Texture, cathodoluminescence and trace elements composition of scheelite, indicator of orogenic gold deposits

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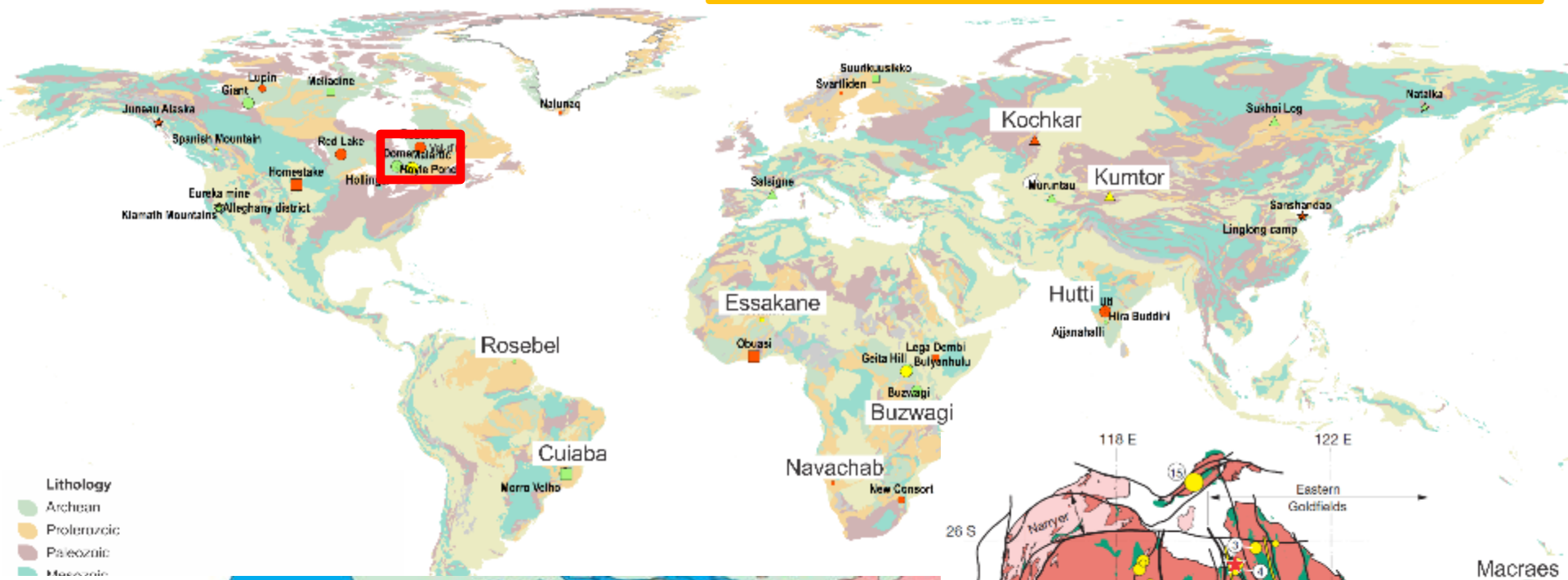
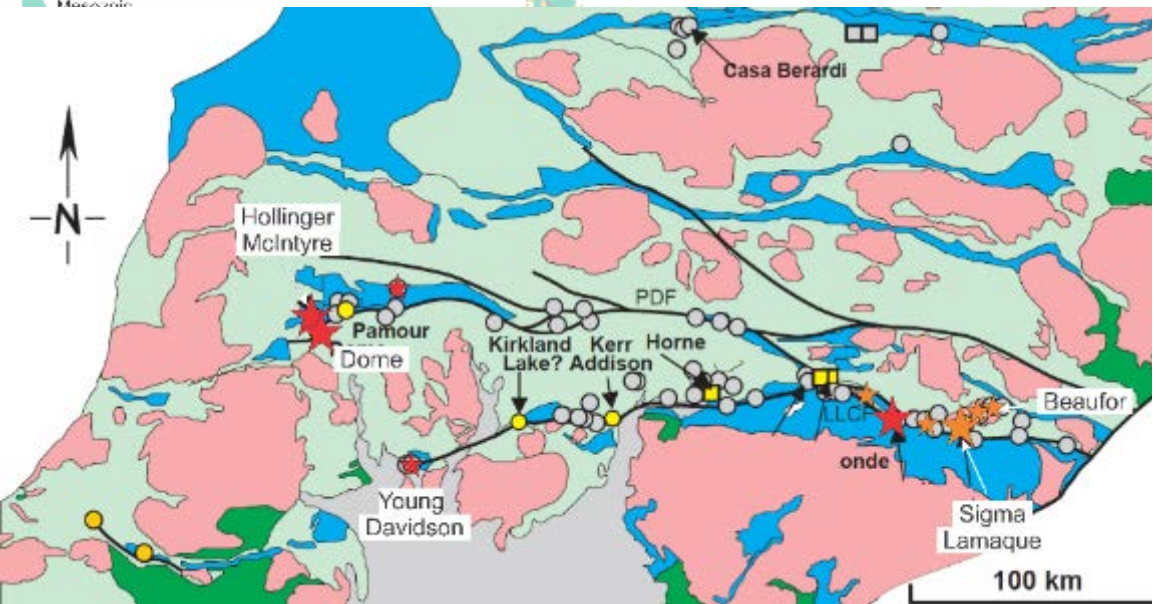
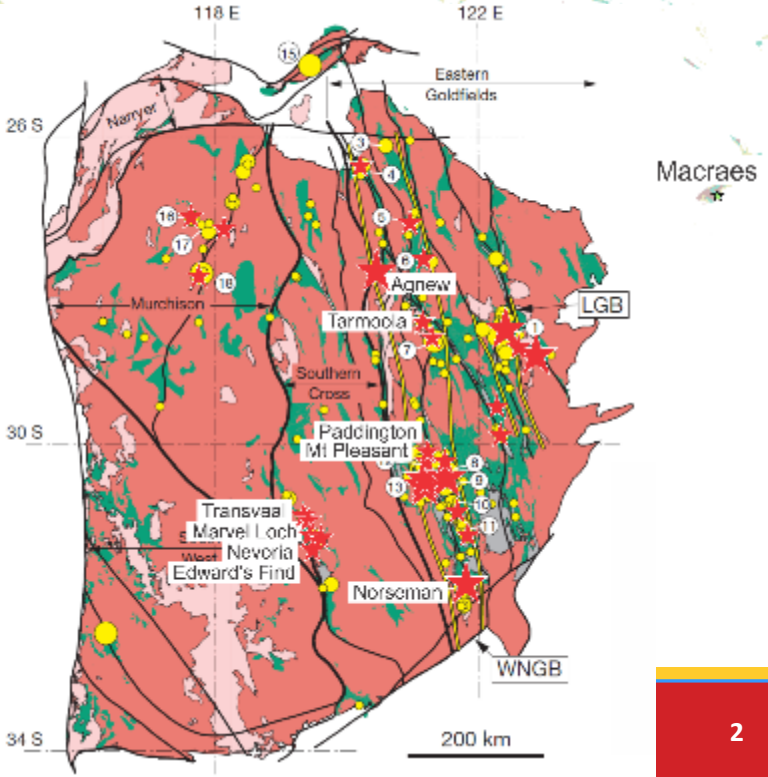
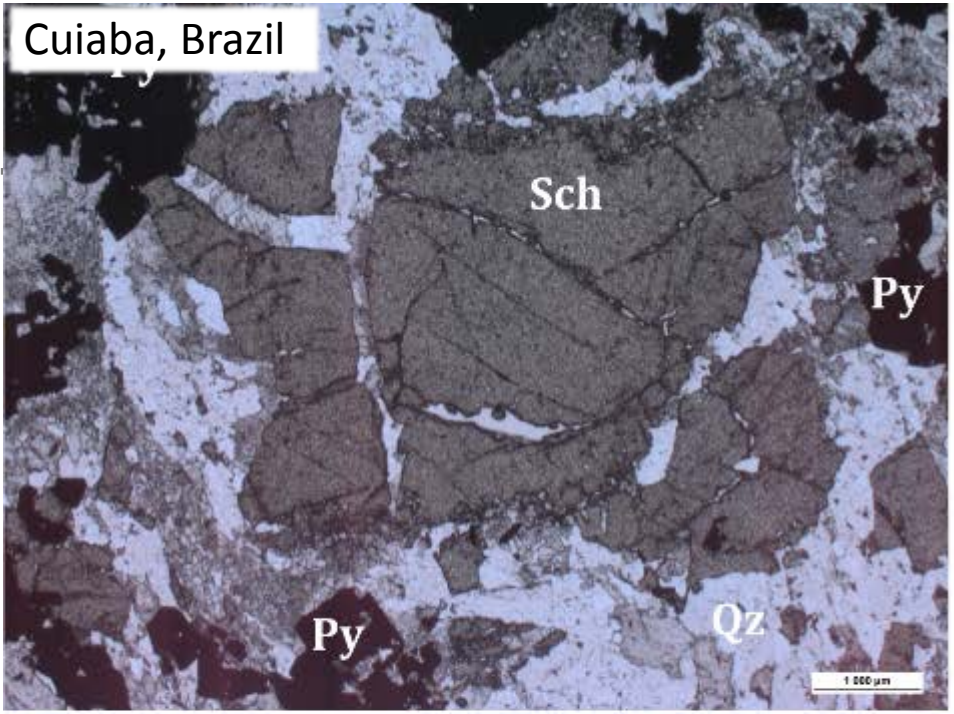
Localisation

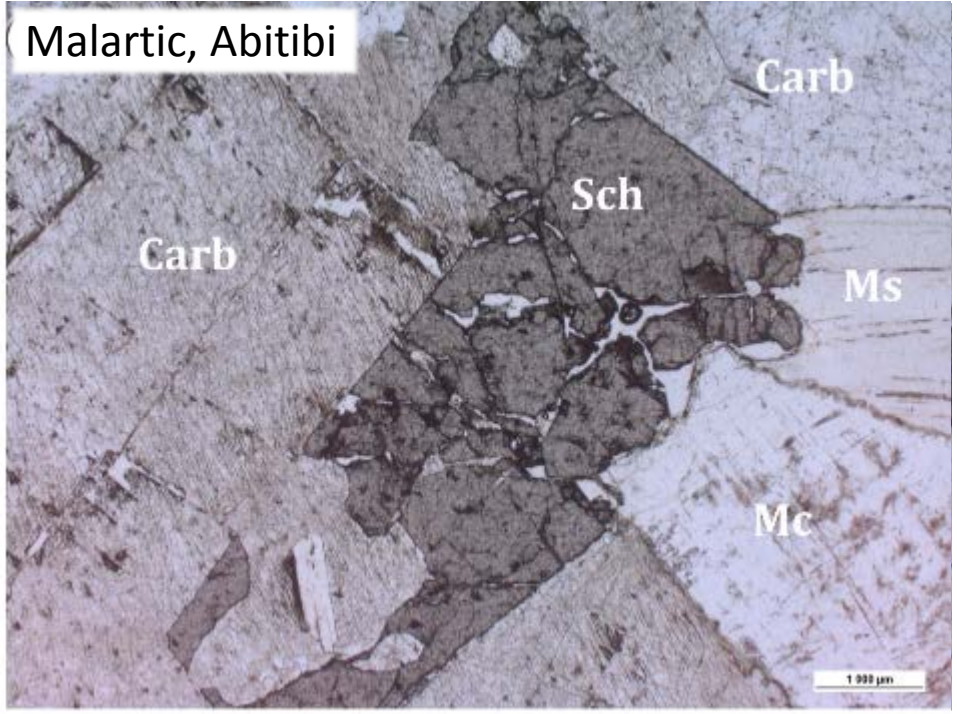
Scheelite from 25 gold deposits and districts

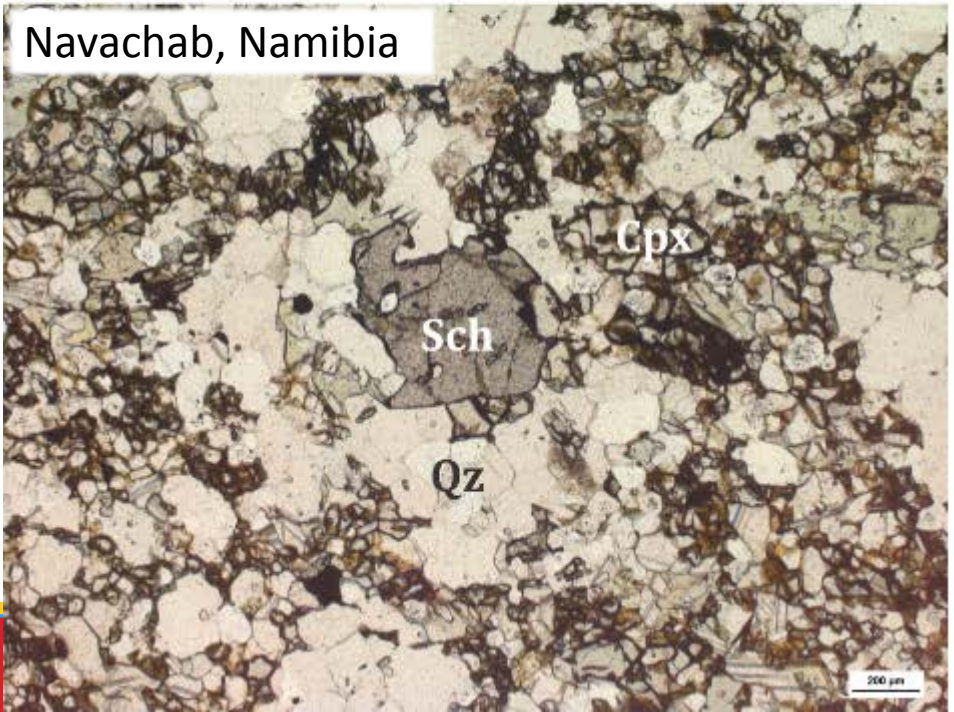


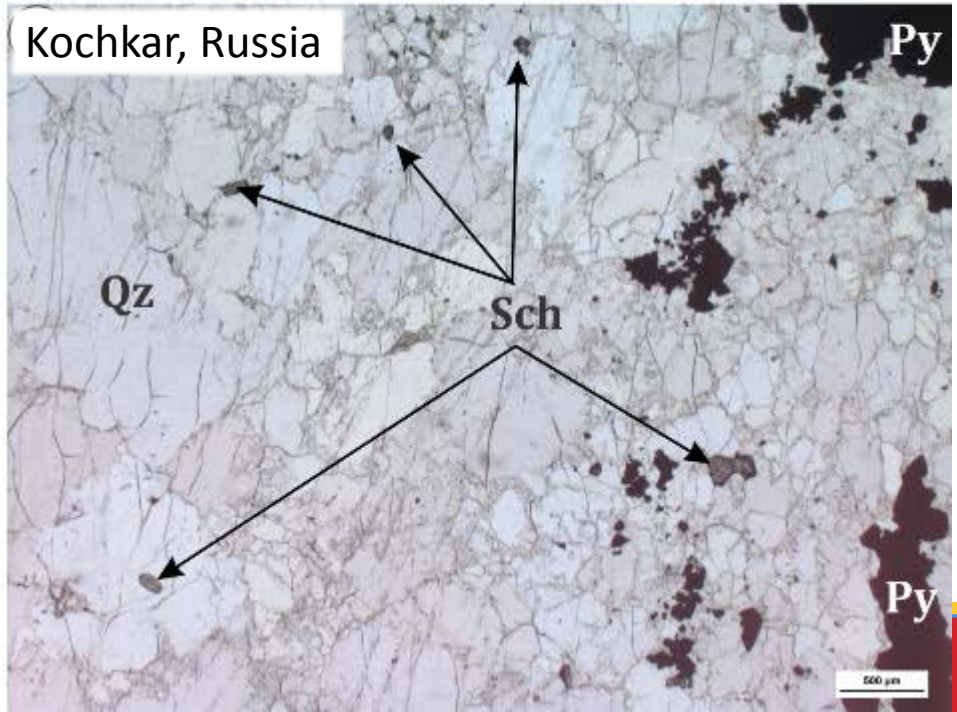





Cuiaba, Brazil
Sch
Py
Py
Qz

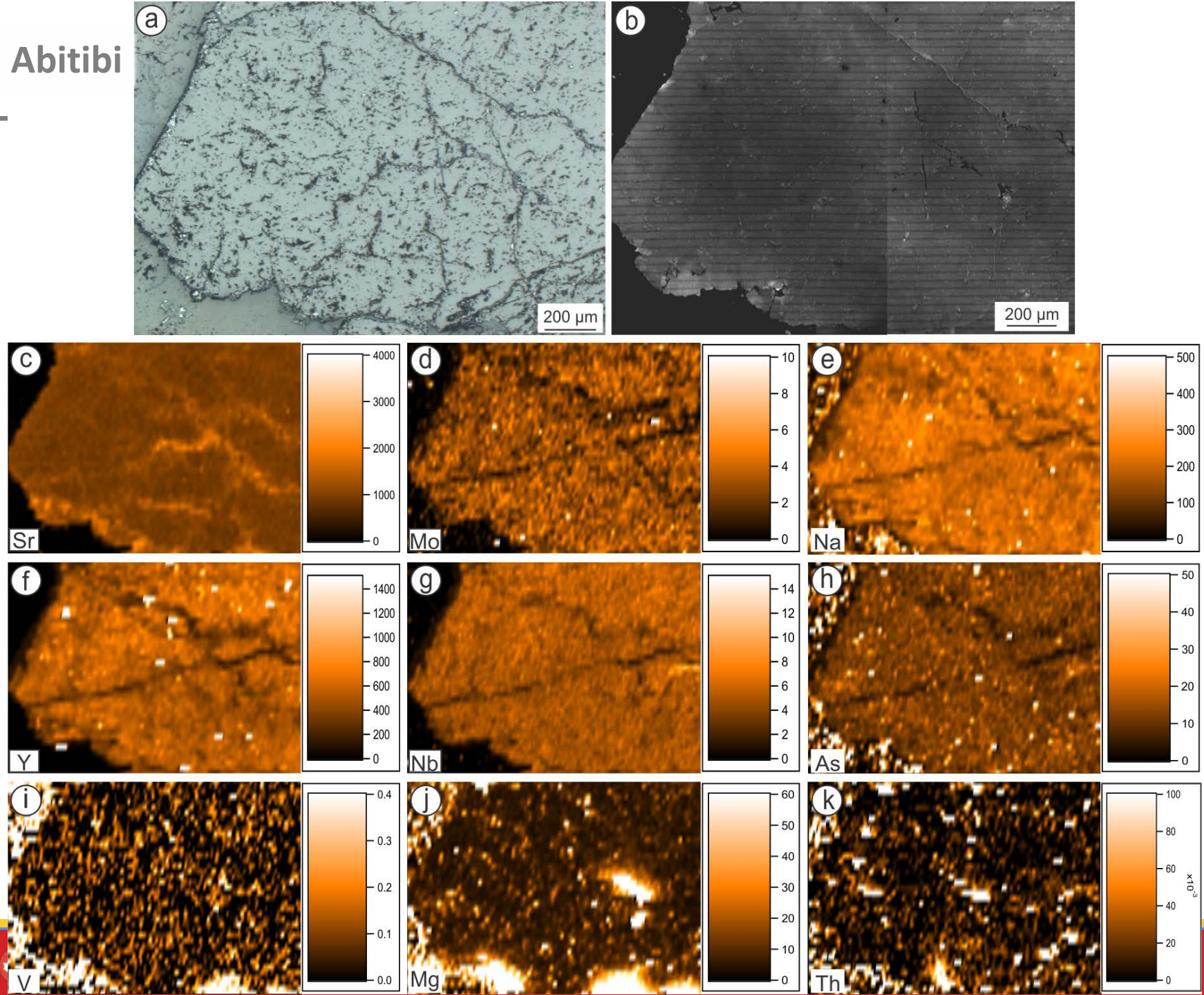

Malartic, Abitibi
Carb
Sch
Carb
Ms
Mc


Navachab, Namibia
Cpx
Sch
Qz

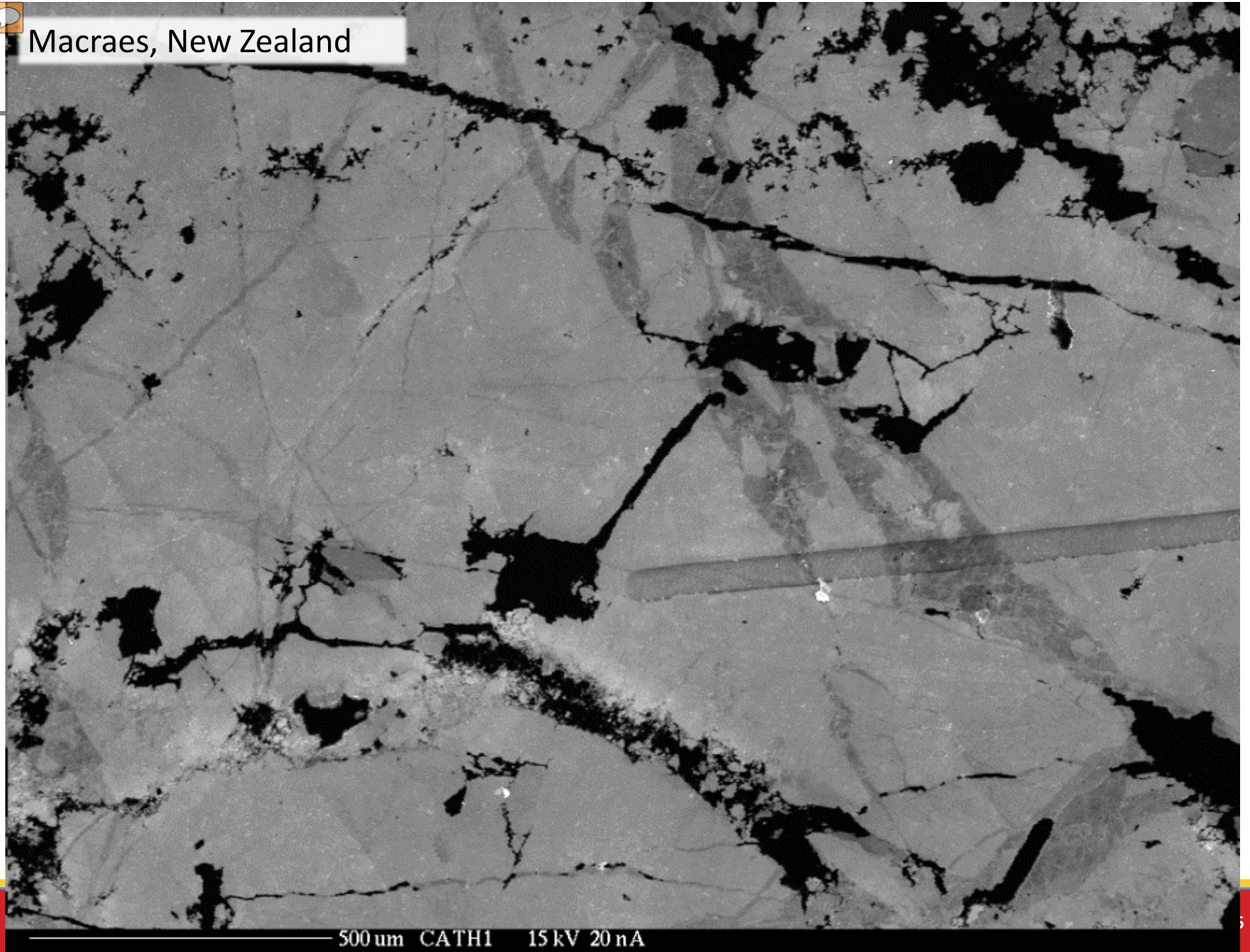

Kochkar, Russia
Py
Qz
Sch
Py


Essakane, Burkina Faso
1000 um CATH1 15 kV 20 nA

Dome, Abitibi

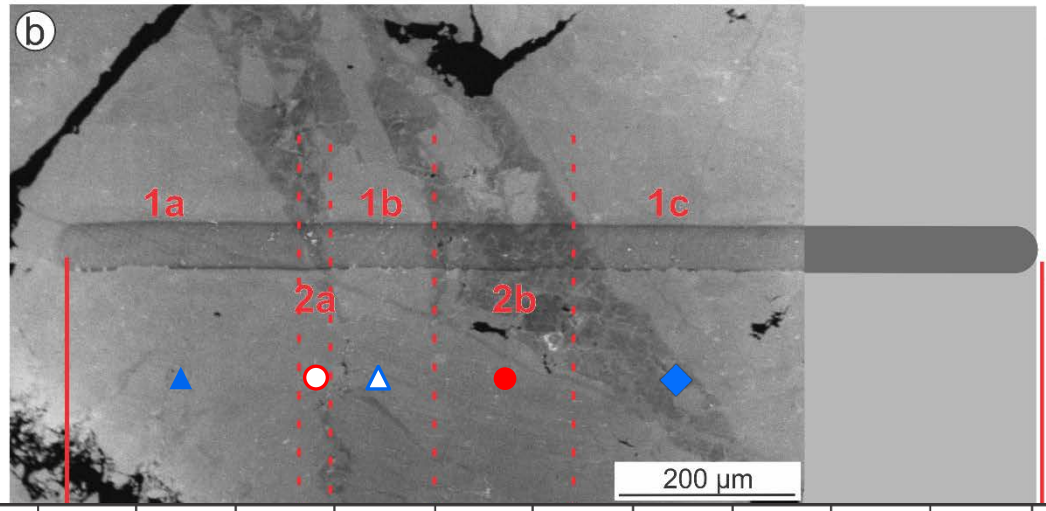


Macraes, New Zealand

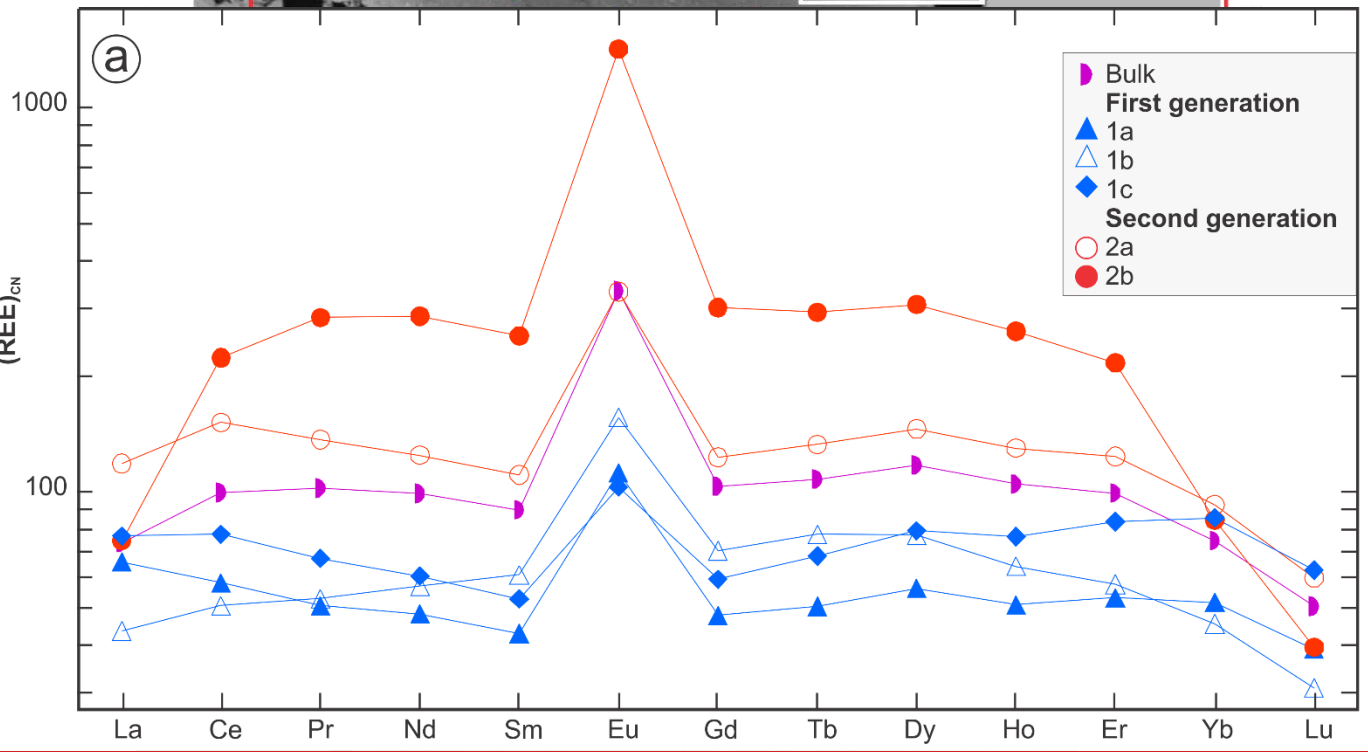


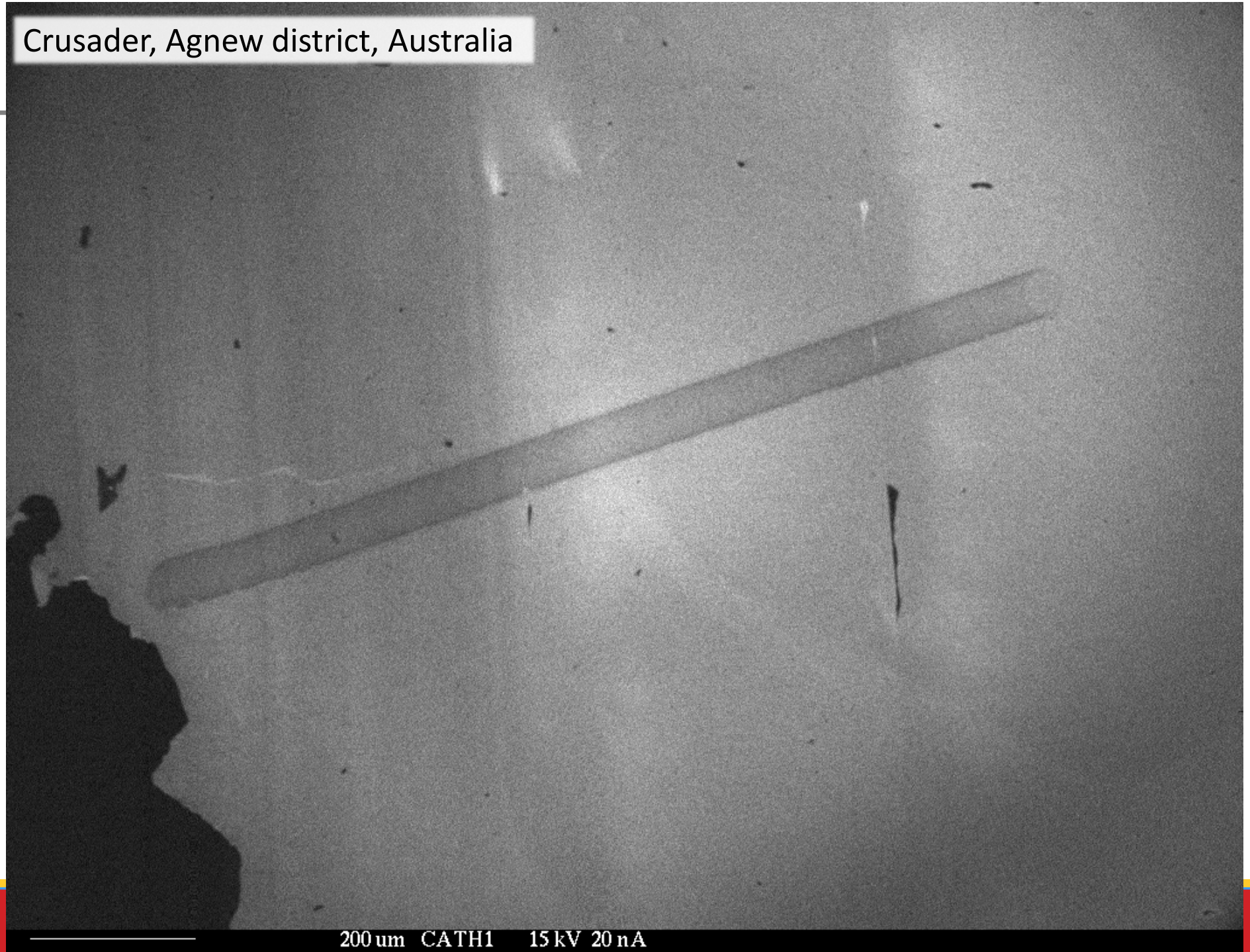
Variation in trace elements between two generations

Macraes,
New Zealand



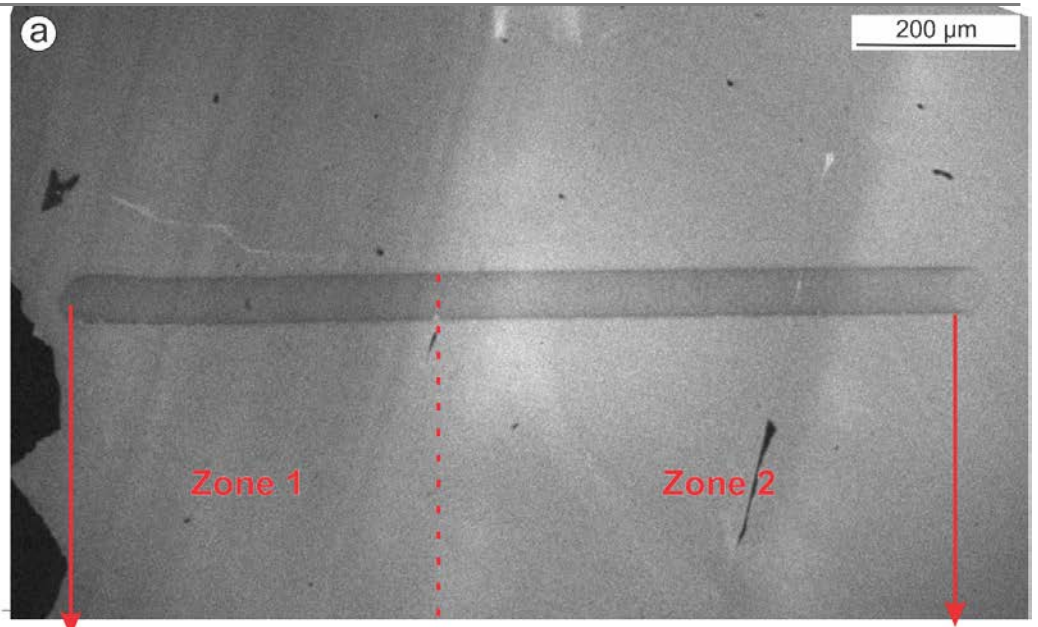
	MACR01D-L3	
ppm	1a	2b
Sr	5130	2250
Na	68.0	40.0
Mg	21.8	11.4
Mn	4.31	1.22
Th	0.523	0.056
U	1.360	0.053
Y	115	536
∑REE	137.44	643.1



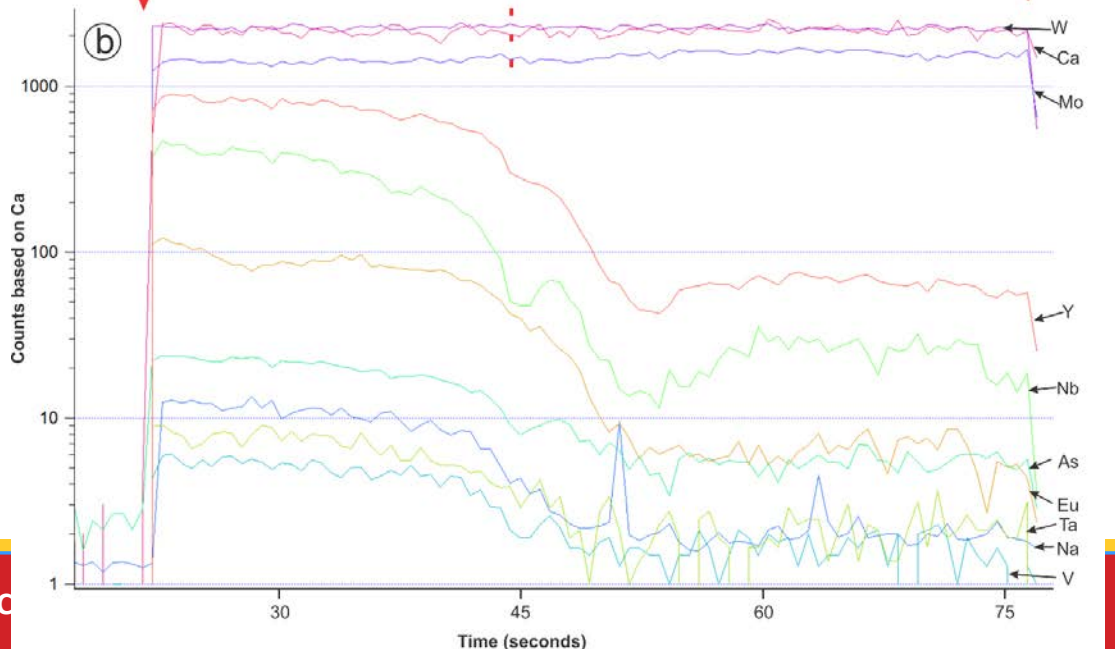

Crusader, Agnew district, Australia
200 um CATH1 15 kV 20 nA

Variation in trace elements between two zones

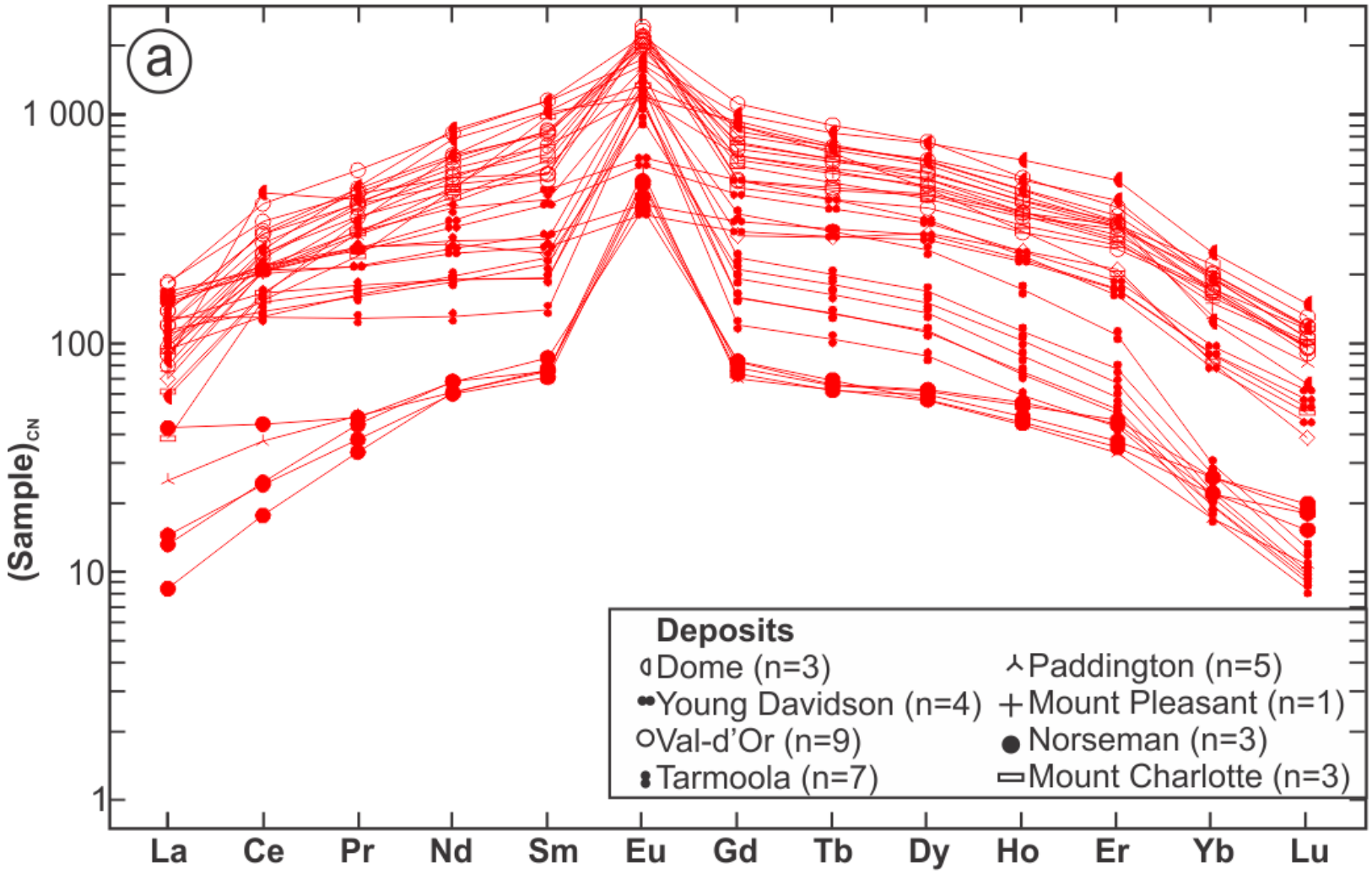
Crusader
Agnew district,
Australia



CRUS01B-L1		
ppm	Zone 1	Zone 2
Mo	58300	70200
Na	166.10	15.60
V	4.25	0.17
As	172.00	6.18
Nb	48.80	1.50
Ta	0.33	0.02
Y	860.00	15.50
∑REE	559.77	18.10

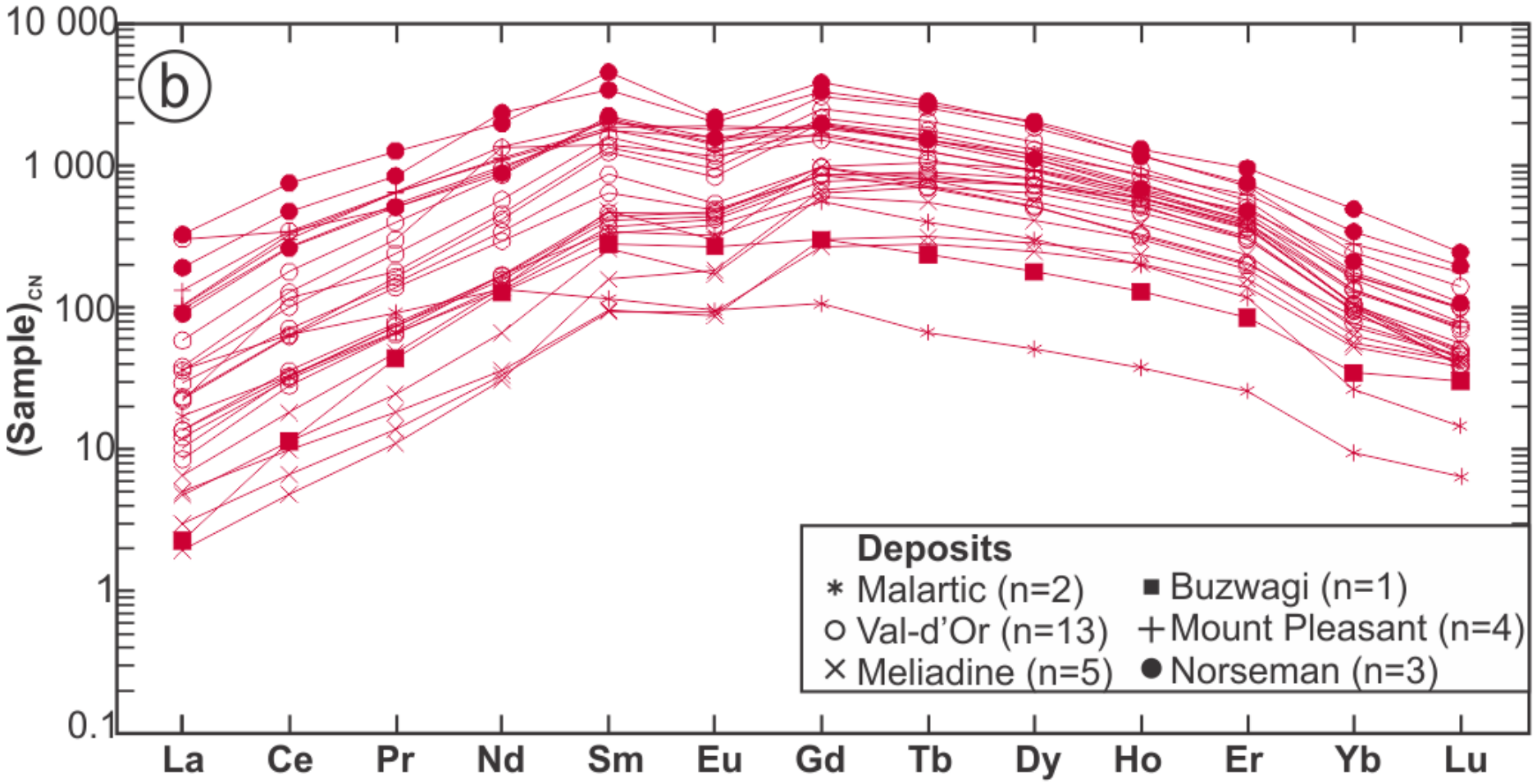


REE Patterns



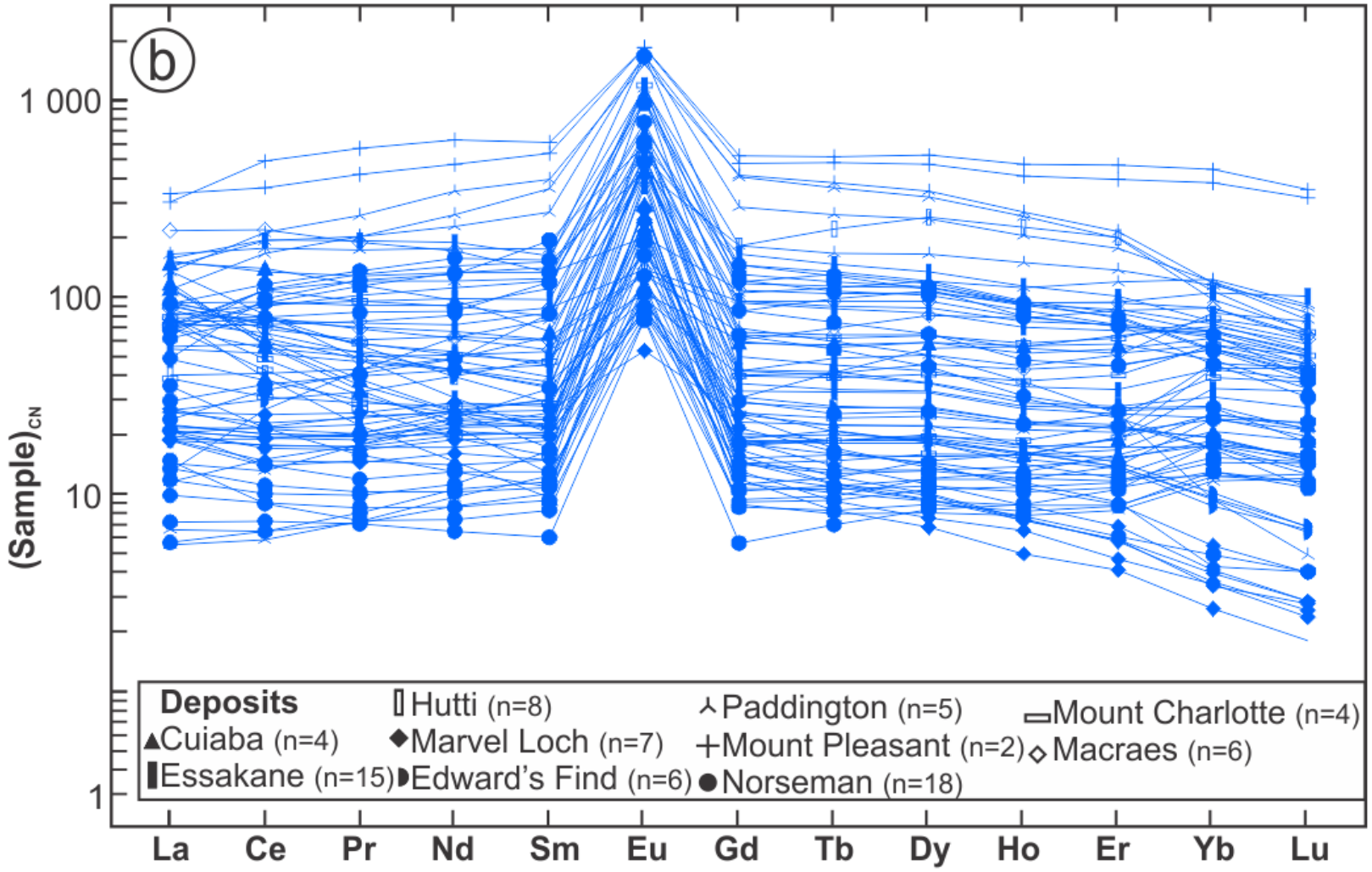
Bell-shape with positive Eu anomaly

REE Patterns



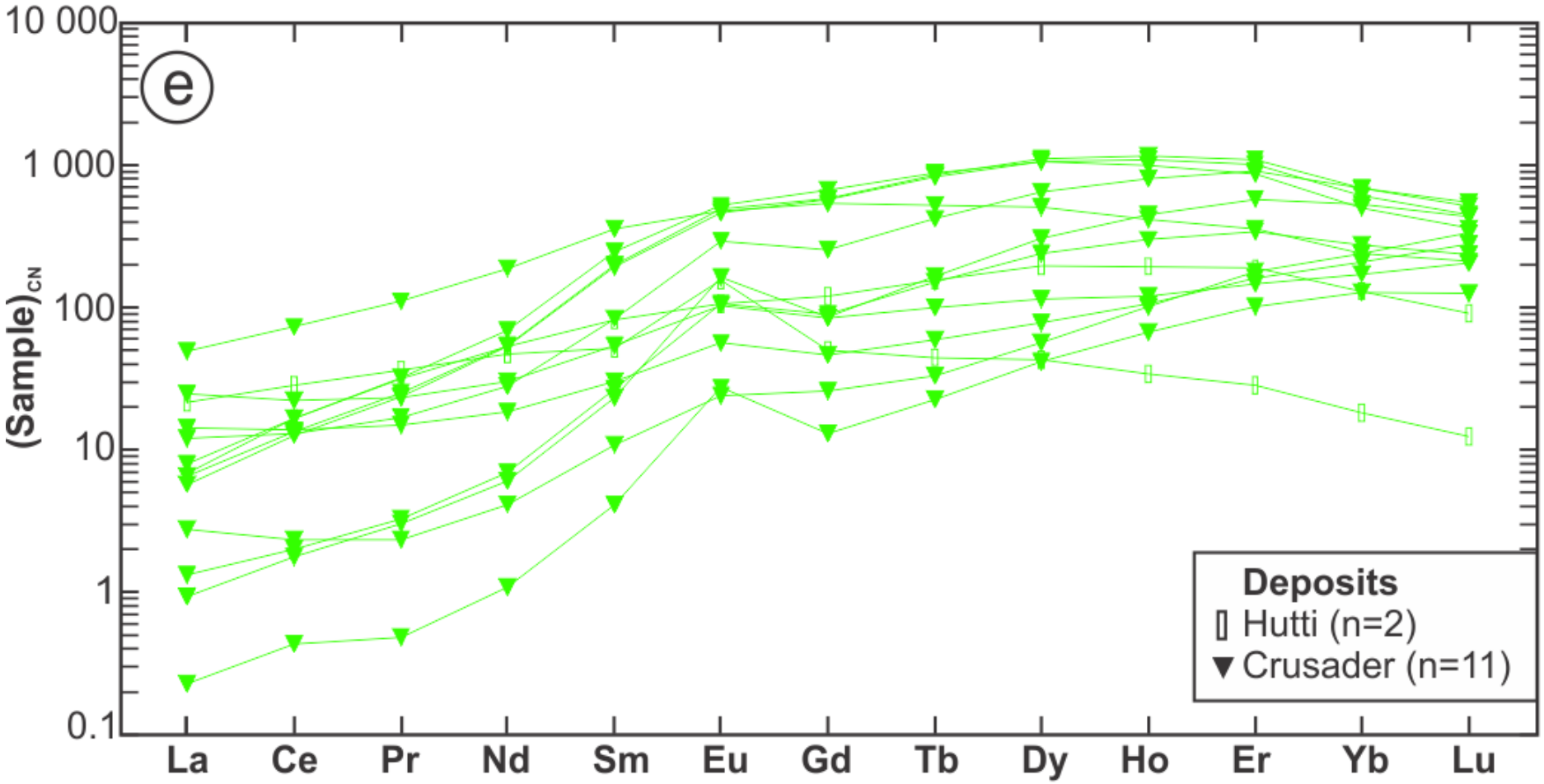
Bell-shape with negative Eu anomaly

REE Patterns



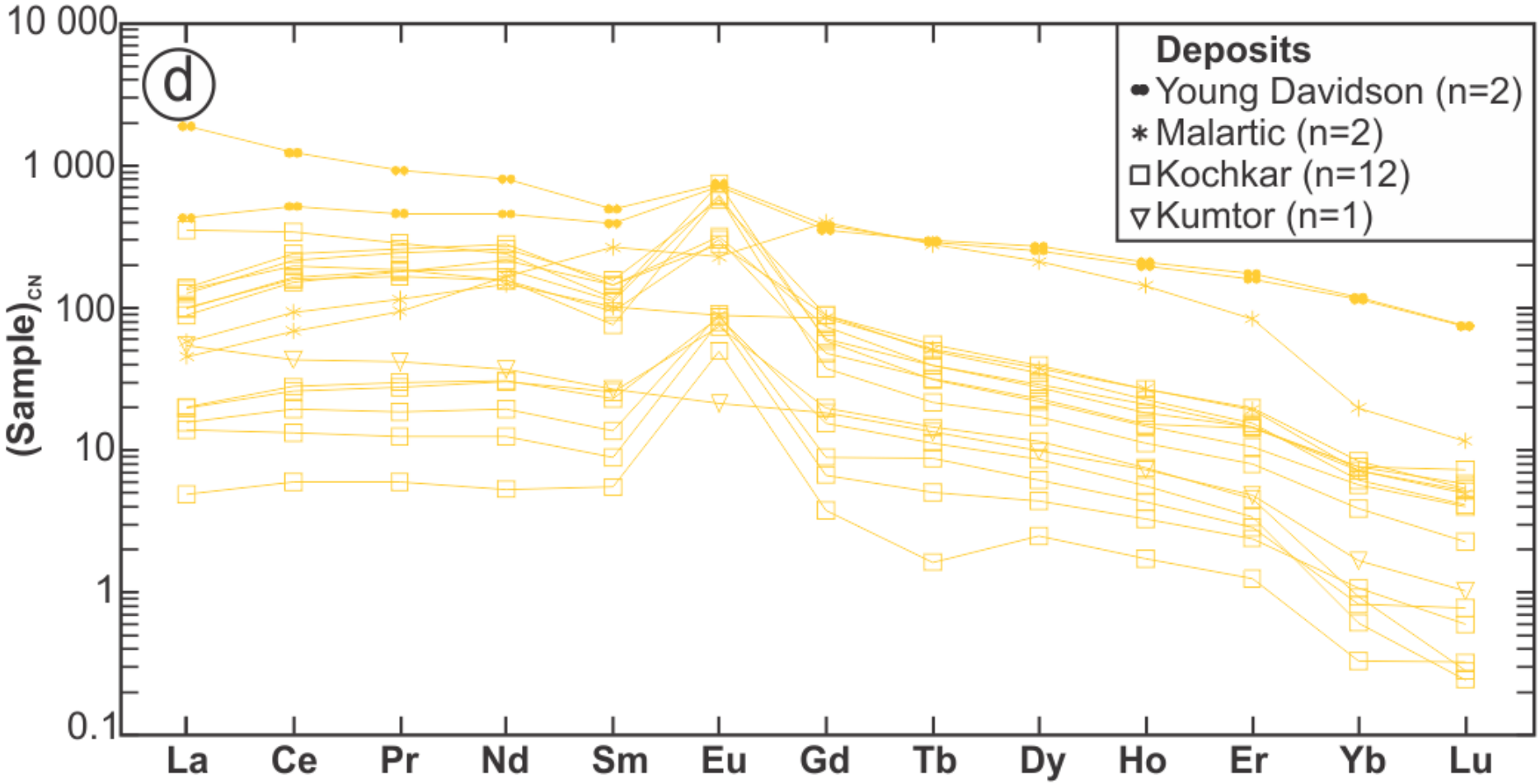
Flat with positive Eu anomaly

REE Patterns



Positive slope with HREE enrichment

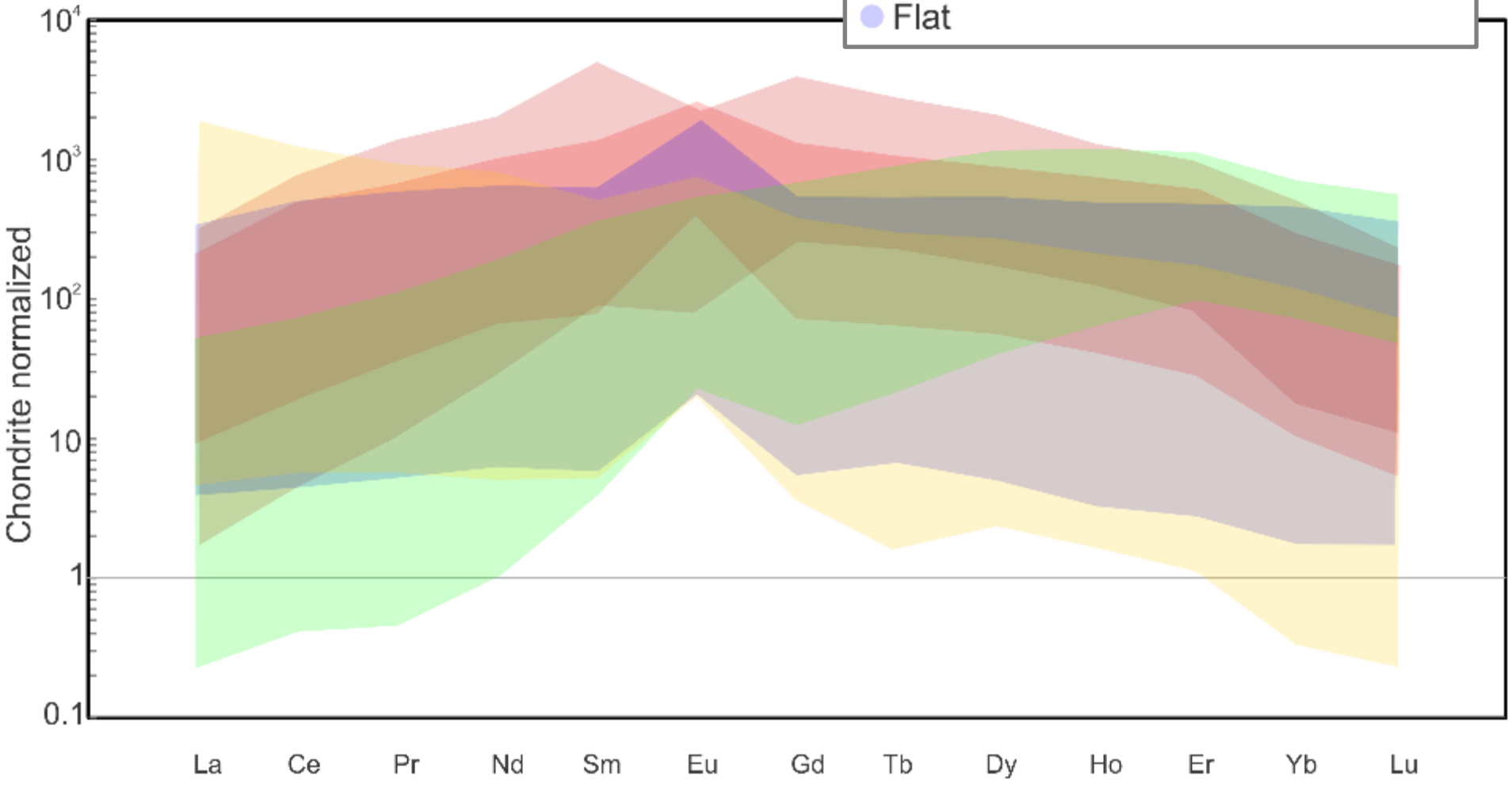
REE Patterns



Negative slope with positive Eu anomaly and LREE enrichment

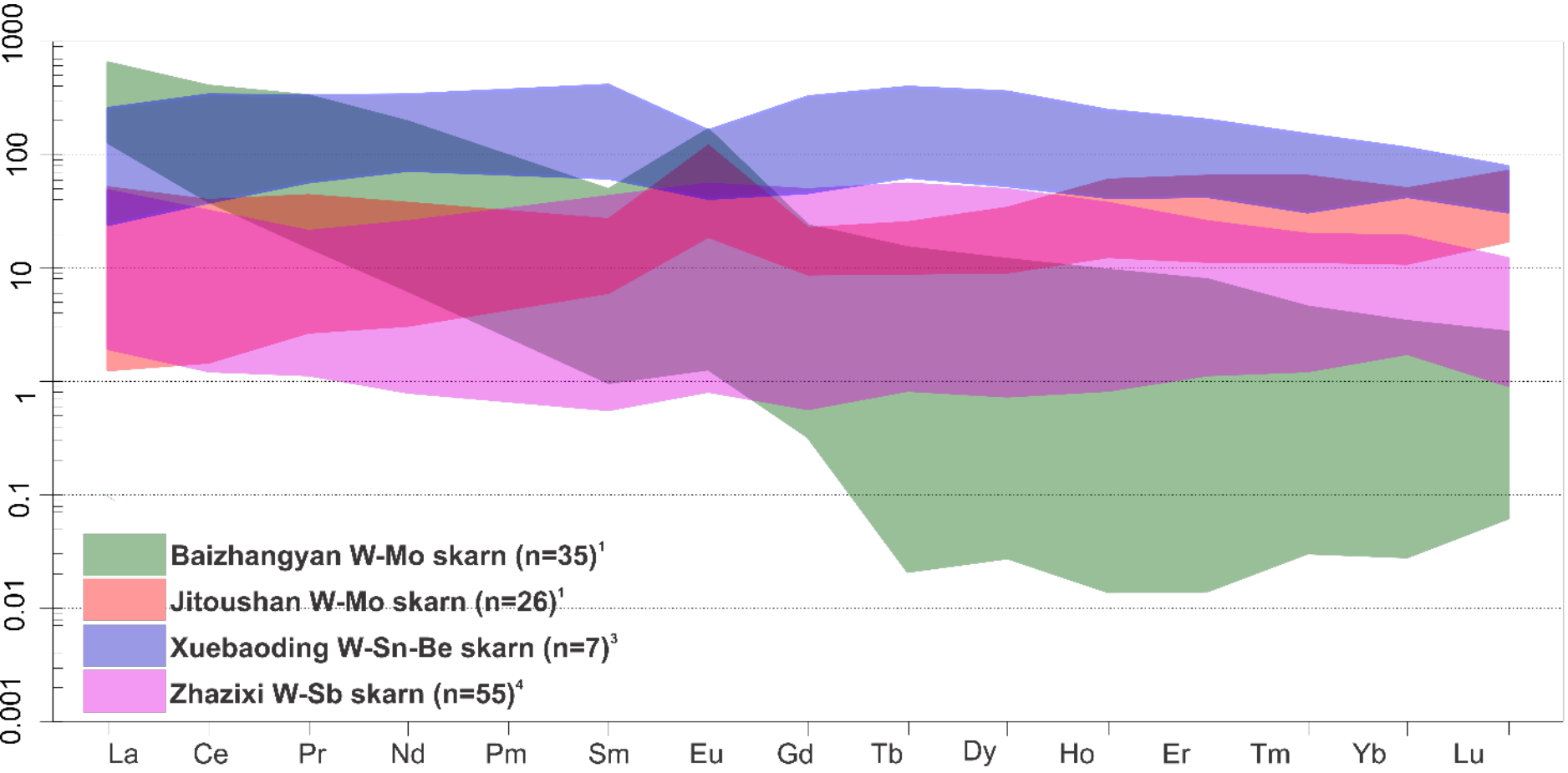
REE Patterns

Orogenic Gold deposits

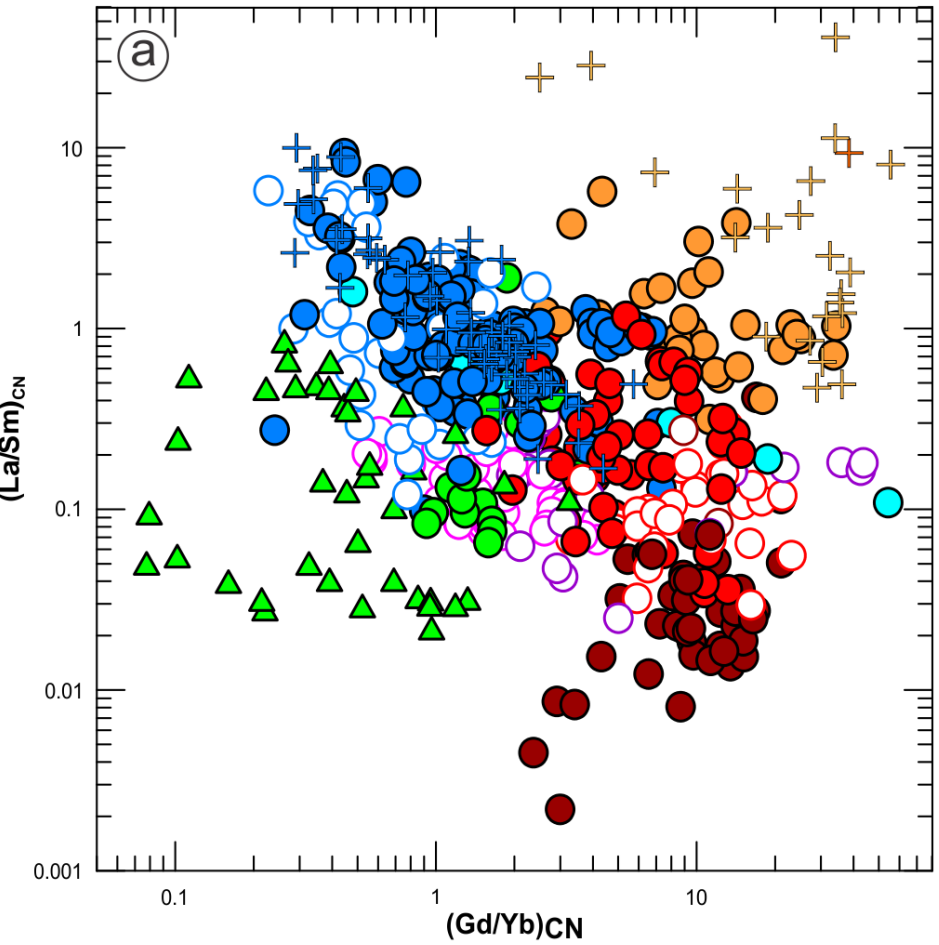


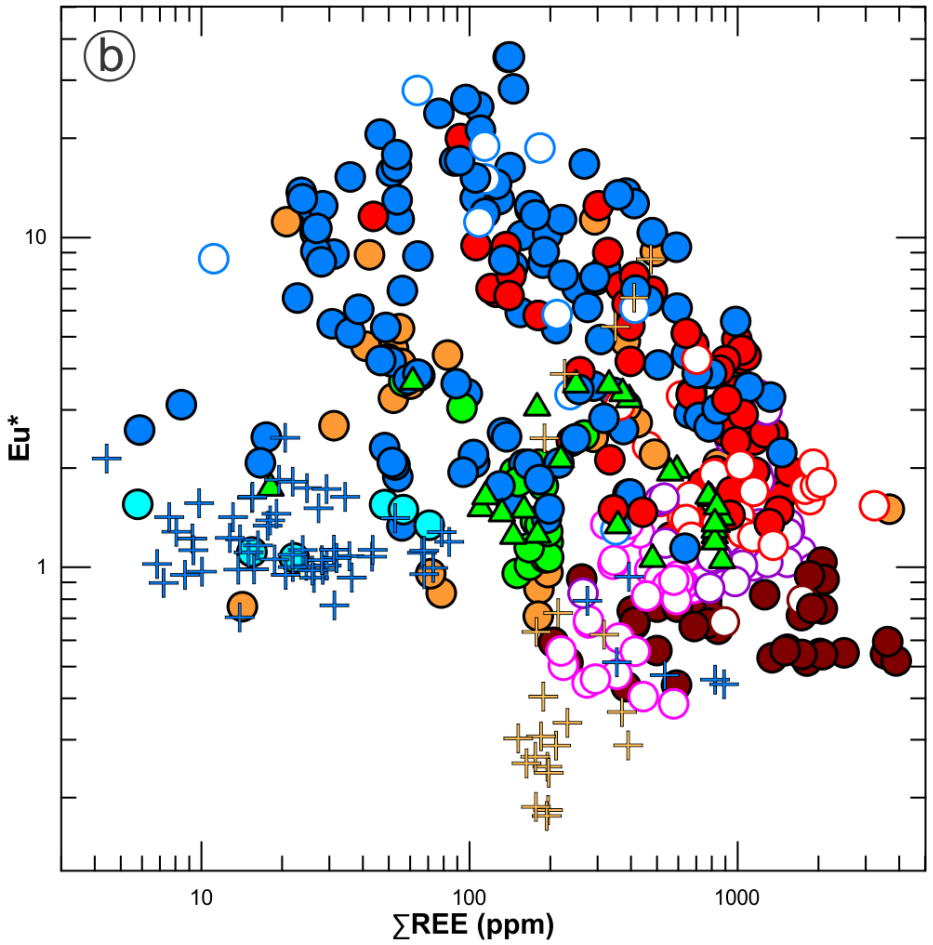
REE Patterns

Chinese skarn deposits



Quantification of the REE patterns





REE pattern

- Bell +
- Bell -
- Flat
- Decreasing
- Increasing
- Nevoria
- Bell Ho +
- Bell Ho -

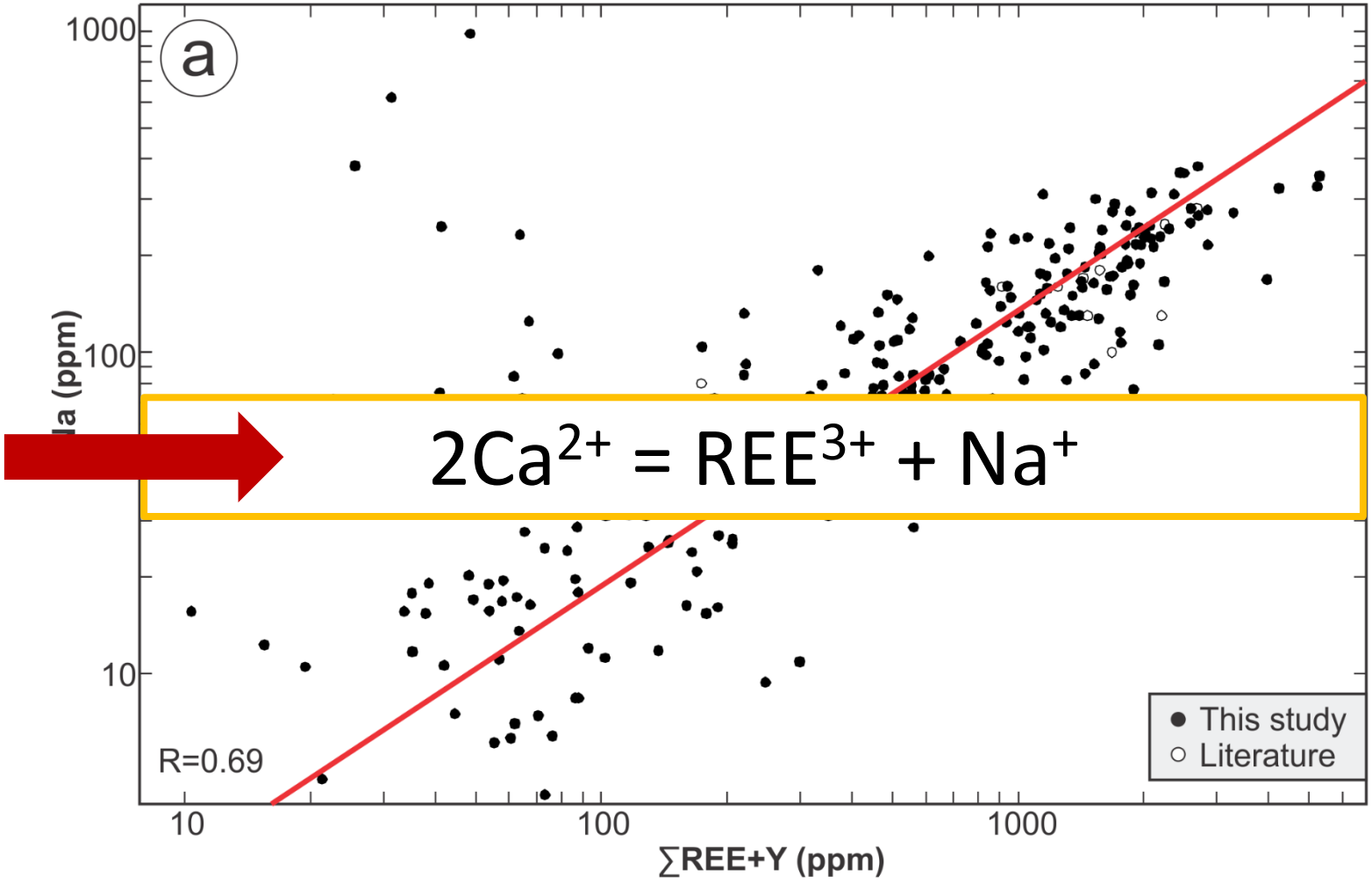
Deposit type

Orogenic
- This study
- Litterature

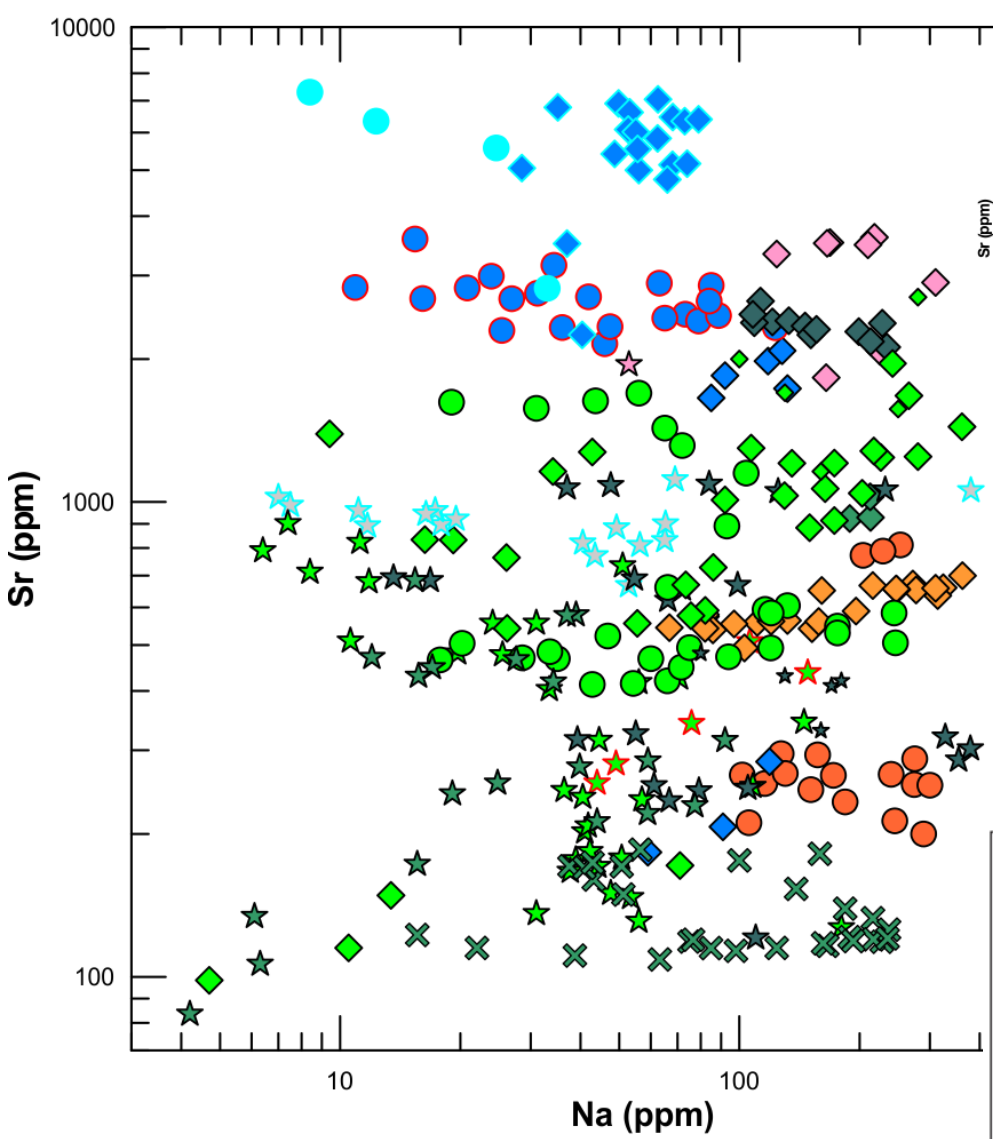
Crusader

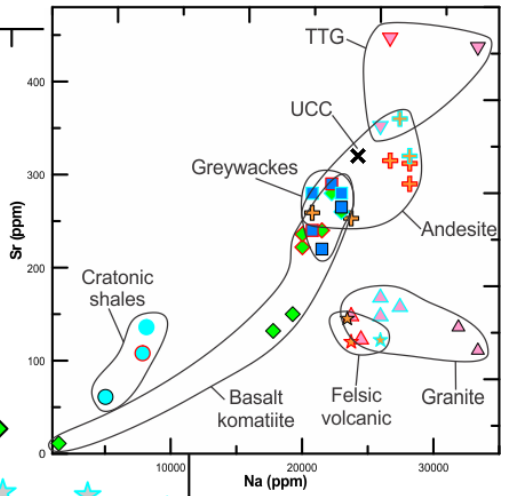
Skarn
- Kumbel (Poulin et al., accepted)
- Jitoushan and Baizhangyan (Song et al., 2014)
- Zhazixi (Peng et al., 2008)
- Xueboading (Yan et al., 2007)

Substitution in scheelite



Na vs. Sr





Origin
This study
Litterature

Metamorphic facies
Low
Moderate
High

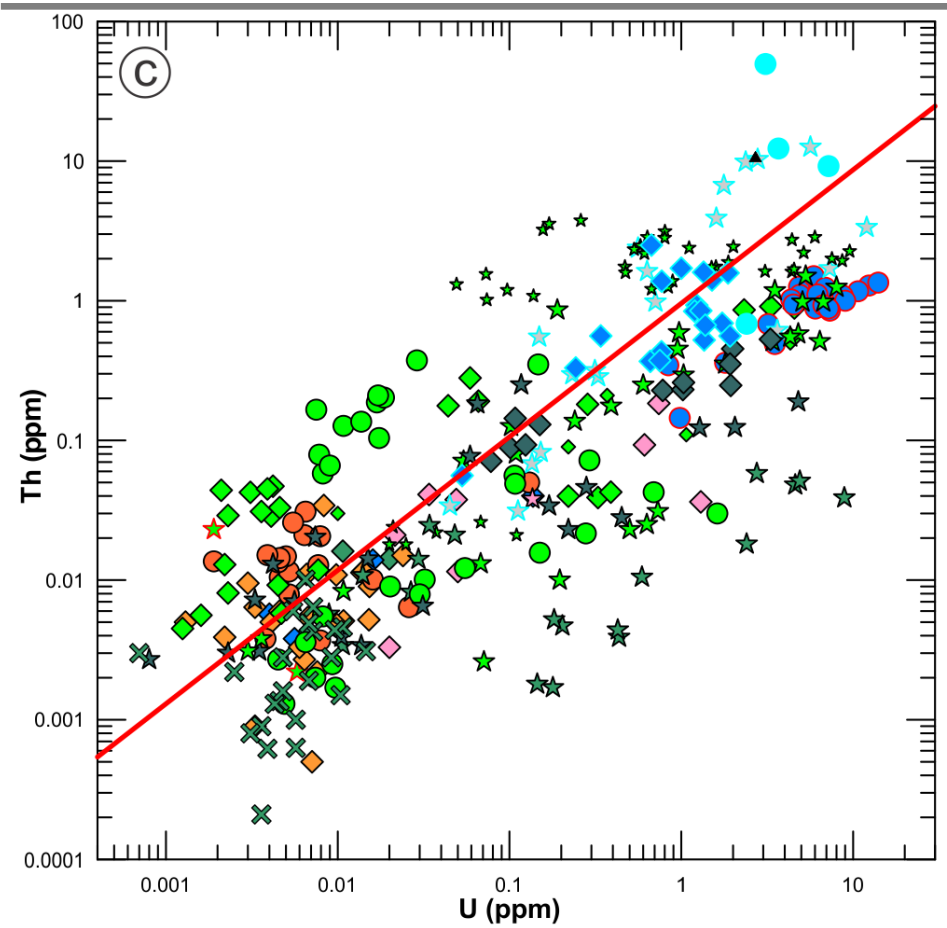
Mineralization age
Archean
Proterozoic
Phanerozoic

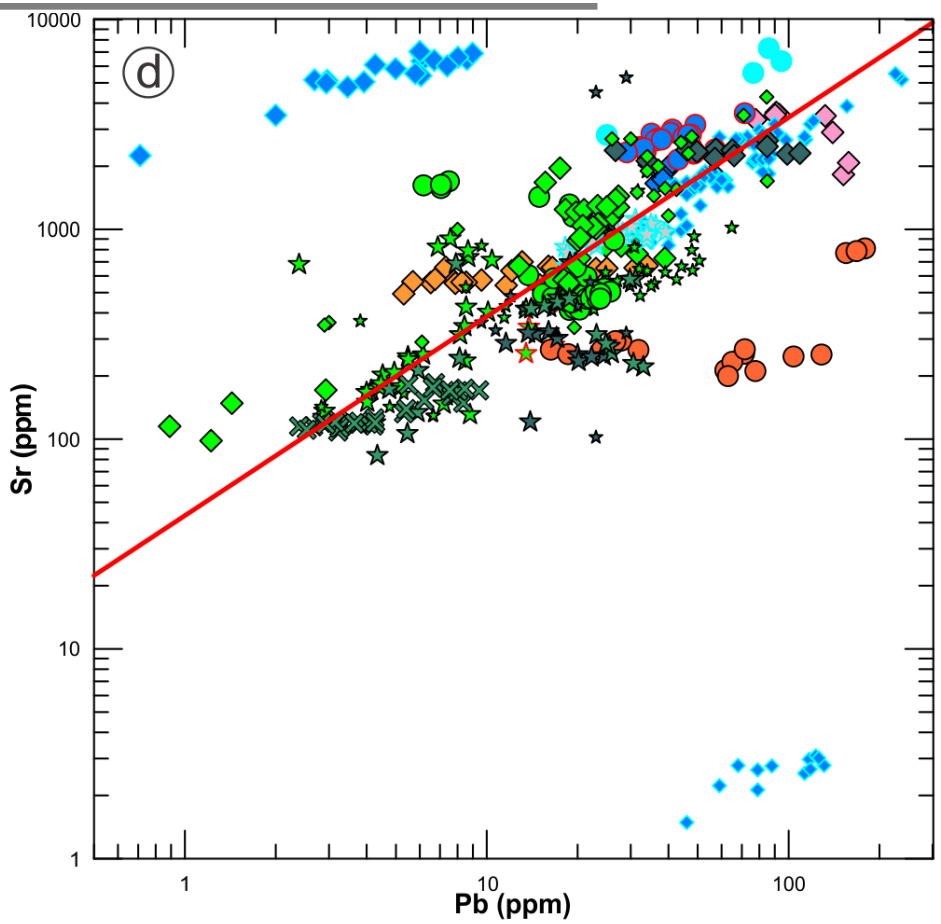
Host rock composition
Sediments
Black shales
Felsic
Intermediate
Intermediate-mafic
Mafic
Mafic-ultramafic
Ultramafic
Contact mafic/felsic

Legend per deposits (One symbol is not exclusive to one deposit)

Meliadine
Dome
Hollinger
Young Davidson
Malartic
Lamaque
Sigma
Beaufor
Rosebel (EPMA)
Cuiaba
Essakane
Buzwagi
Kochkar
Kumtor
Hutti
Marvel Loch
Nevoria
Edward's Find
Tarmoola
Paddington
Mt Pleasant
Mt Charlotte
Lindays
Kambalda
Norseman
Norseman-01
Norseman-02
Norseman-03
Macraes
Crusader

Influence of the hostrock composition





Metamorphic facies
- Low
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Mineralization age
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Host rock composition
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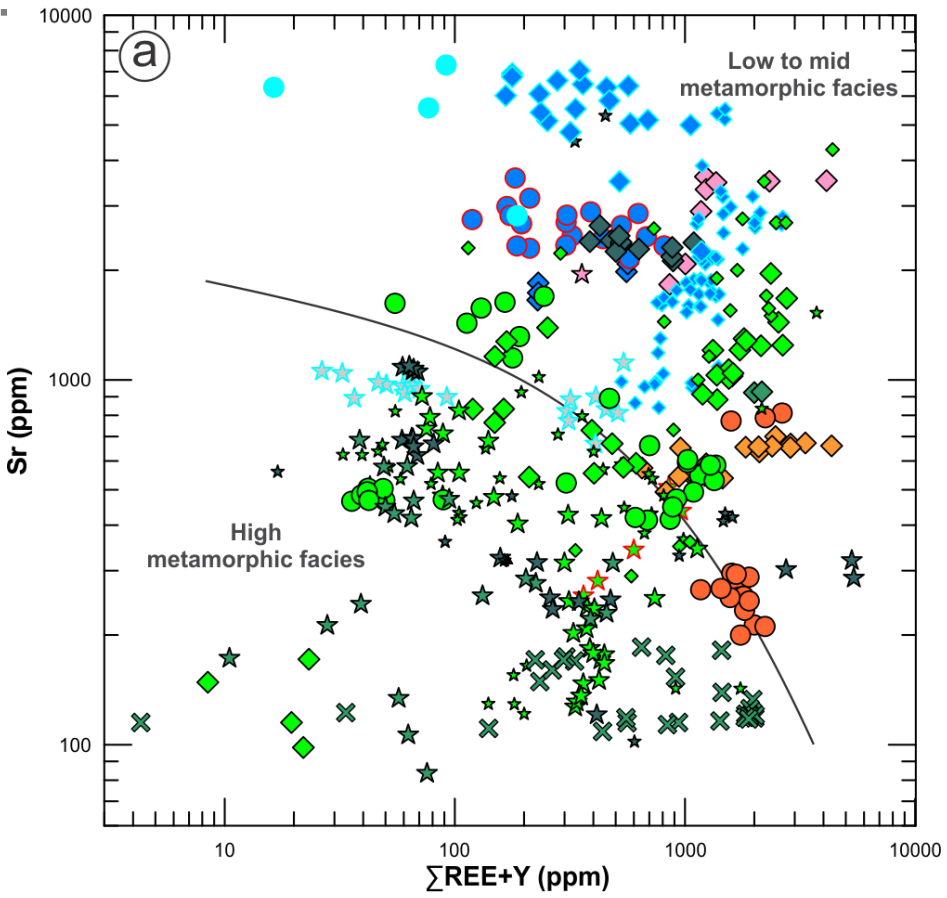
- Black shales
- Felsic
- Intermediate
- Intermediate-mafic
- Mafic
- Mafic-ultramafic
- Ultramafic
- Contact mafic/felsic

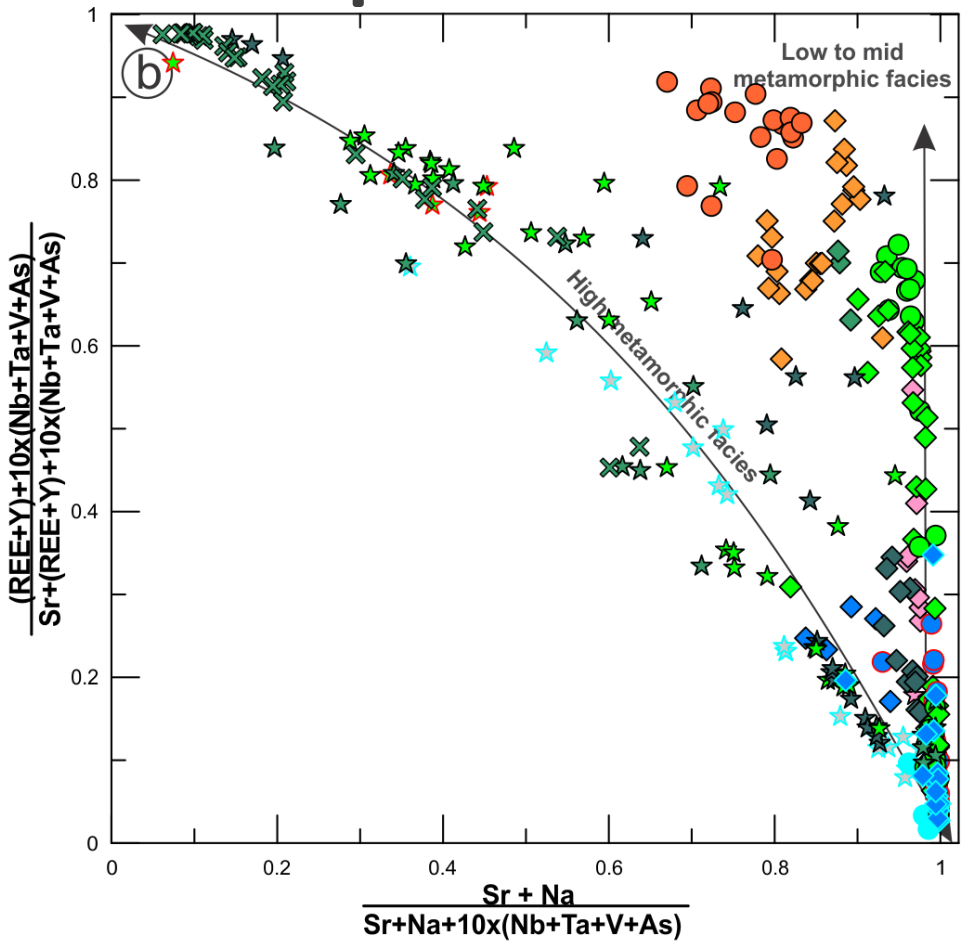
Origin
- This study
- Litterature

Gold deposit not orogenic in origin
- Crusader

Legend per orogenic-gold deposits (One symbol is not exclusive to one deposit)
- Meliadine
- Dome
- Hollinger
- Young Davidson
- Malartic
- Lamaque
- Sigma
- Beaufor
- Meguma
- Cuiaba
- Essakane
- Buzwagi
- Kochkar
- Kumtor
- Hutti
- Marvel Loch
- Nevoria
- Edward's Find
- Tarmoola
- Paddington
- Mt Pleasant
- Mt Charlotte
- Drysdale
- Lindays
- Kambalda
- Norseman
- Norseman-01
- Norseman-02
- Norseman-03
- Macraes

Influence of the metamorphism





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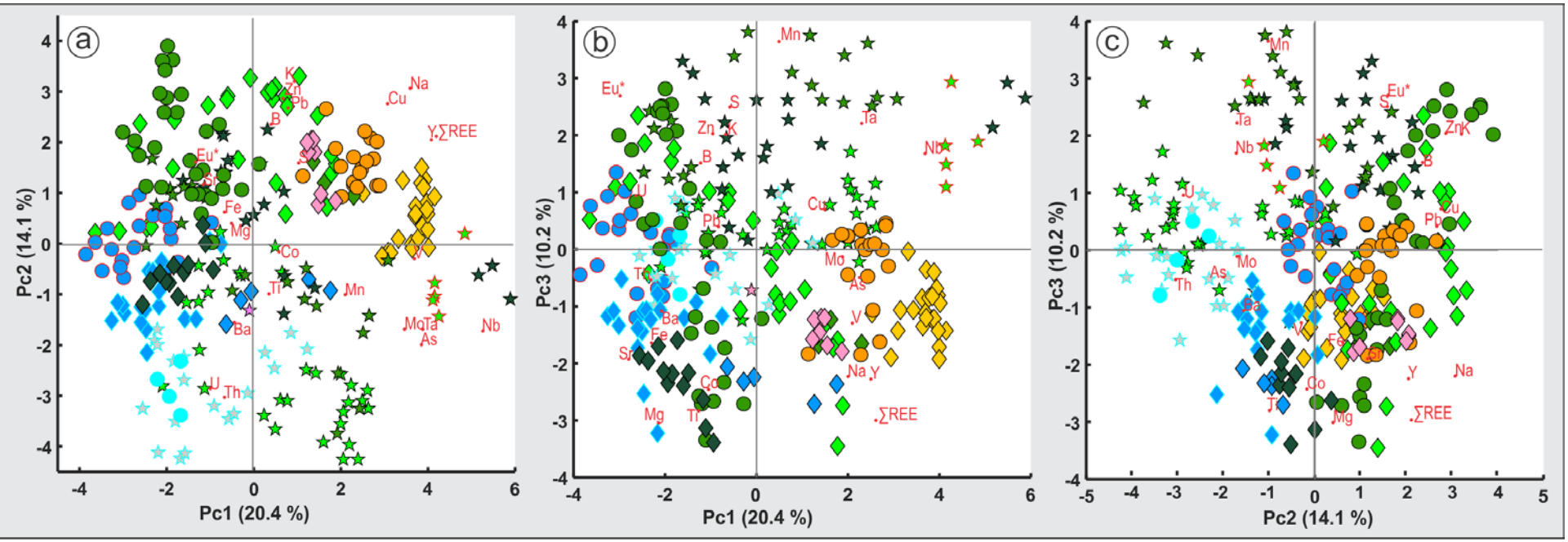
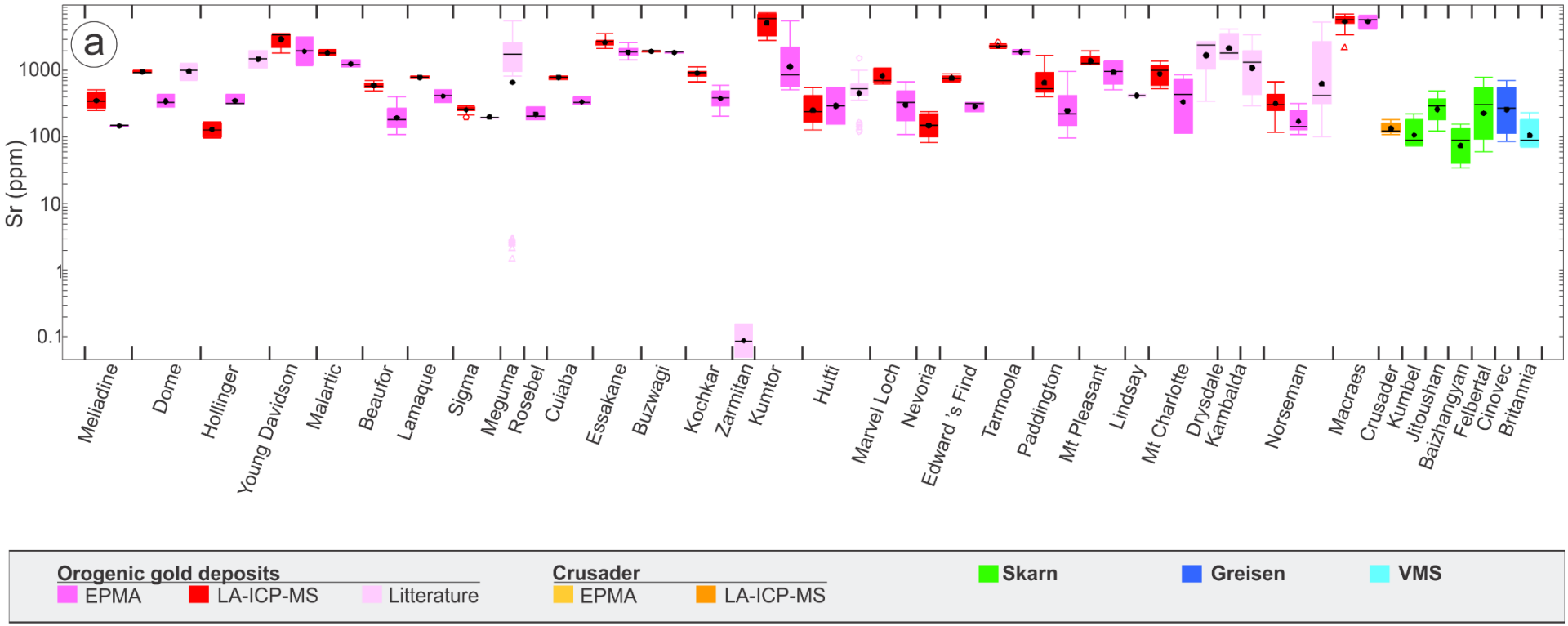
- Norseman-03
- Macraes

PCA on orogenic gold deposits

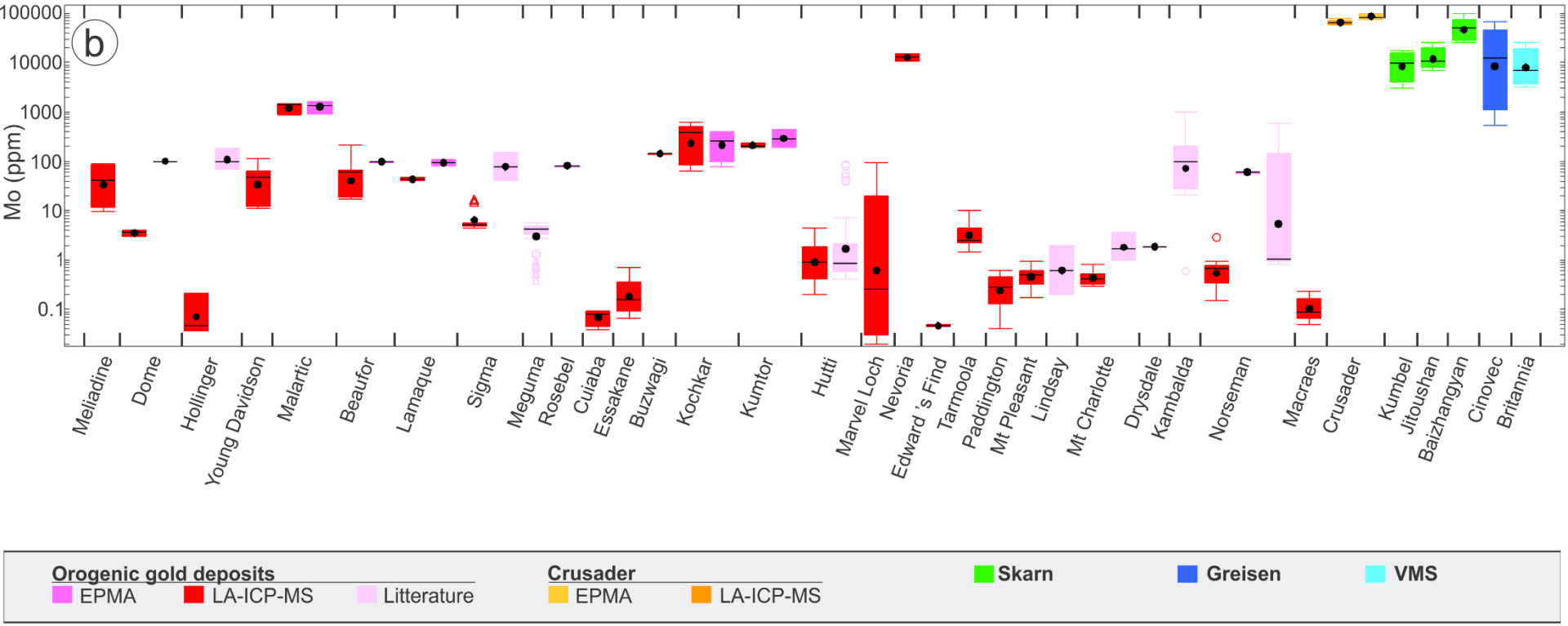
Influence of the hostrock composition and the metamorphism



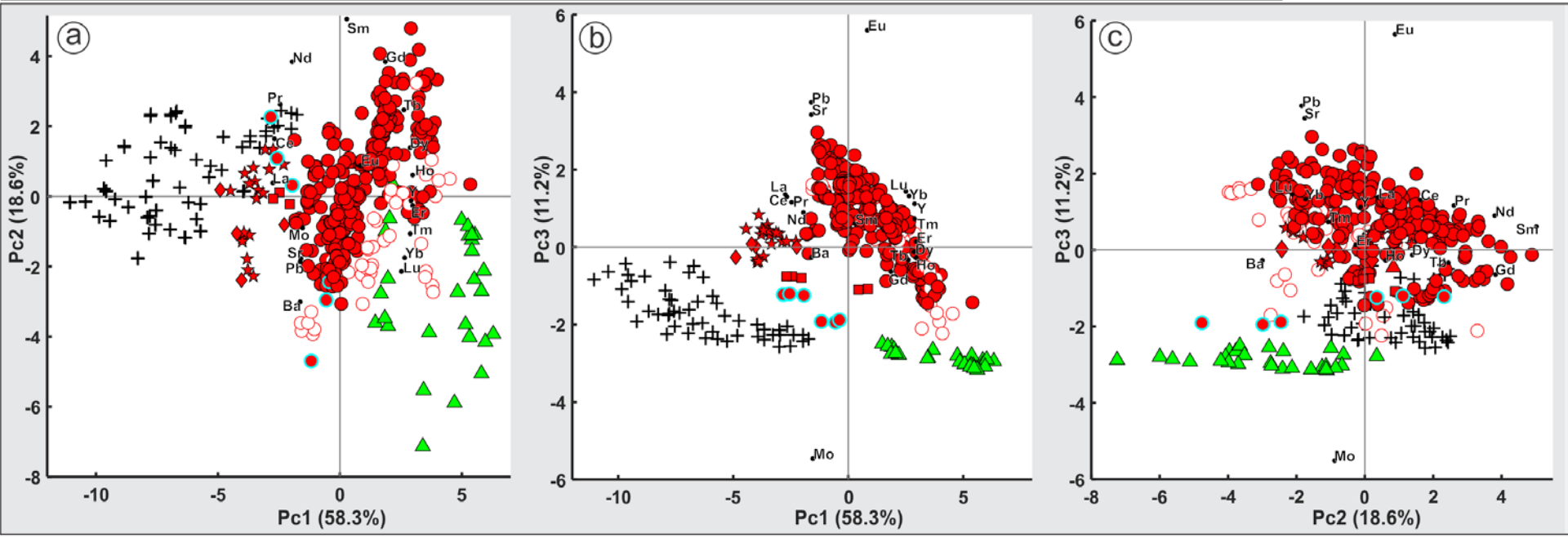
Strontium variation in scheelite

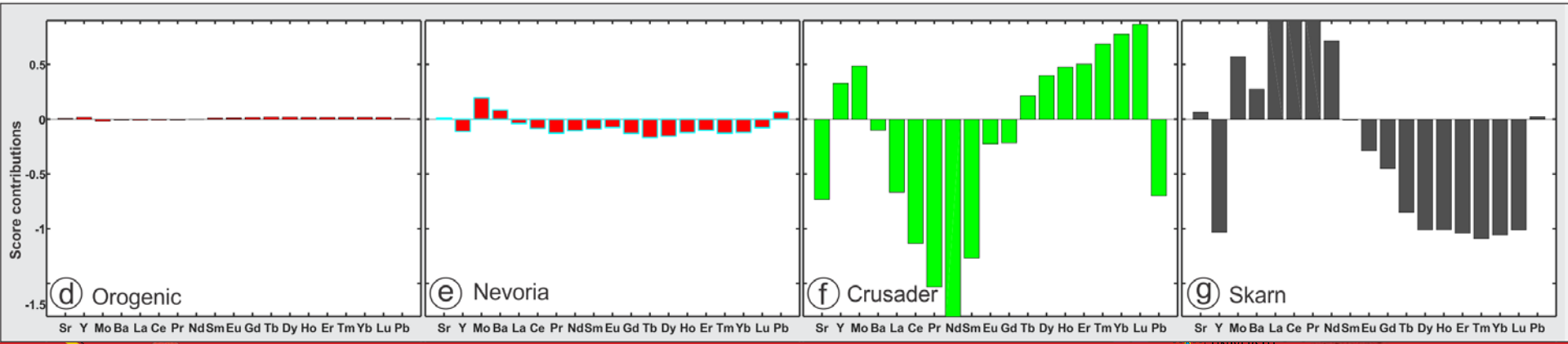


Molybdenum variation in scheelite



PCA on various deposit types





Conclusion

Scheelite from orogenic gold deposits:

- homogeneous in CL & trace element composition
- CL zonation correlates with variation in trace element composition
- 4 REE patterns with a bell-flat serie
- Trace element variation after hostrock composition, metamorphic facies
- Not conclusive features: ultramafic and mafic hosted deposits, mineralization age

- REE, Mo & Sr: discriminant for orogenic vs. others

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Thank you for your attention

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