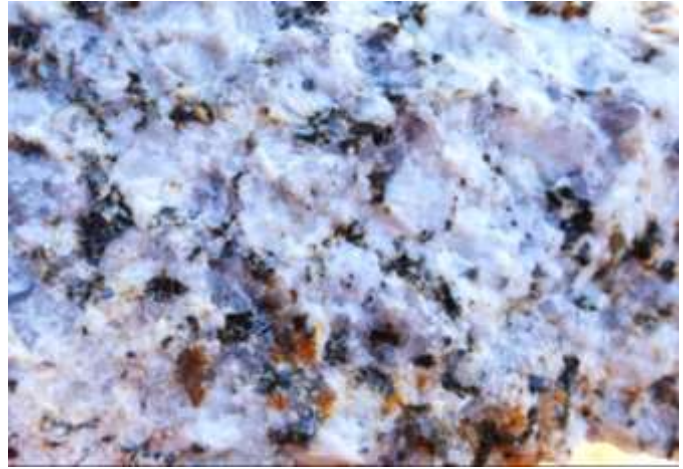
P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.32	-	1	25.90	11	10.60	50	5.50	2.65	9	-	23.17

Late Variscan event

**Orca
Salvaterra do Extremo
Panasqueira
Castelo Branco
Segura
Argemela
Penamacor**

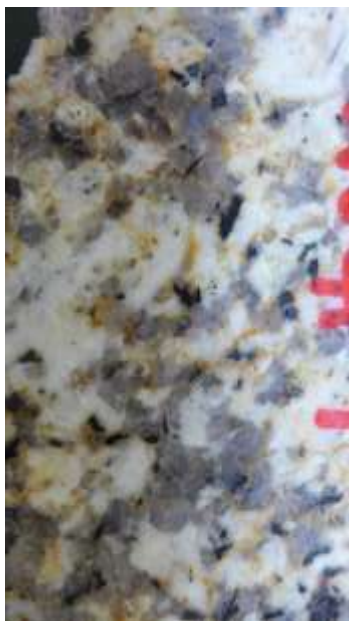
Orca

Mata da Rainha

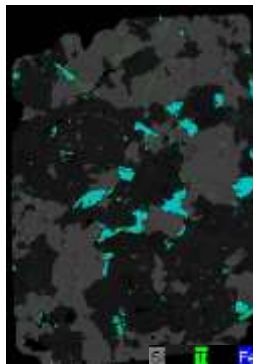
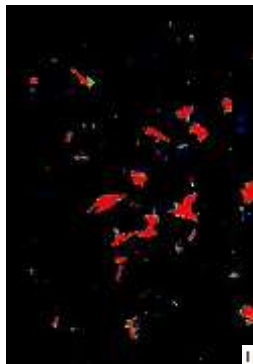
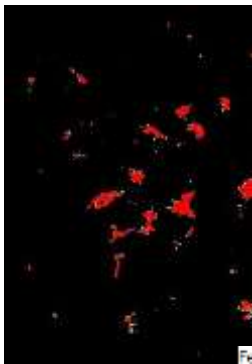
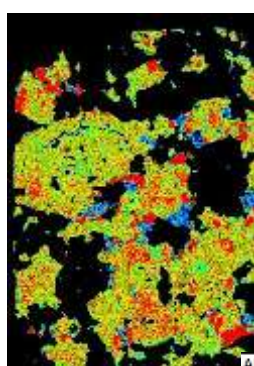
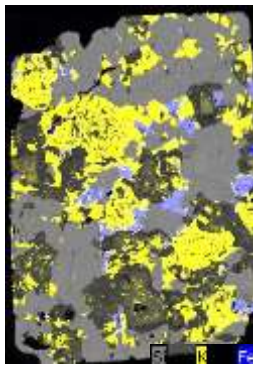
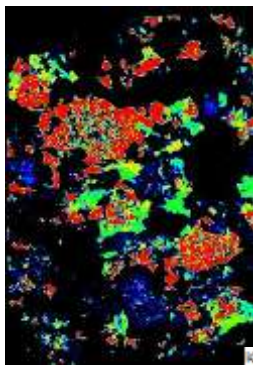
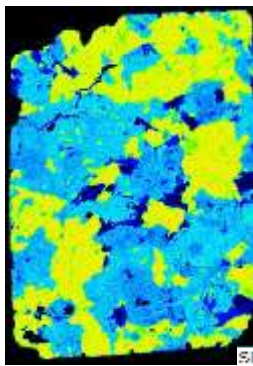
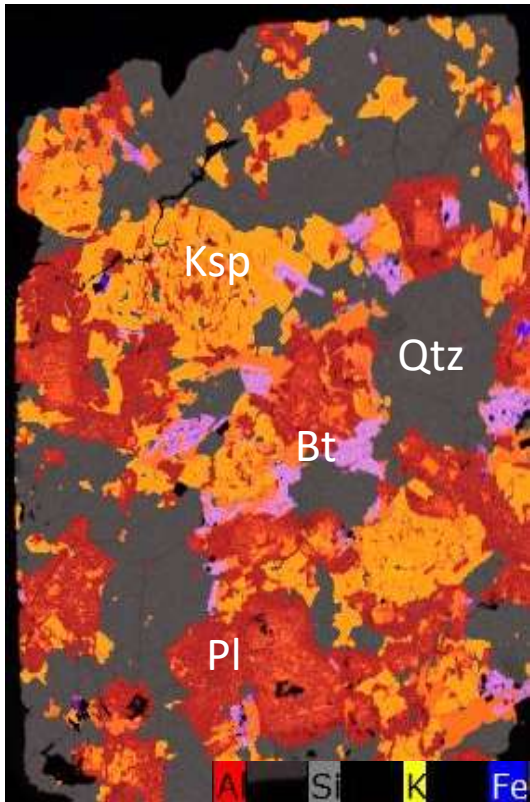


Granites – Variscan event

G-SEIXO#1 (Orca Pluton)



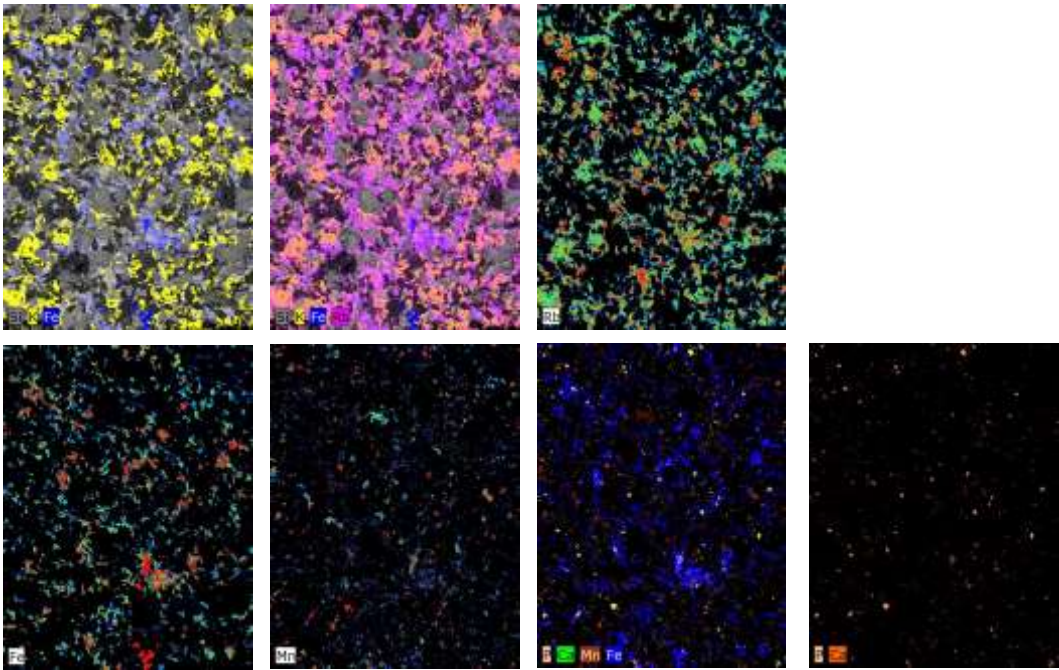
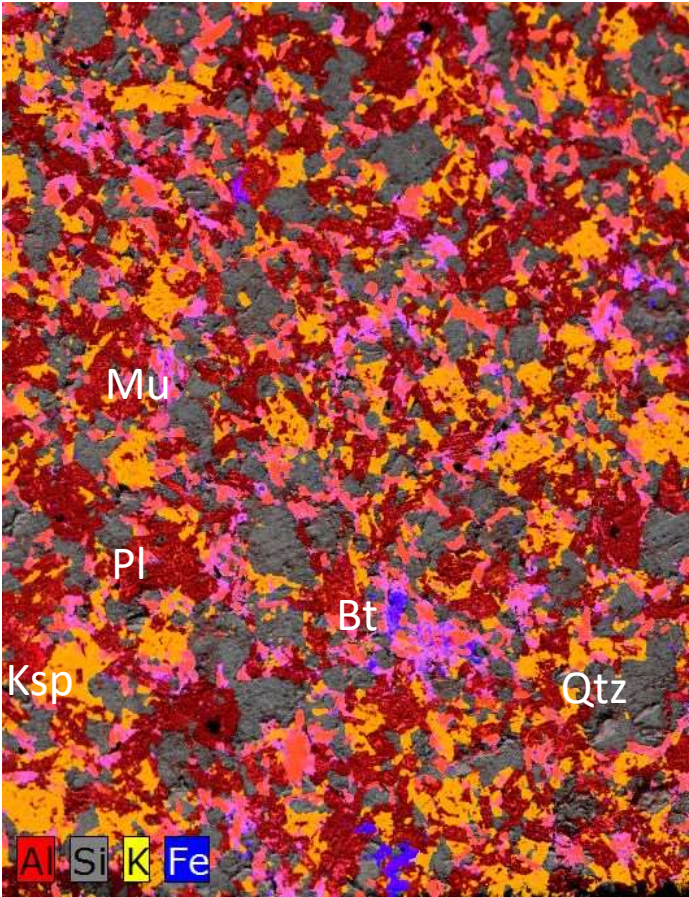
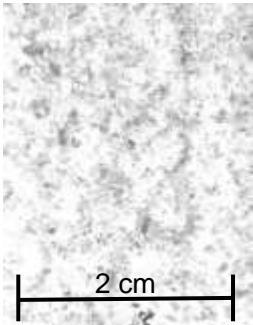
2 cm



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.33	700	3	193	39	19.50	170	15.30	2.07	14	-	8.57

Granites – Variscan event

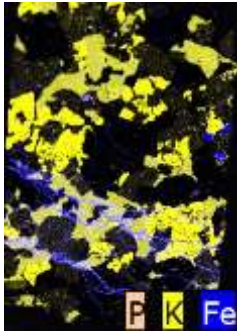
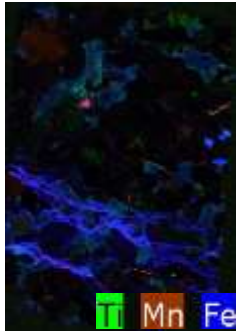
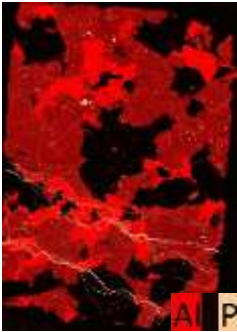
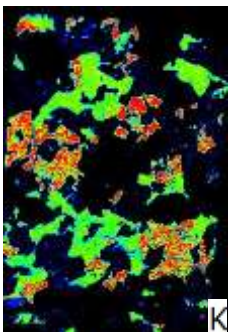
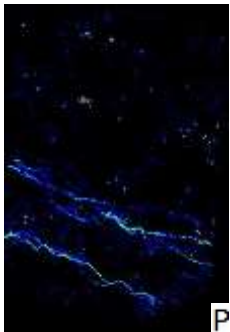
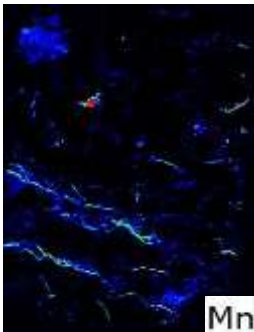
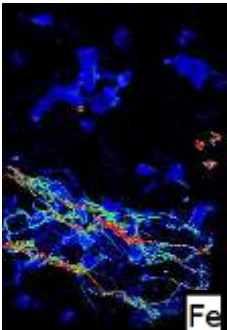
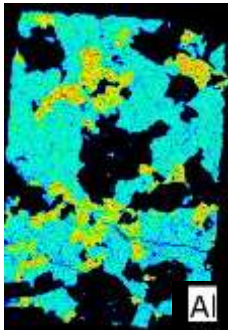
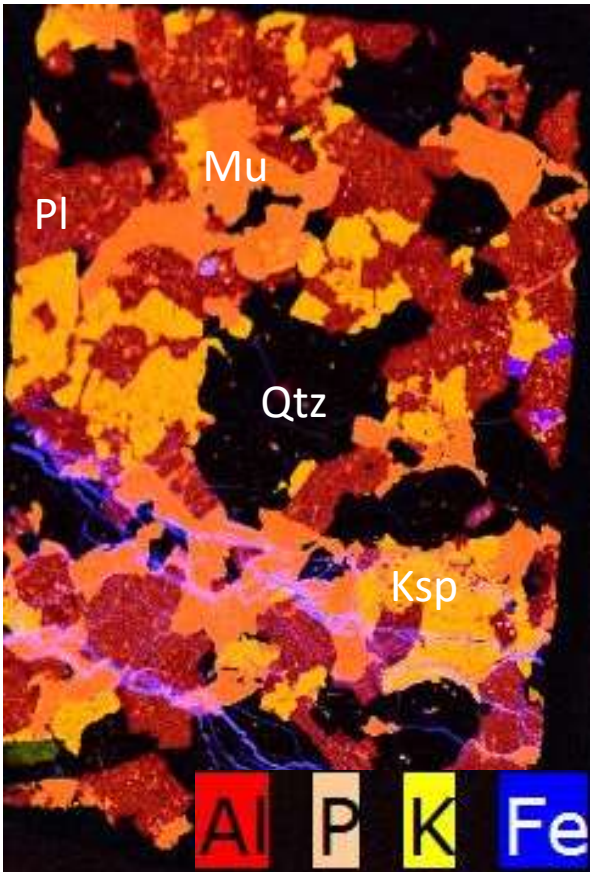
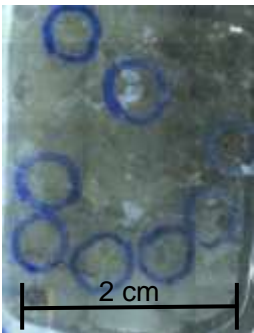
G-SEIXO#2 (Orca Pluton)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.39	1541	-	-	-	36.60	7.60	21.20	3.40	29.90	4.40	37.49

Granites – Variscan event

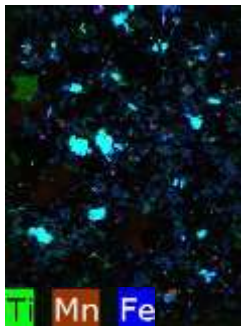
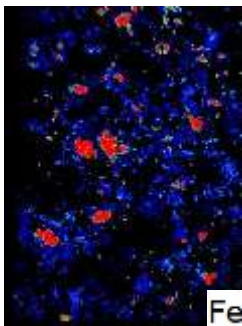
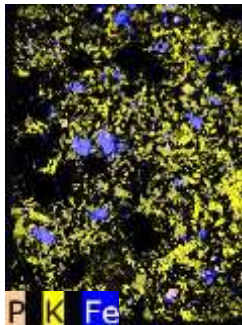
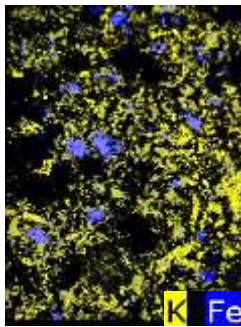
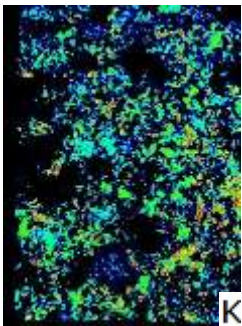
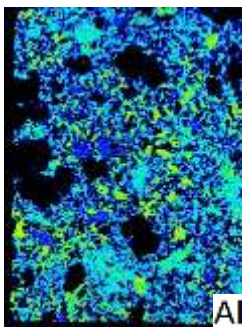
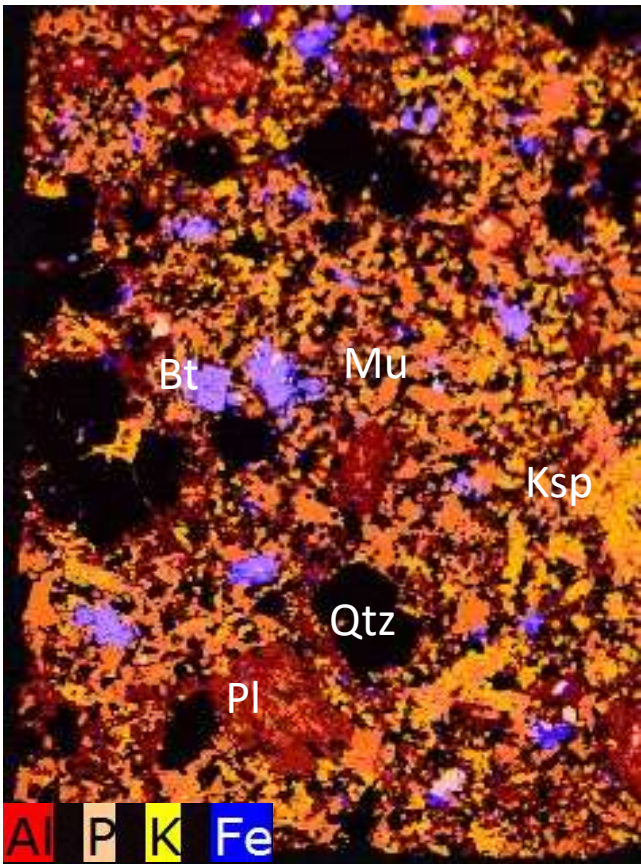
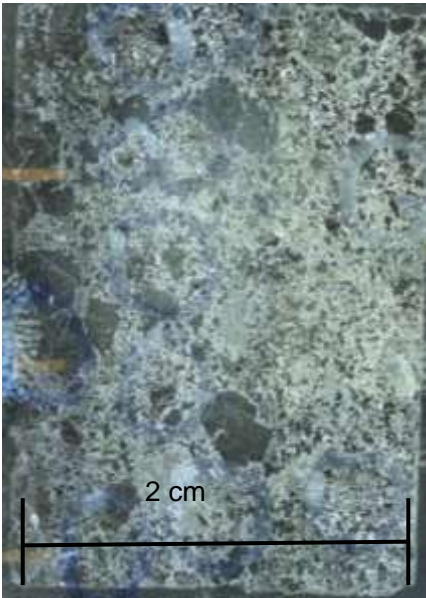
G-STEX#2B (Salvaterra do
Extremo Facies)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.72	600	2	-	138	43.90	11	16.40	5.30	31	2	9.80

Granites – Variscan event

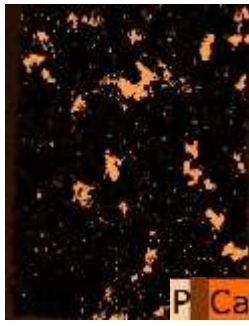
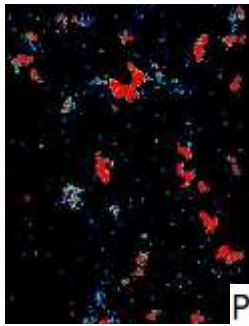
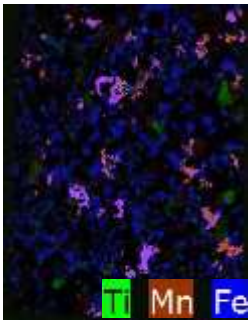
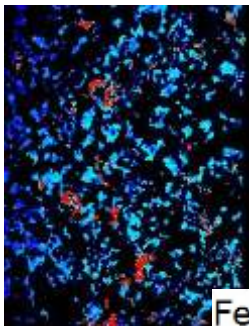
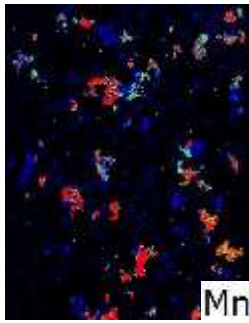
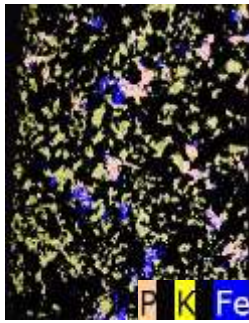
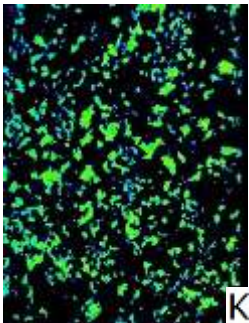
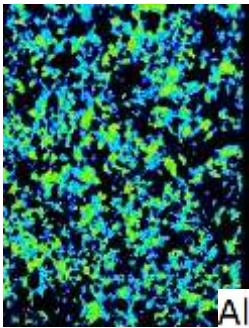
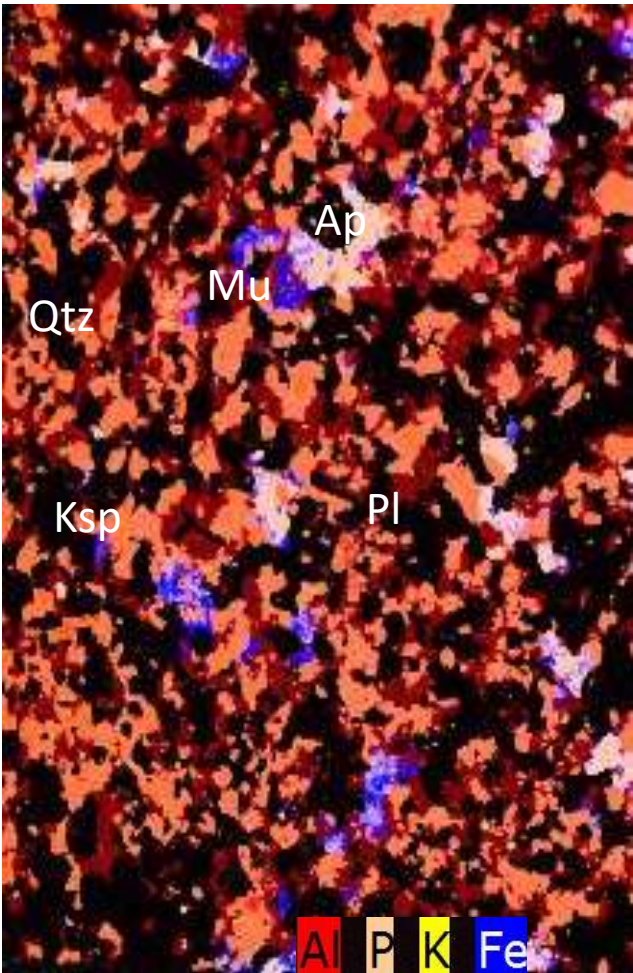
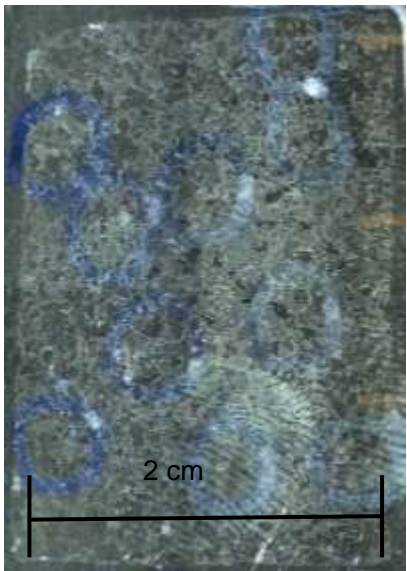
SCB2#11 (Two-mica
Panasqueira Granite)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.45	2500	3	423	16	19.30	81	11.30	2.77	18	11	21.58

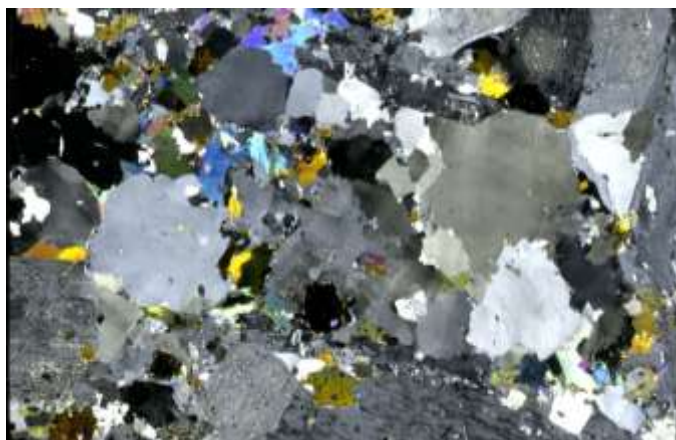
Granites – Variscan event

SCB2#15 (Muscovite Panasqueira Granite)

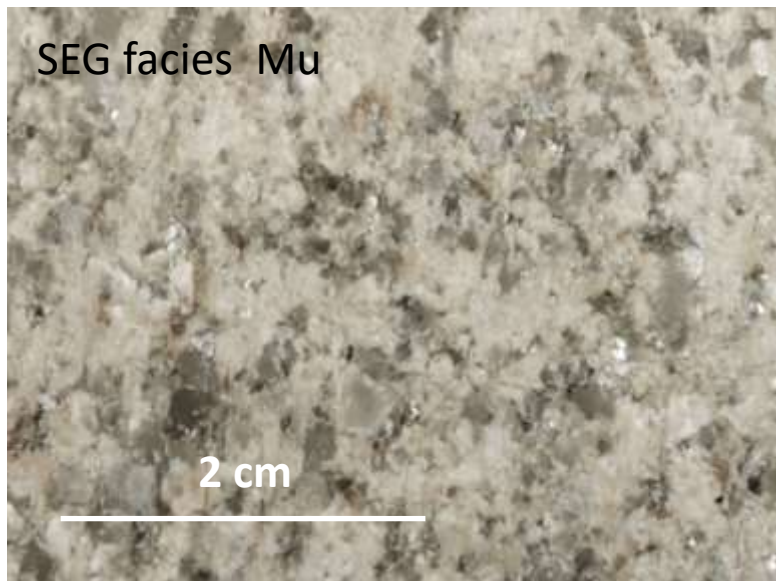
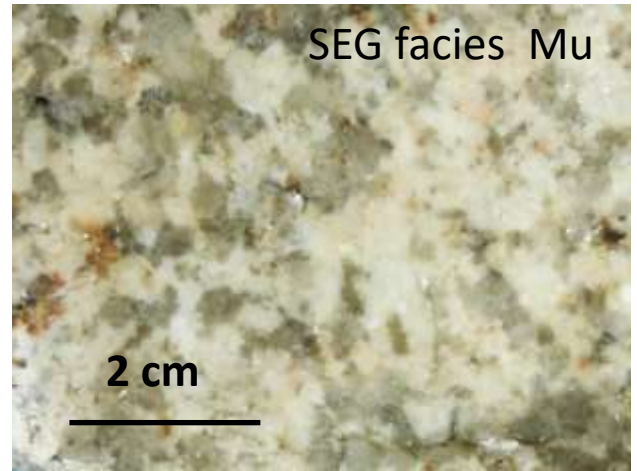
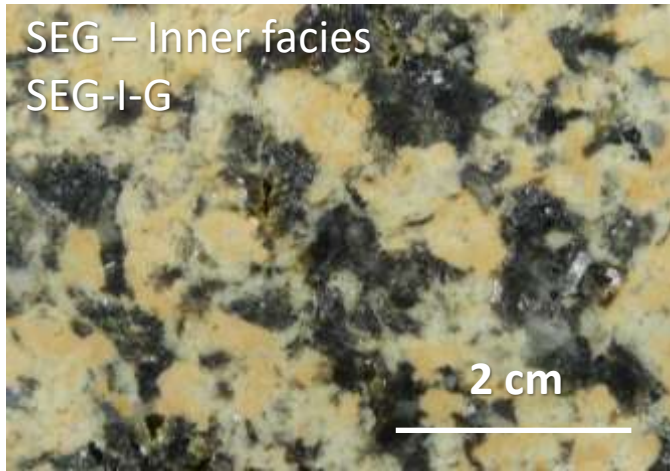


P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
1.41	2300	3	229	29	20.10	14	29.30	11.80	38	15	4.13

Castelo Branco- G1 granite

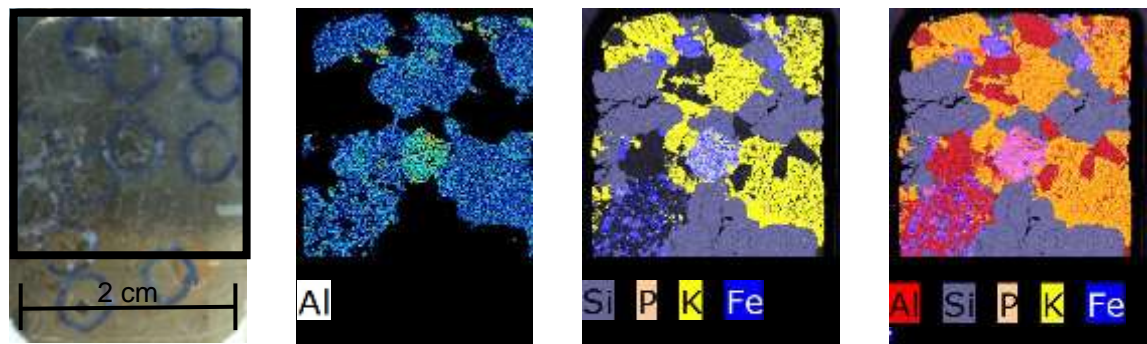


Segura main facies



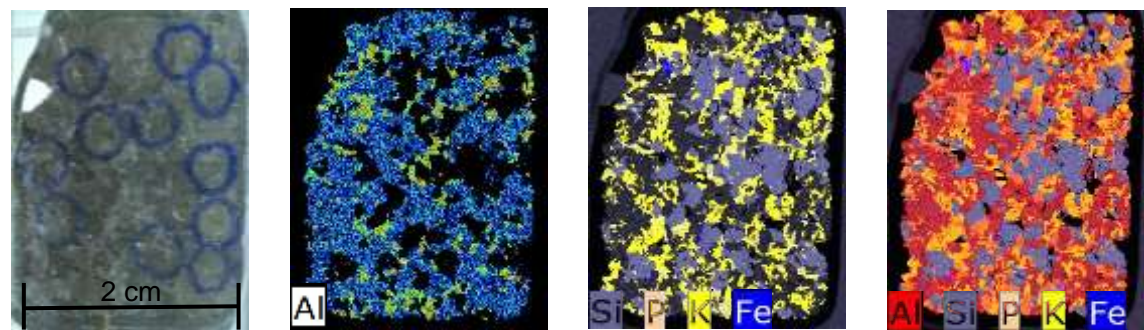
Granites – Variscan event

G SEG#4 (Cordierite-bearing Two-mica Facies)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.34	300	9	131	38	12.30	225	9.30	1.14	8	-	4.86

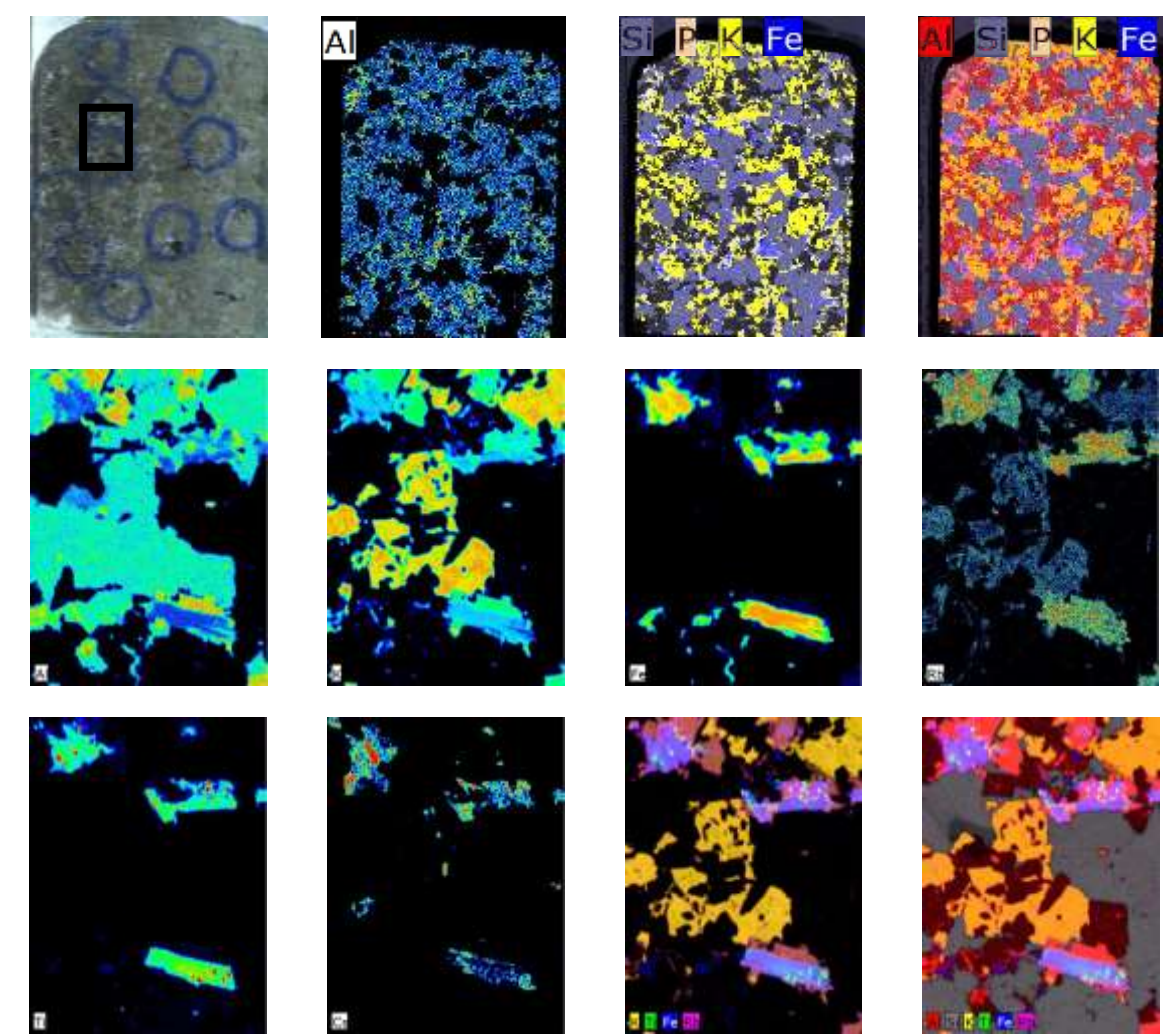
G SEG#1 (Muscovite Facies)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.67	1400	3	206	109	32.20	45	32.70	10.50	48	9	5.15

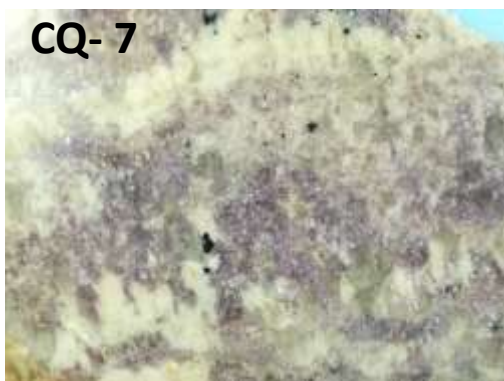
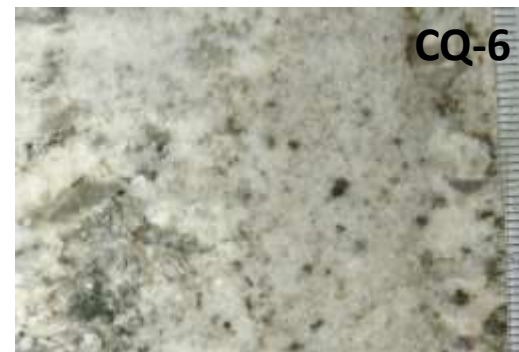
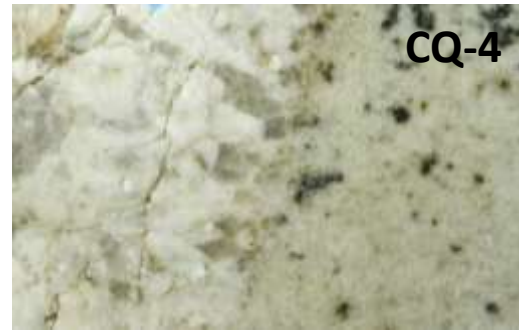
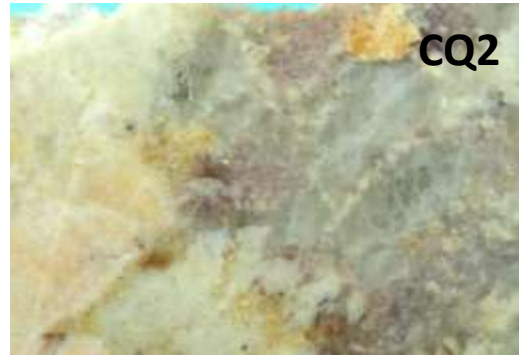
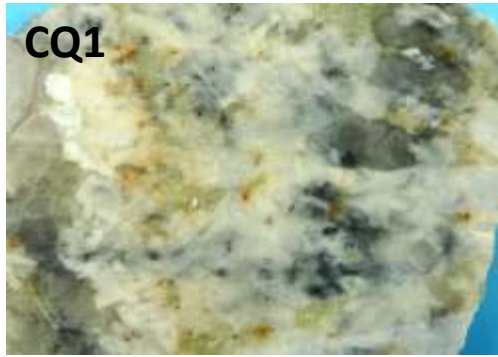
Granites – Variscan event

G SEG#2 (Two-mica Facies – Bt >> Ms) – Mica zoning and inclusions



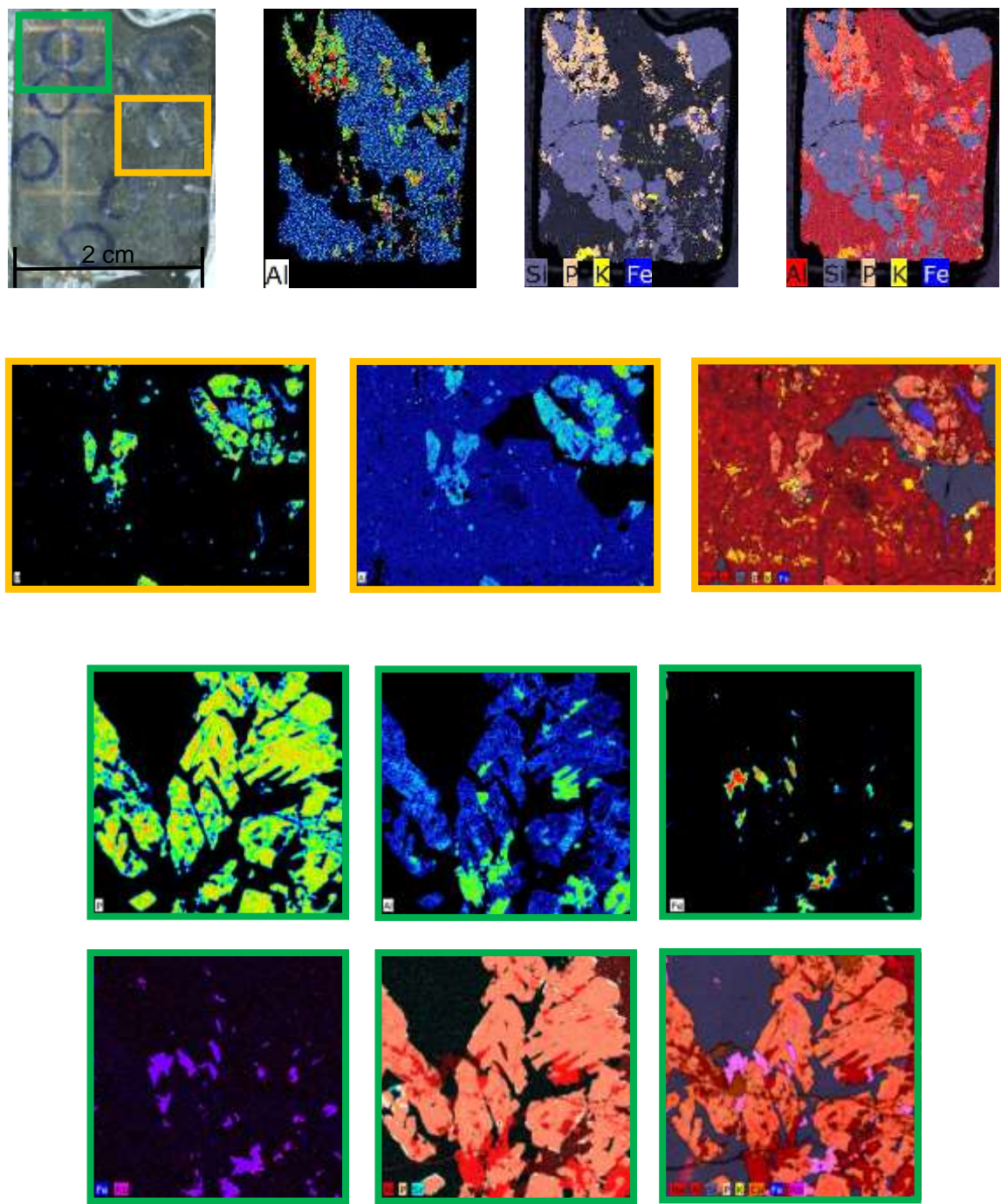
P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.51	1200	4	305	234	67	60	13.60	2.88	31	6	14.53

Segura dykes- Cerro quemado



Granites – Variscan event

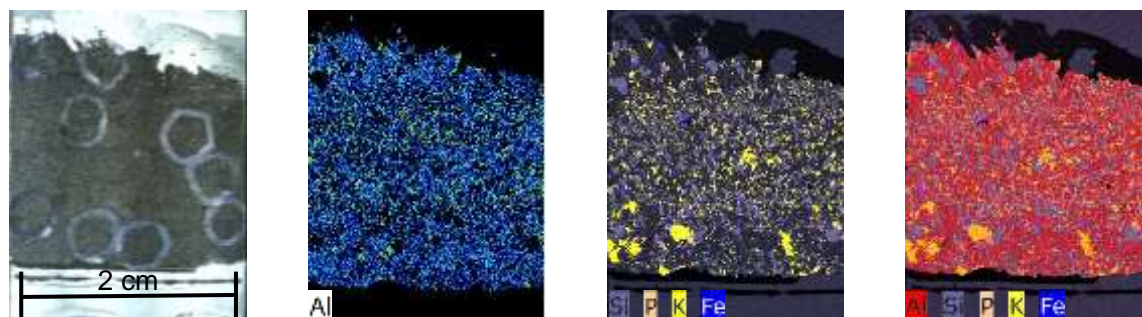
Gf SEG#3A (Aplite-pegmatite Dyke) – Phosphate details in pegmatite part



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.43	2900	7	1160	35	52.30	14	82	59.70	256	1	6.36

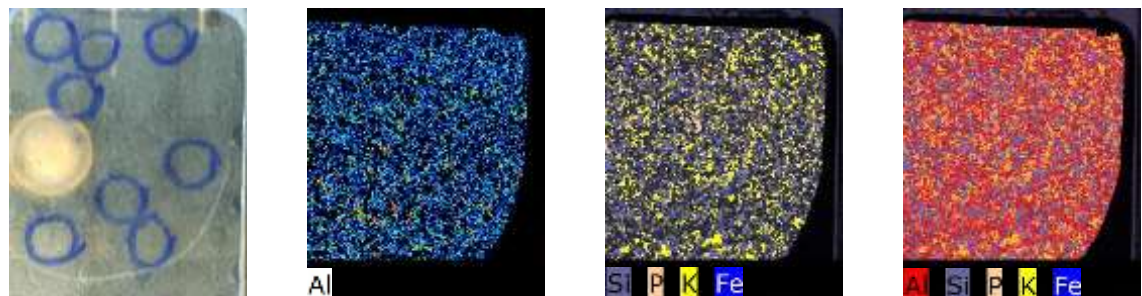
Granites – Variscan event

Gf SEG#3B (Aplite-pegmatite Contact)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.43	2900	7	1160	35	52.30	14	82	59.70	256	1	6.36

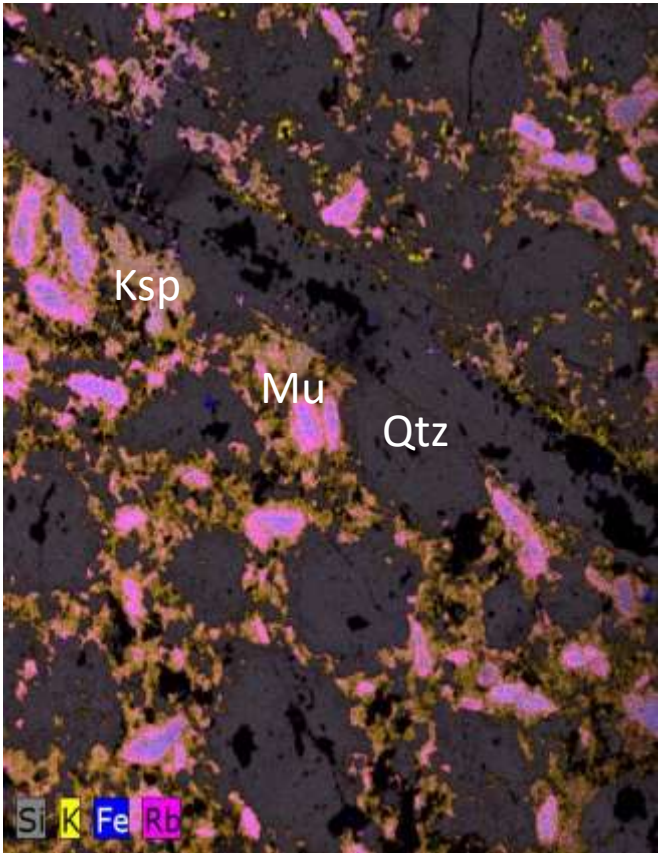
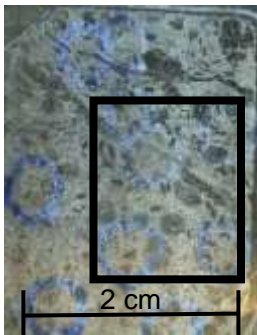
Gf SEG#3C (Aplite-pegmatite Dyke) – Aplite portion



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.43	2900	7	1160	35	52.30	14	82	59.70	256	1	6.36

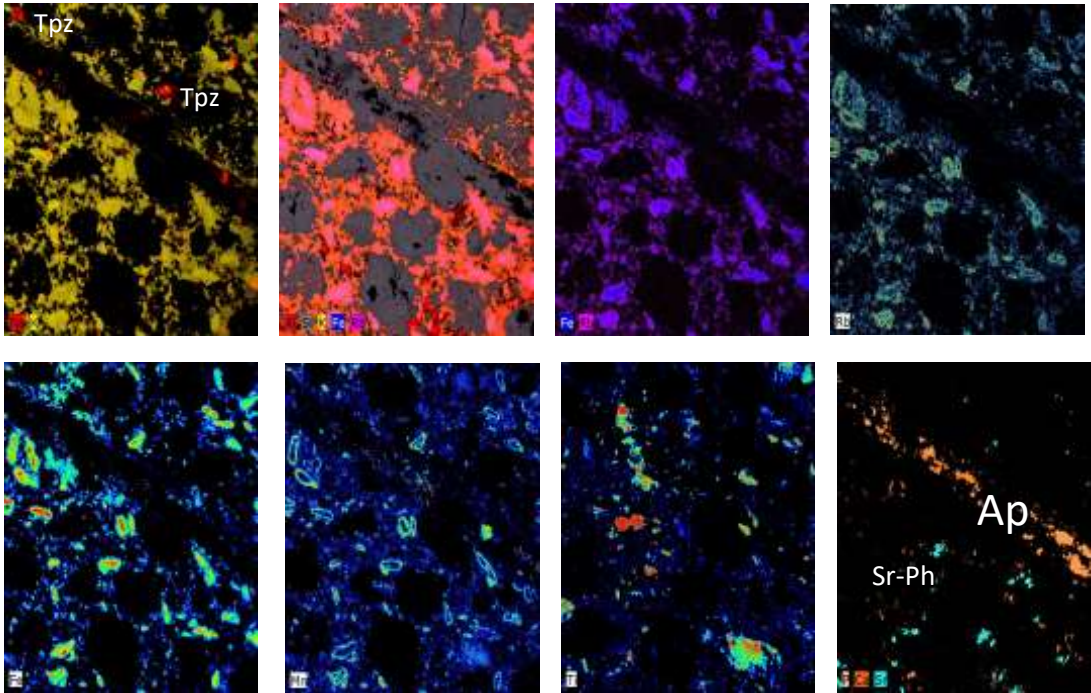
Granites – Variscan event

G_ARG#1 (Argemela RMG)



Micas

inner : Fe rich, outer, Rb rich

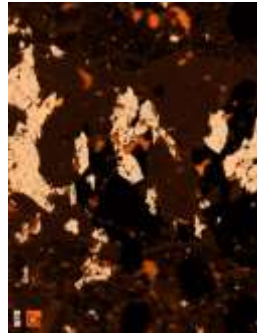
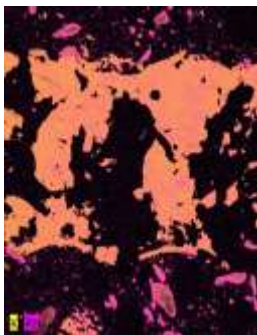
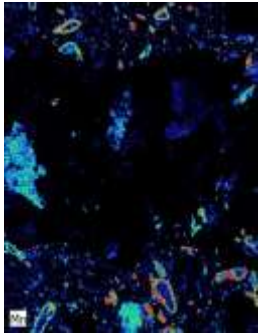
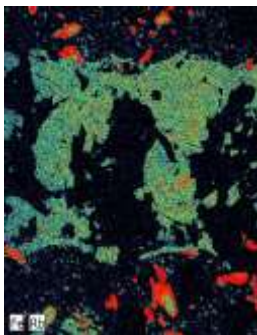
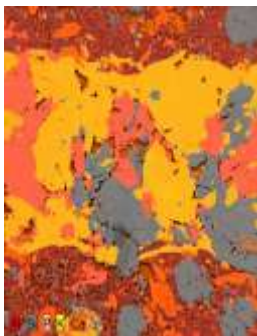
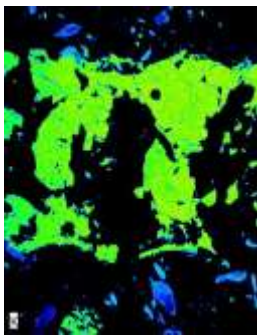
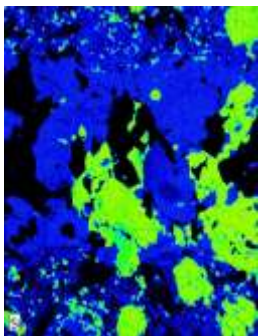
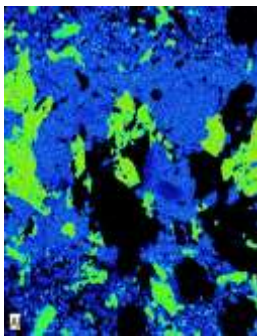
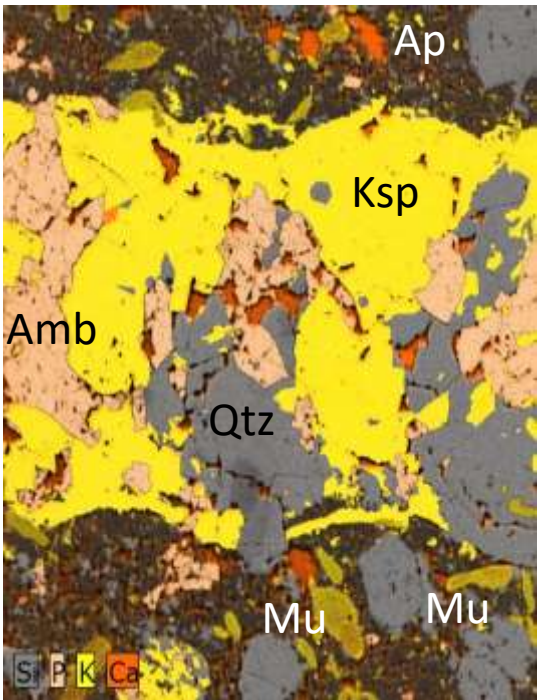


P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.67	2500	114	1110	56	115	26	60.10	65.70	588	-	5.77

Granites – Variscan event

ARGEMELA

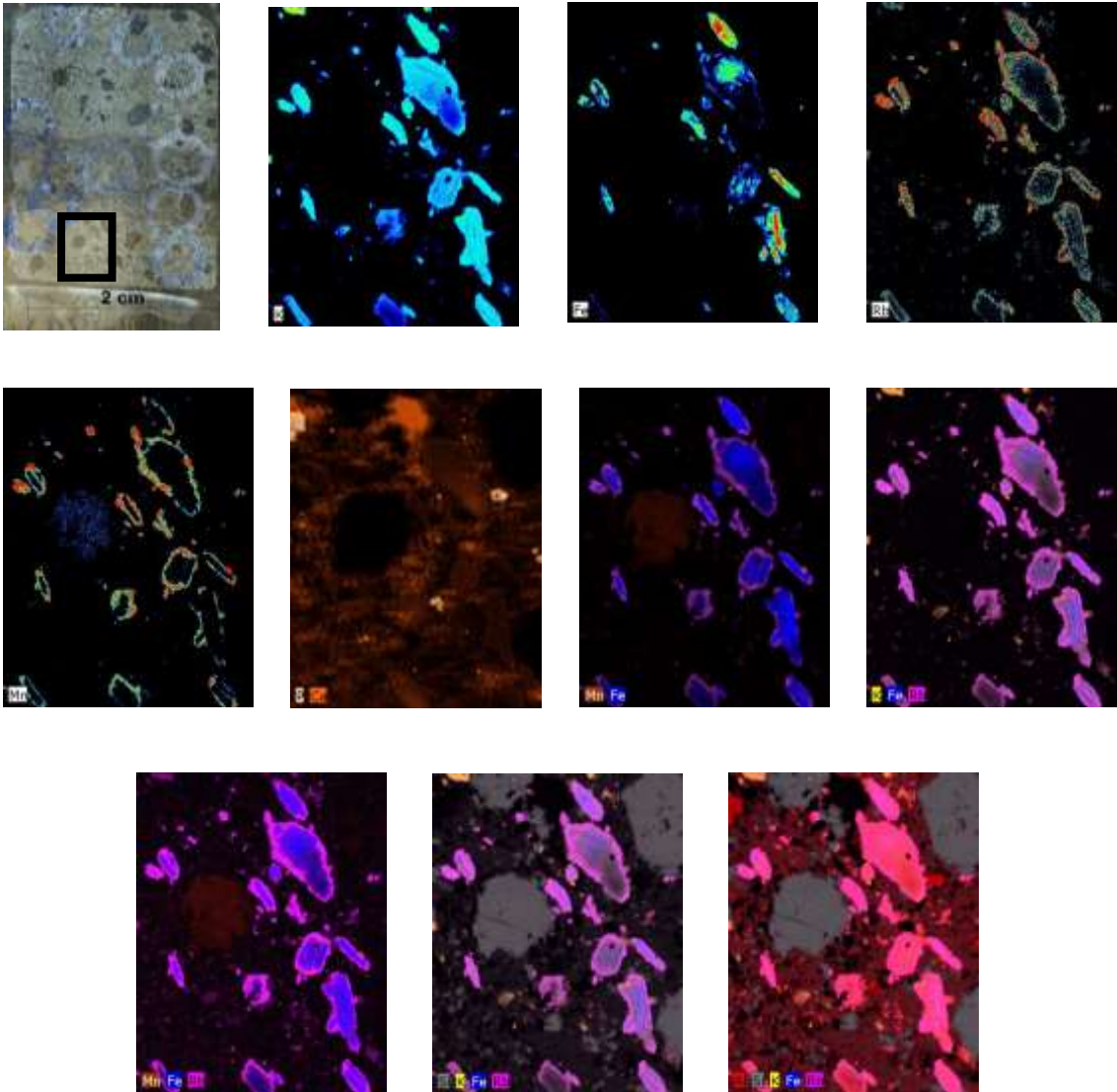
G ARG#2 (Argemela RMG)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.05	2300	108	2240	40	45.60	7	55.70	51.20	687	4	38.28

Granites – Variscan event

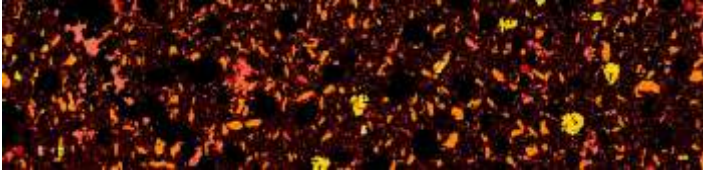
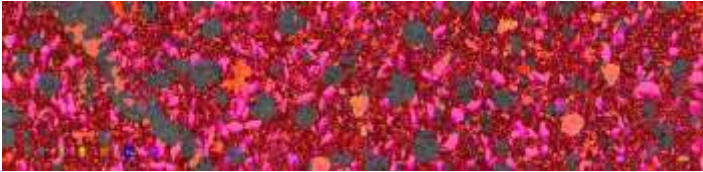
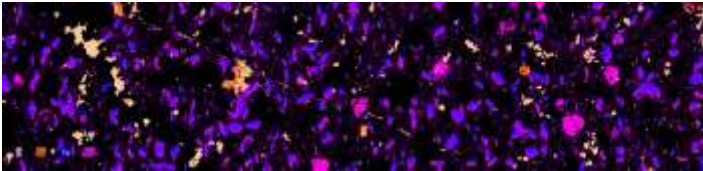
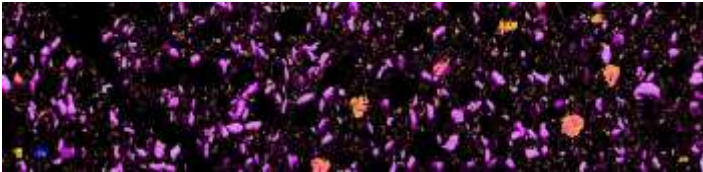
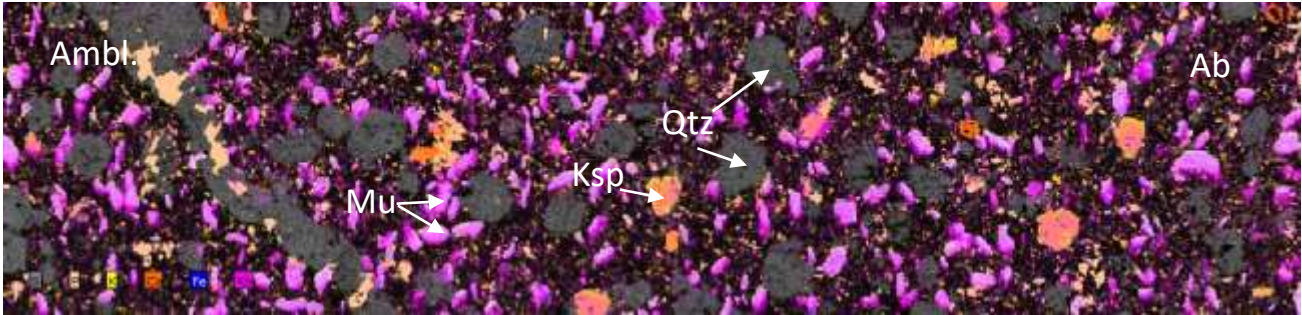
G ARG#2 (Argemela RMG) – Mica zoning



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.05	2300	108	2240	40	45.60	7	55.70	51.20	687	4	38.28

Granites – Variscan event

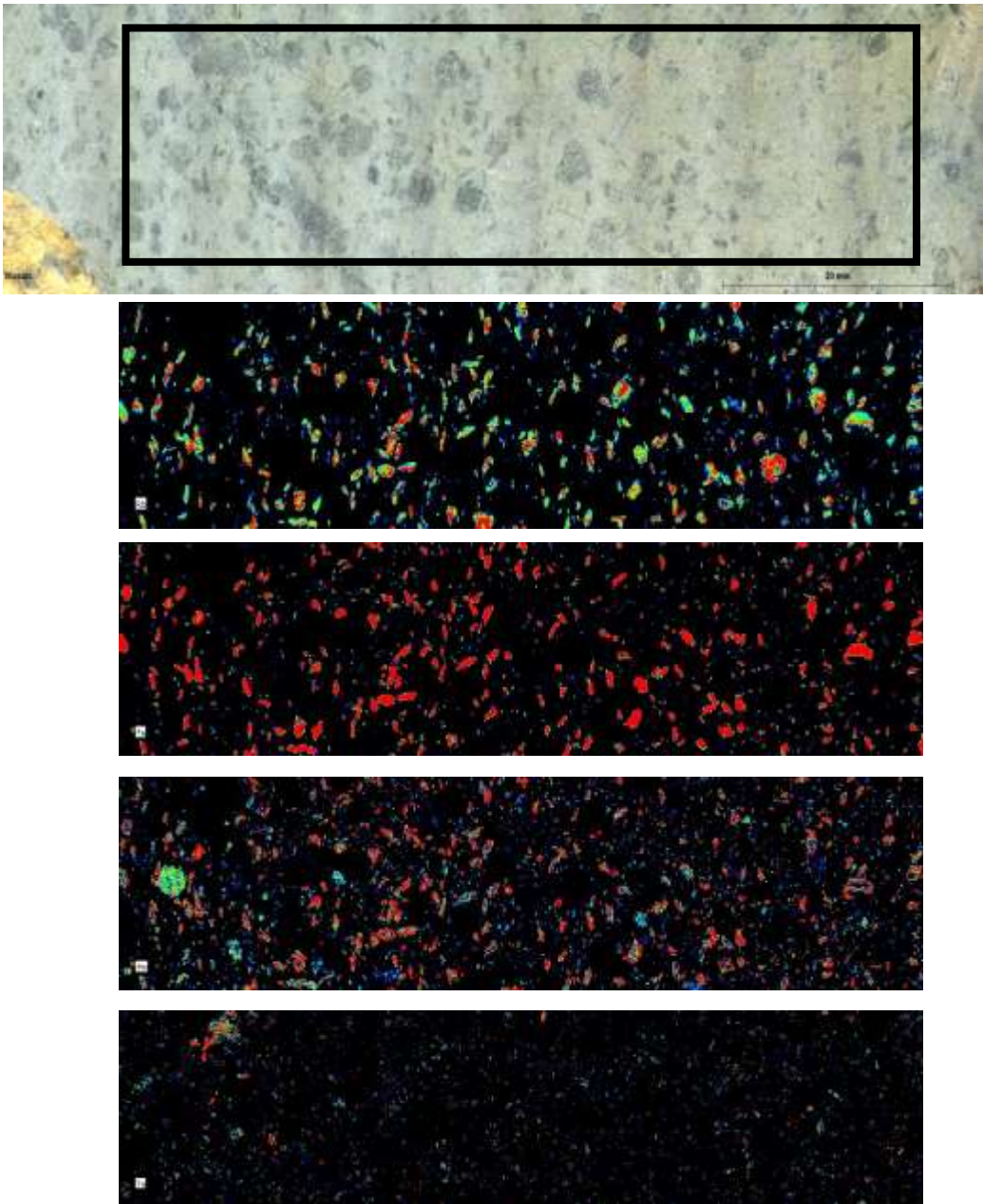
G ARG#2 (Argemela RMG)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.05	2300	108	2240	40	45.60	7	55.70	51.20	687	4	38.28

Granites – Variscan event

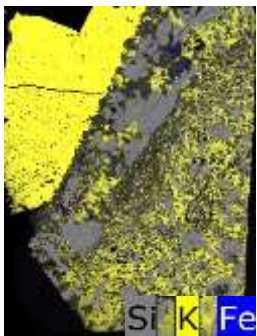
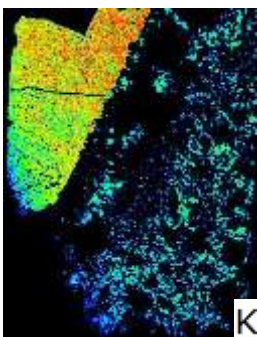
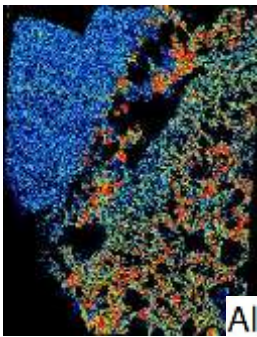
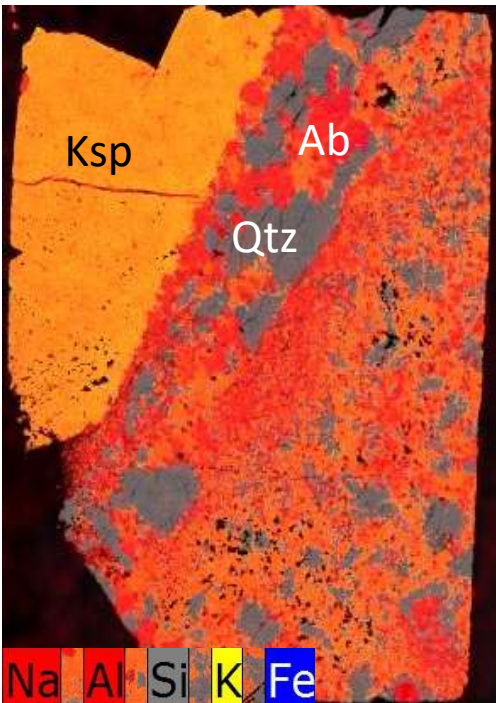
G ARG#2 (Argemela RMG)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
2.05	2300	108	2240	40	45.60	7	55.70	51.20	687	4	38.28

Granites – Variscan event

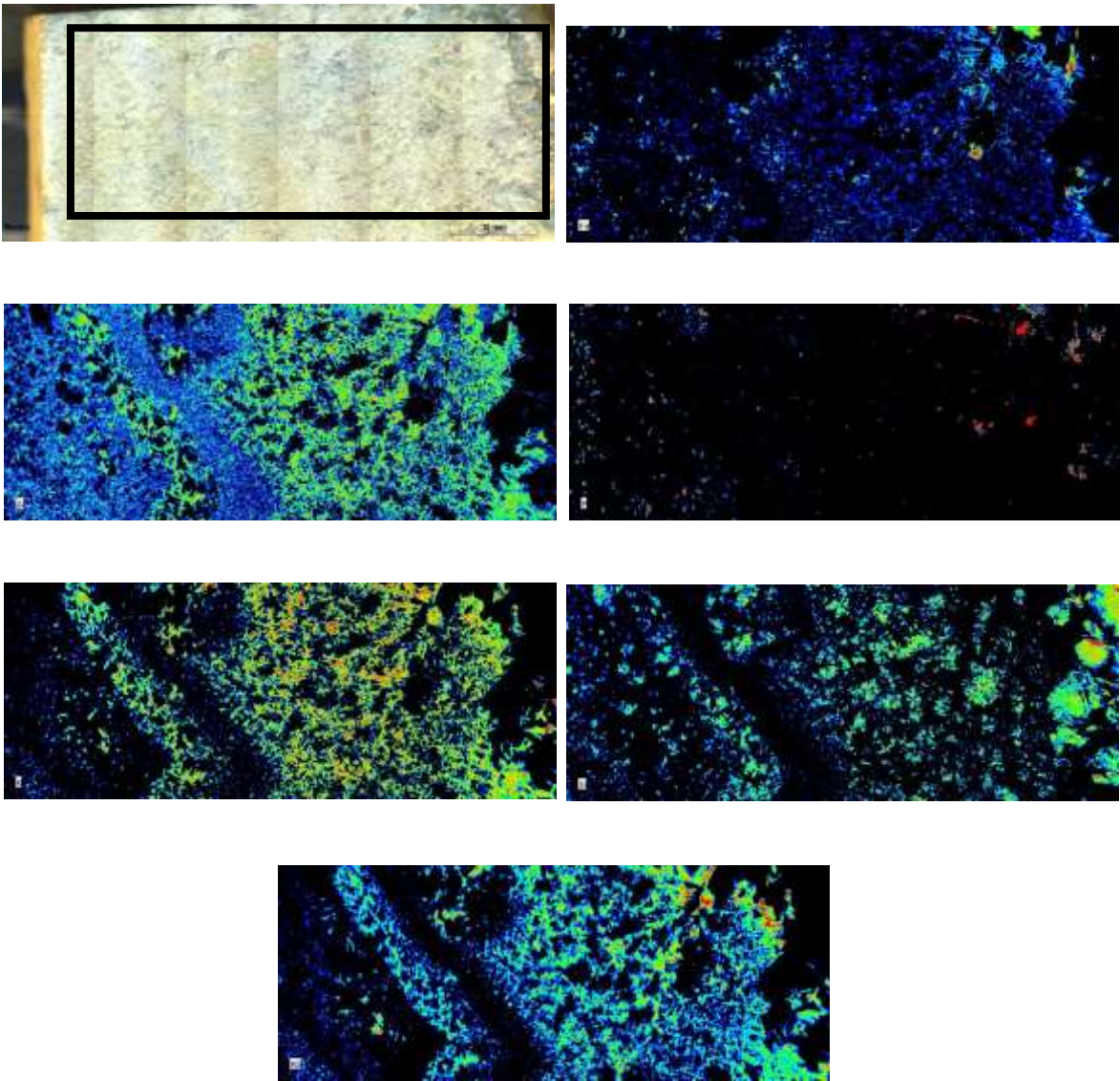
Gf ARG#1 (Argemela Aplite-
Pegmatite Dyke)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
1.51	1600	44	900	85	77.20	22	86.60	114	803	1	23.49

Granites – Variscan event

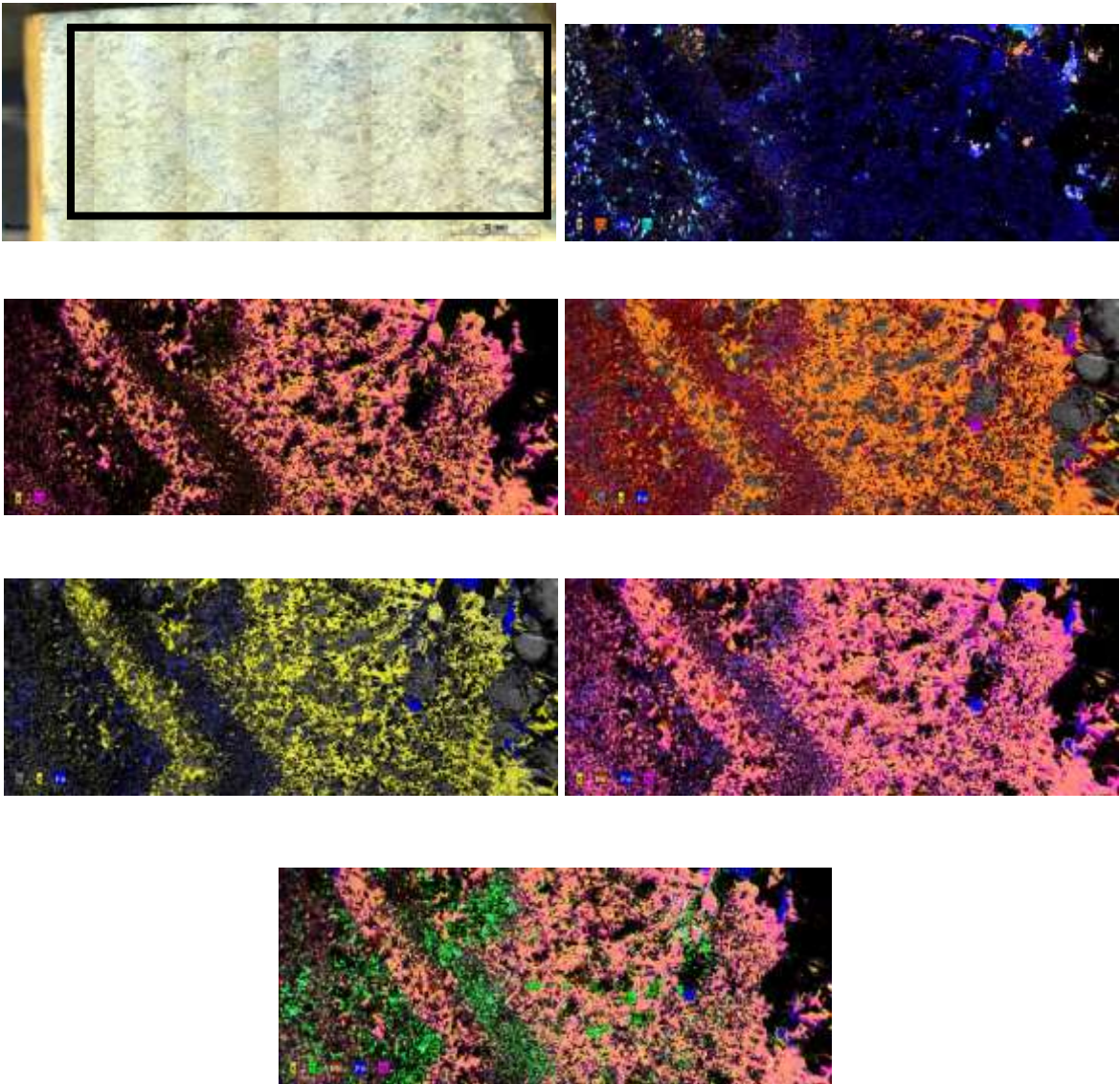
Gf ARG#1 (Argemela Aplite-Pegmatite Dyke)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
1.51	1600	44	900	85	77.20	22	86.60	114	803	1	23.49

Granites – Variscan event

Gf ARG#1 (Argemela Aplite-Pegmatite Dyke)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
1.51	1600	44	900	85	77.20	22	86.60	114	803	1	23.49

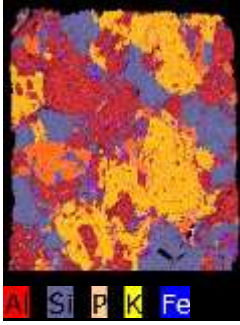
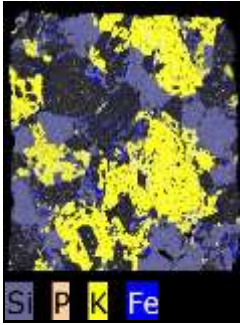
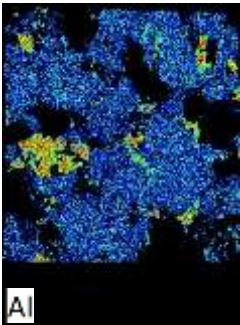
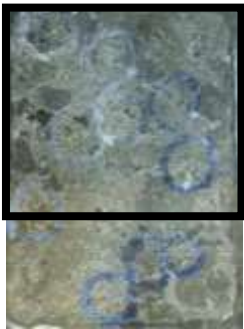
PENAMACOR-MONSANTO



Penamacor-Monsanto

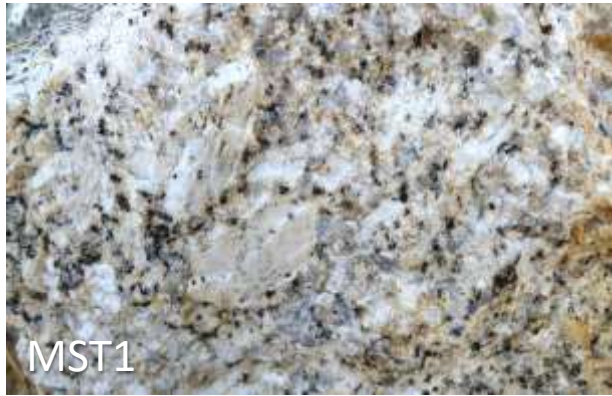
Medelim

G_MED#1 (Muscovite+Turmaline Facies)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.60	1400	14	661	752	192	46	27.30	8.83	391	7	18.93

PENAMACOR. Monsanto



MONT-P2 pegmatite



MONT-TU1 : tourmaline
MONT-TU2 : granite



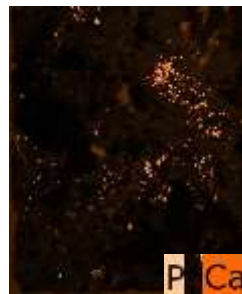
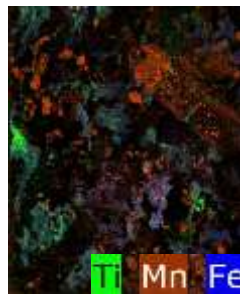
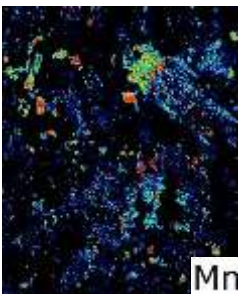
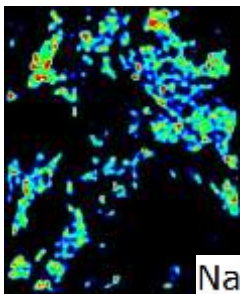
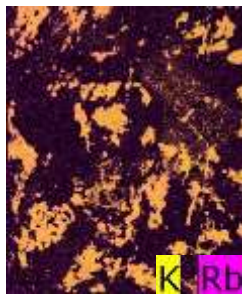
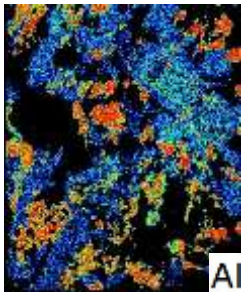
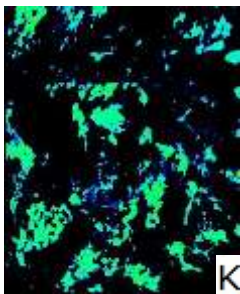
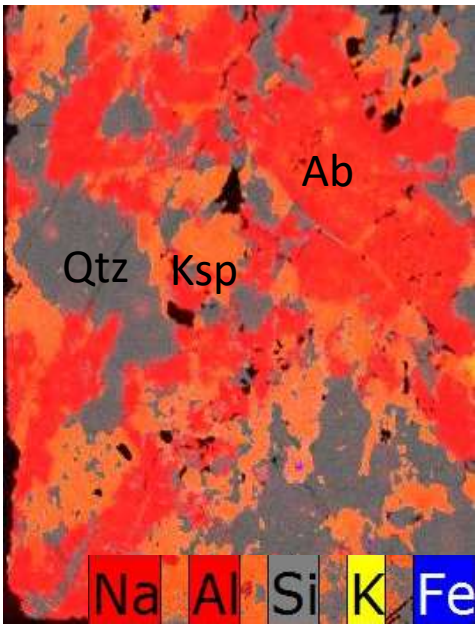
Montsanto
MONT -V1

Monsanto



Granites – Variscan event

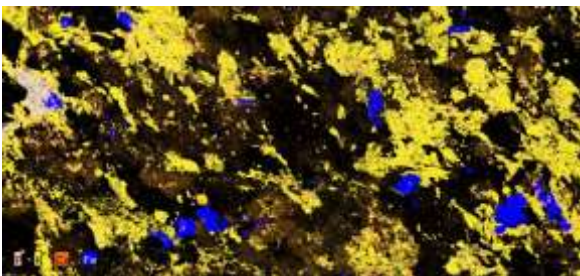
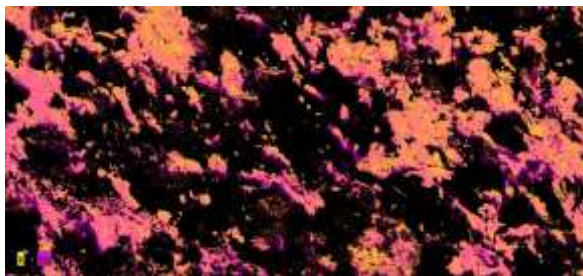
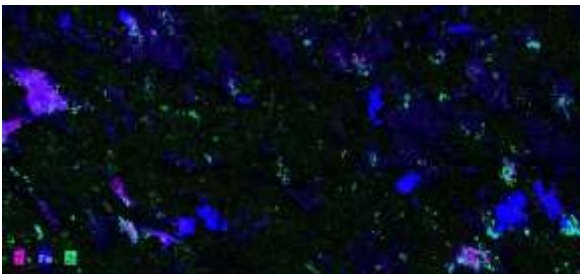
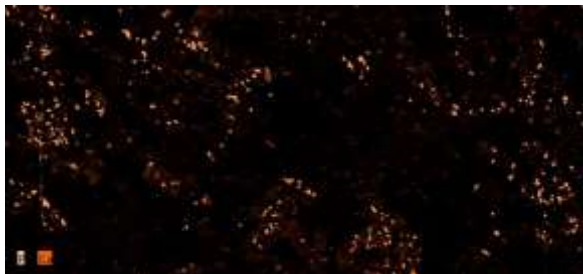
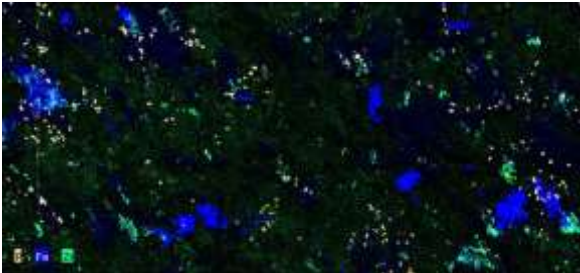
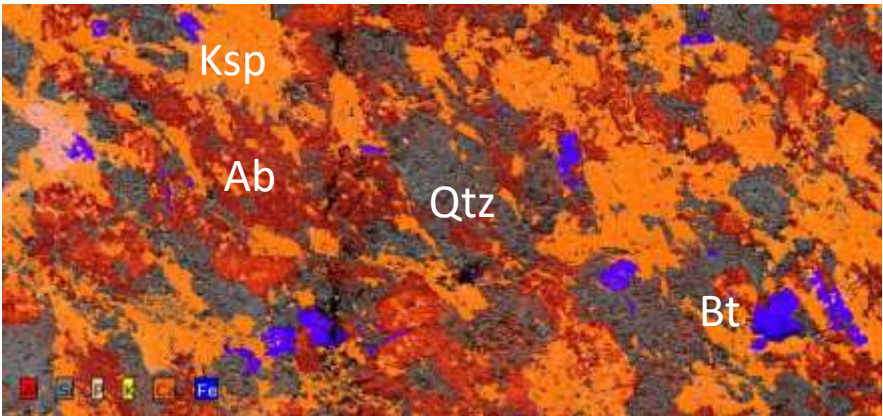
Gf MONS#1A (Monsanto Pegmatite Dyke)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.45	1700	3	458	884	42.40	85	13.70	6.68	60	8	22.72

Granites – Variscan event

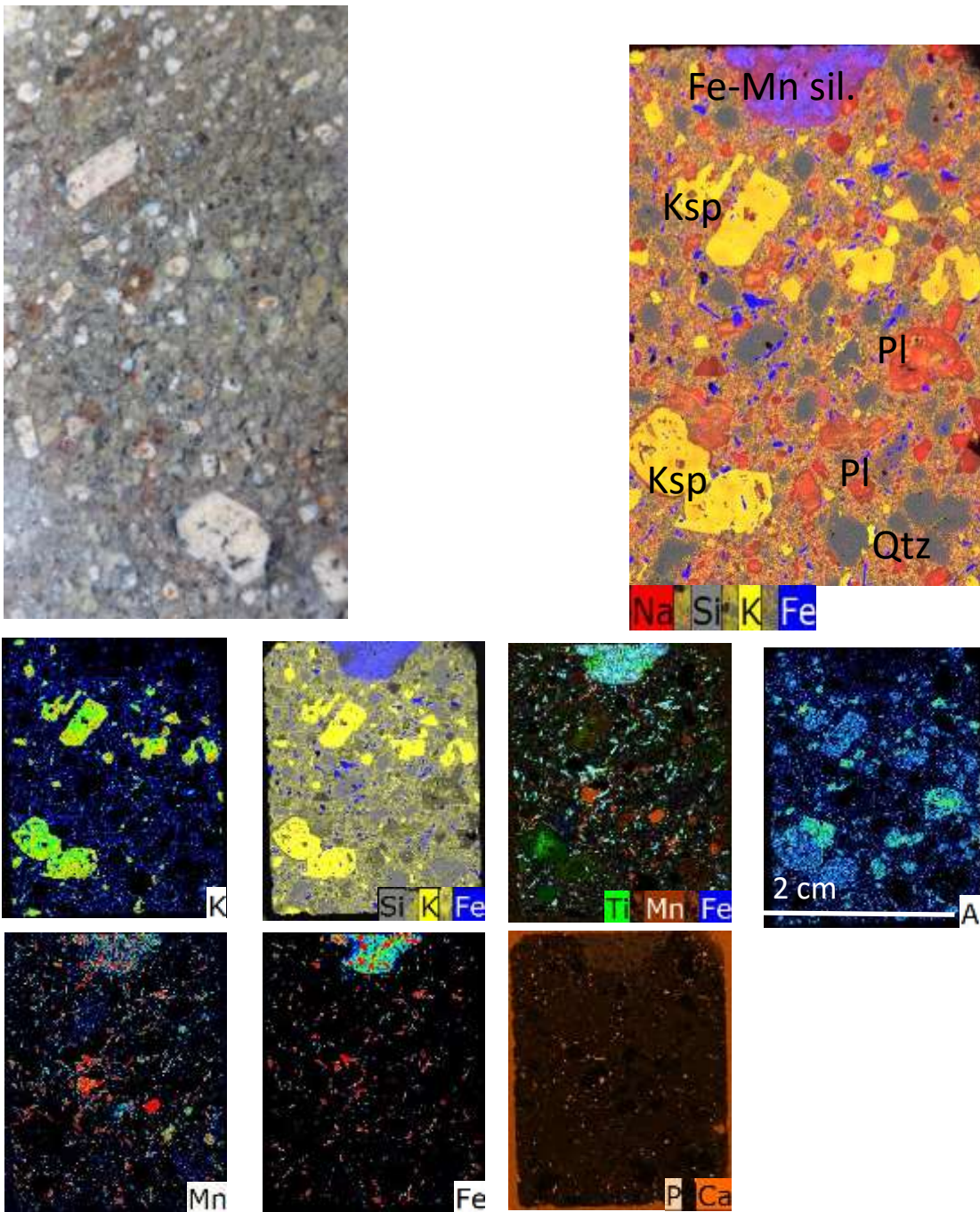
Gf MONS#1A
(Monsanto
Pegmatite Dyke)



P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.45	1700	3	458	884	42.40	85	13.70	6.68	60	8	22.72

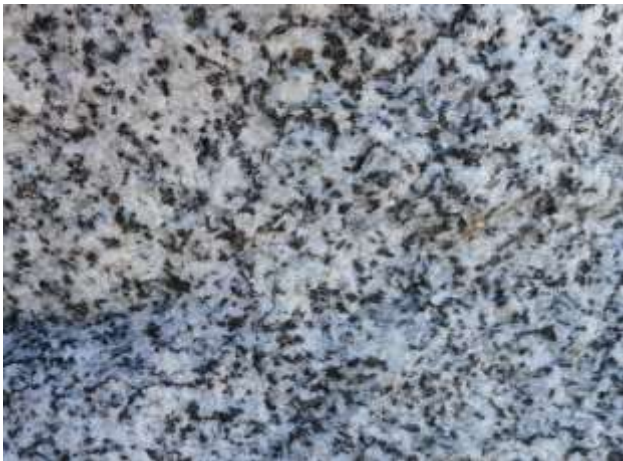
G MARCELINA#1

(Porphyry Intrusion in Zebreira Area)



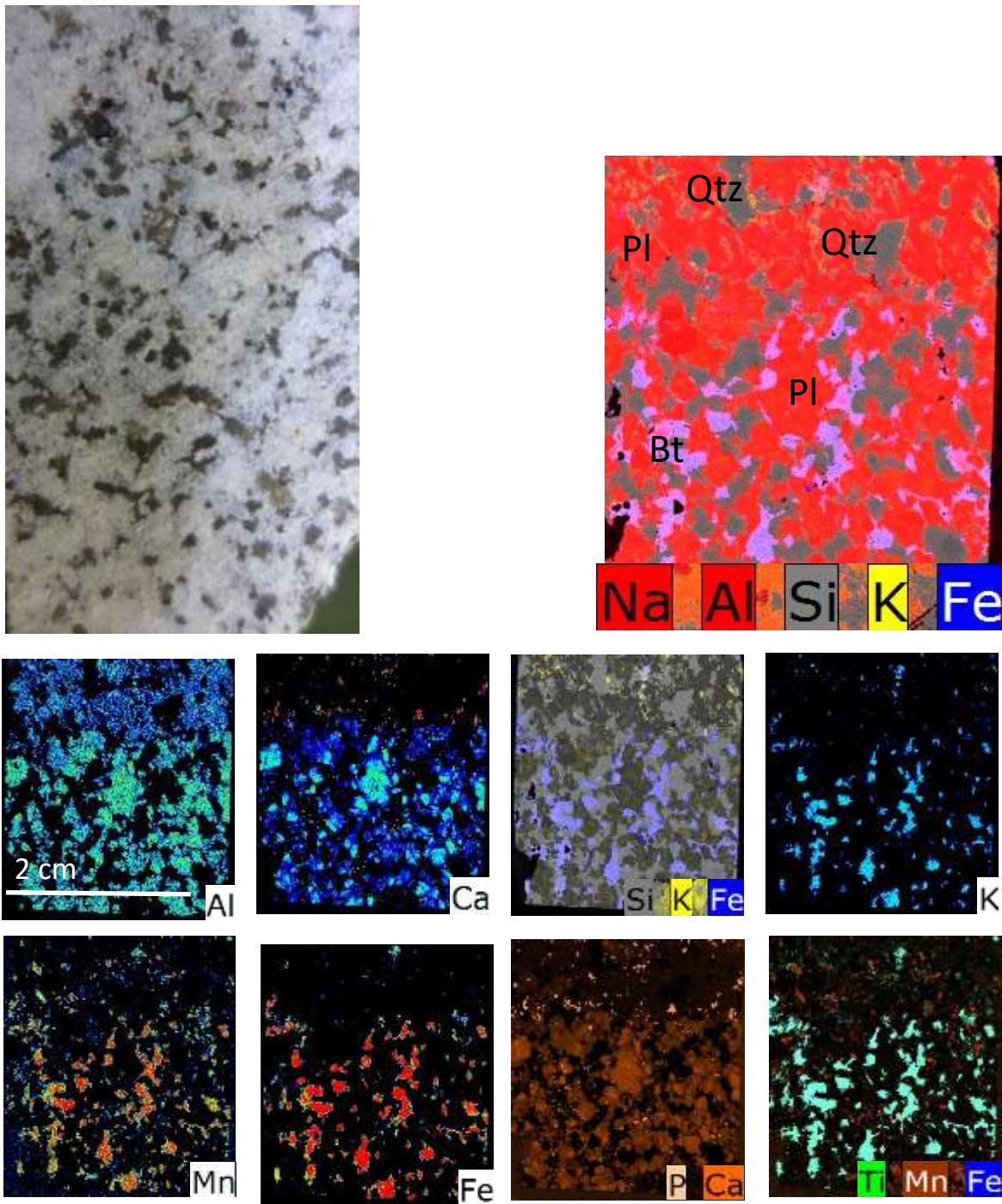
P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.27	300	11	64.90	66	15.10	550	9.70	1.88	11	-	2.01

IDANHA dykes



Granites – Variscan event

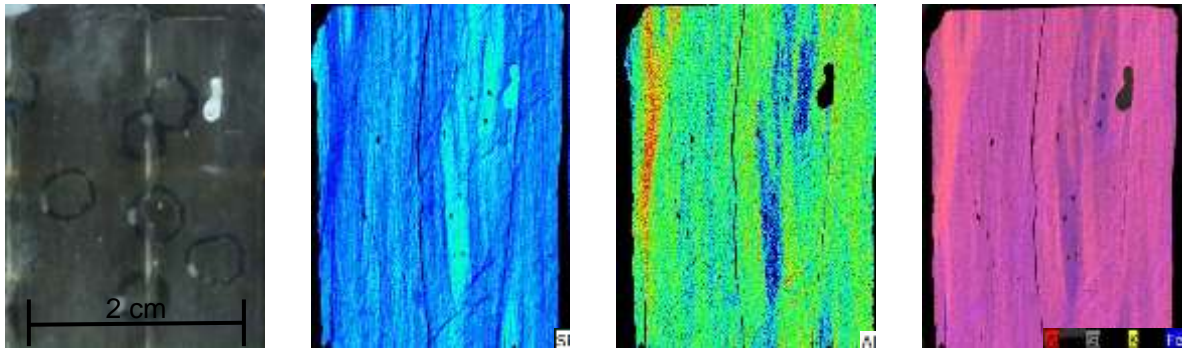
Gf IDN#4 (Differentiated Microgranite Dyke in Oledo-Idanha-a-Nova Area)



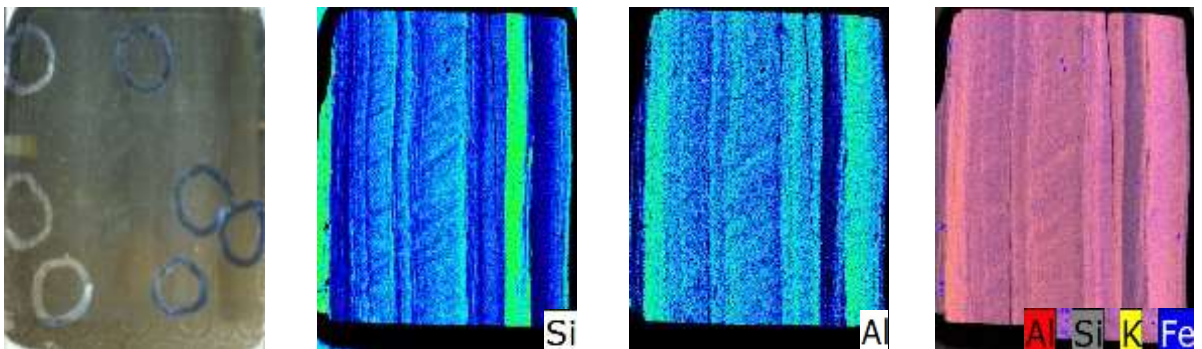
P (wt%)	F (ppm)	Be (ppm)	Li (ppm)	B (ppm)	Cs (ppm)	Ba (ppm)	Nb (ppm)	Ta (ppm)	Sn (ppm)	W (ppm)	Rb/Sr
0.28	2500	8	544	25	81.60	476	6	1.17	42	1	2.18

Metasedimentary Rocks

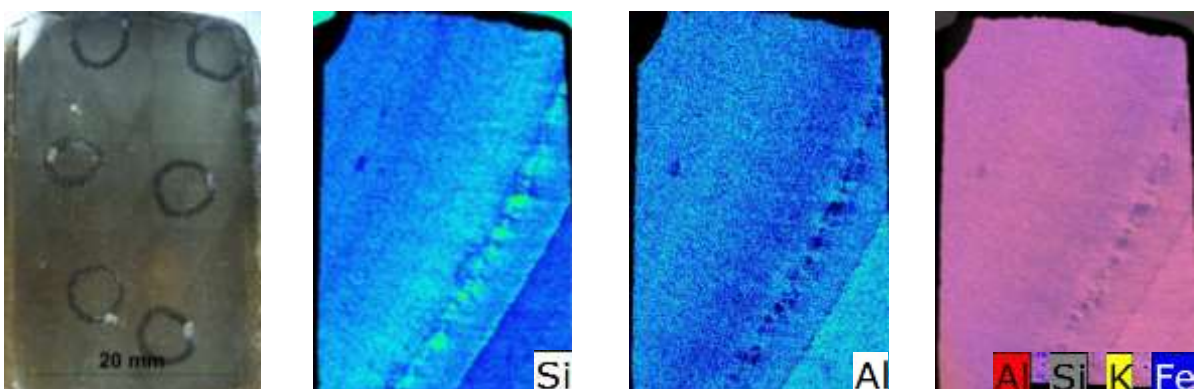
R#13 (Rosmaninhal Upper Member)



P#15 (Rosmaninhal Lower Member)

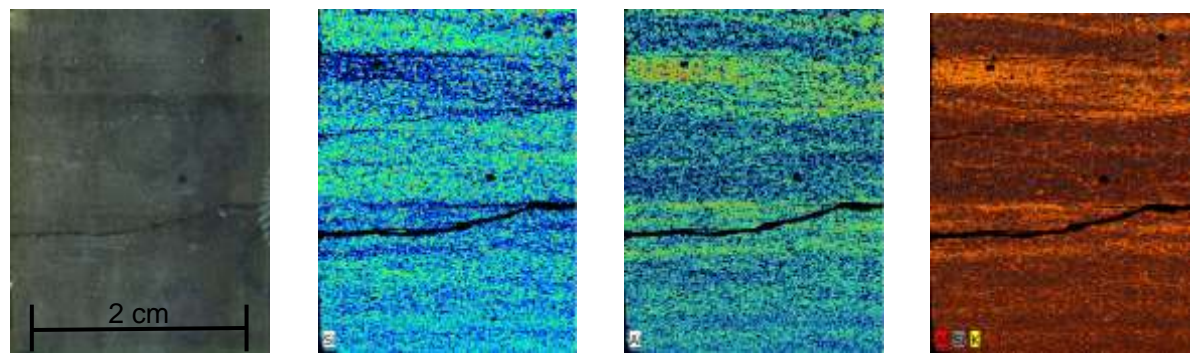


P#5 (Malpica do Tejo Upper Member)



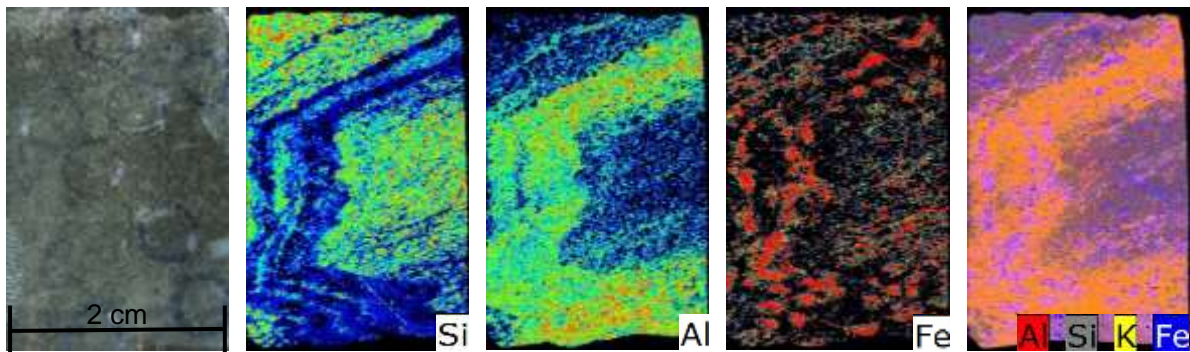
Metasedimentary Rocks

P#4 (Malpica do Tejo Lower Member)

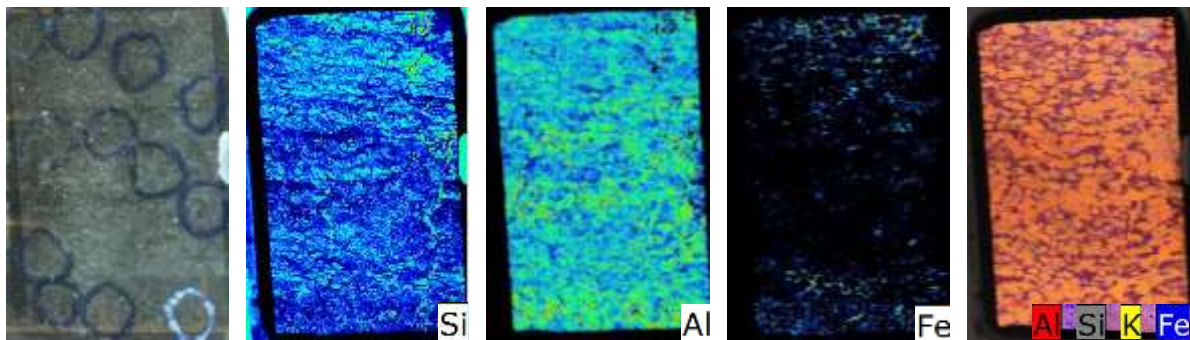


Metasedimentary Rocks – Spotted Schists

MT#10 (Malpica do Tejo Upper Member)

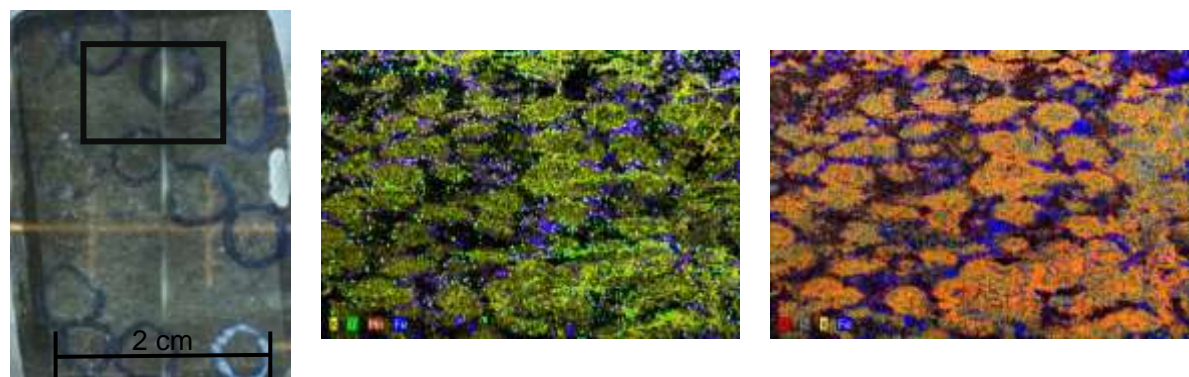


ZEB-CONT#1 (Malpica do Tejo Upper Member)

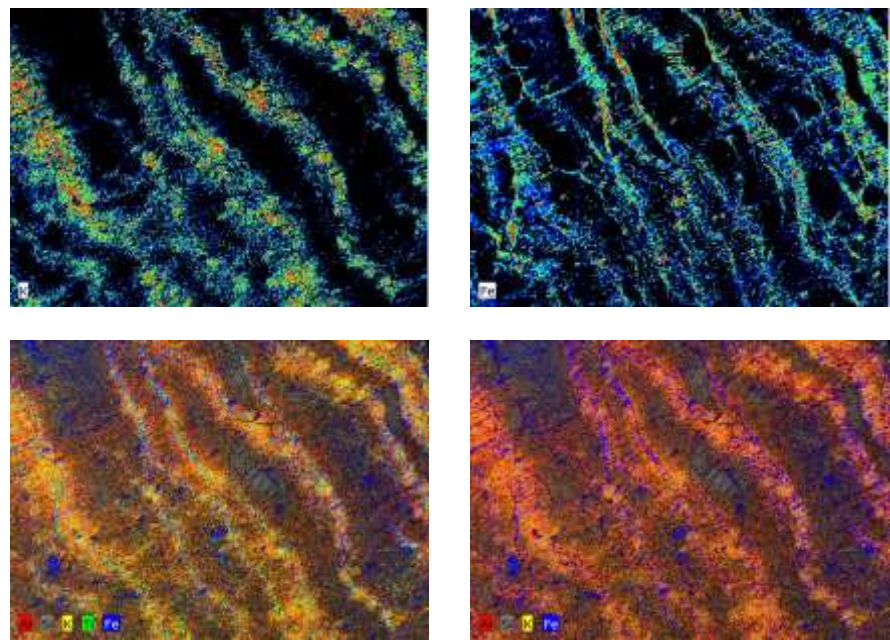
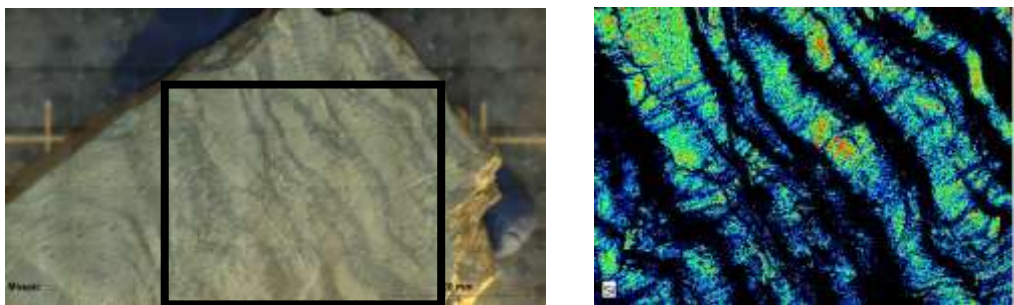


Metasedimentary Rocks – Spotted Schists

ZEB-CONT#1 (Malpica do Tejo Upper Member)



ARG#1 (Malpica do Tejo Upper Member)



ARG#1	
F	4800
Be	14
Li	1120
B	1980
Cs	448
Ba	589
Nb	14
Ta	1.01
Sn	62
Rb/sr	22