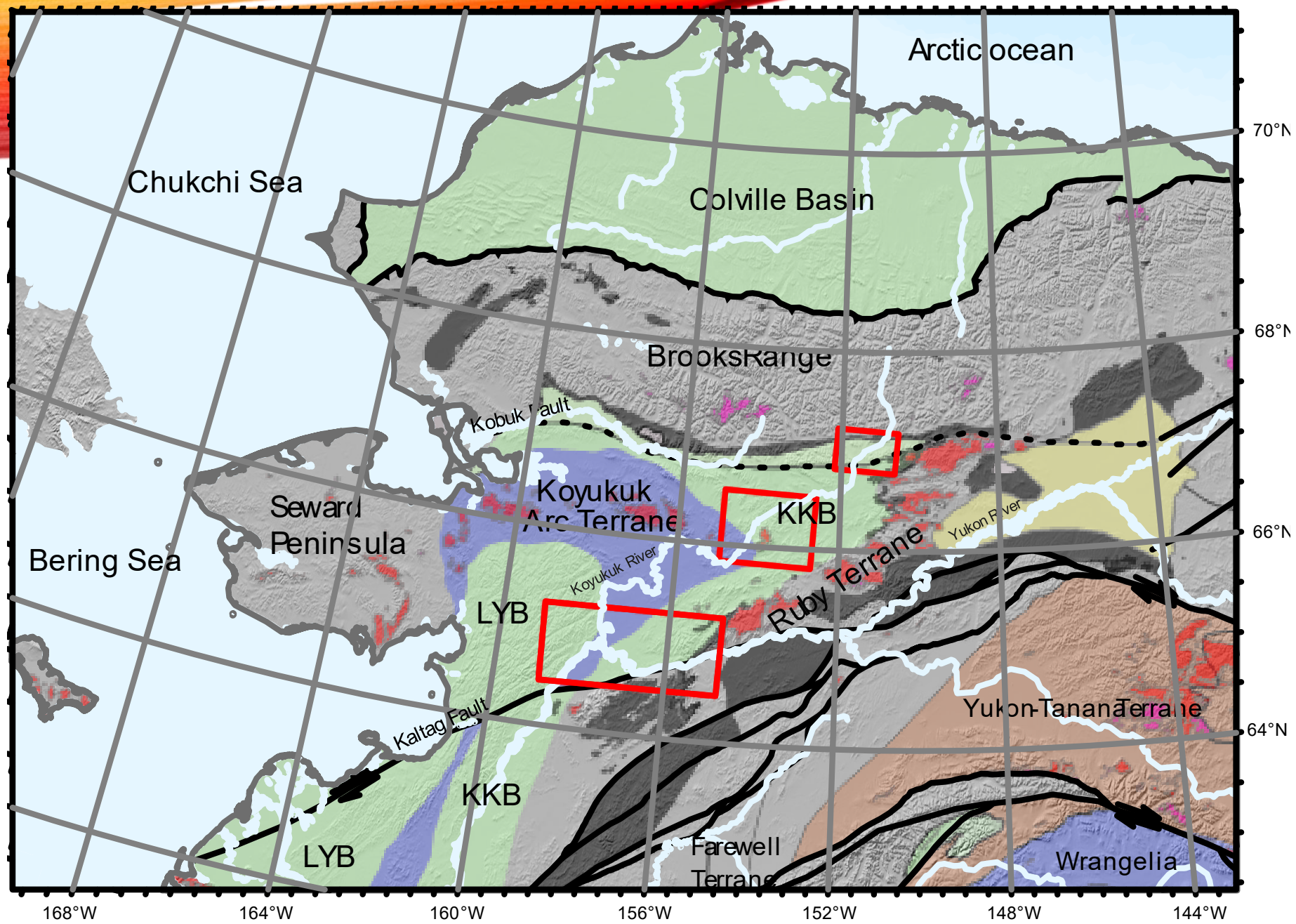

# Provenance analyses: a tool to constrain tectonic changes. Parallelism between the ancient Yukon-Koyukuk Basin (Alaska) and modern Southeast Asia

Seminara S. [1], Pease V. [1], Toro J. [2] and Omma J. [3]

[1] Stockholm University (simone.seminara@geo.su.se), [2]West Virginia University, [3] Rocktype Ltd.



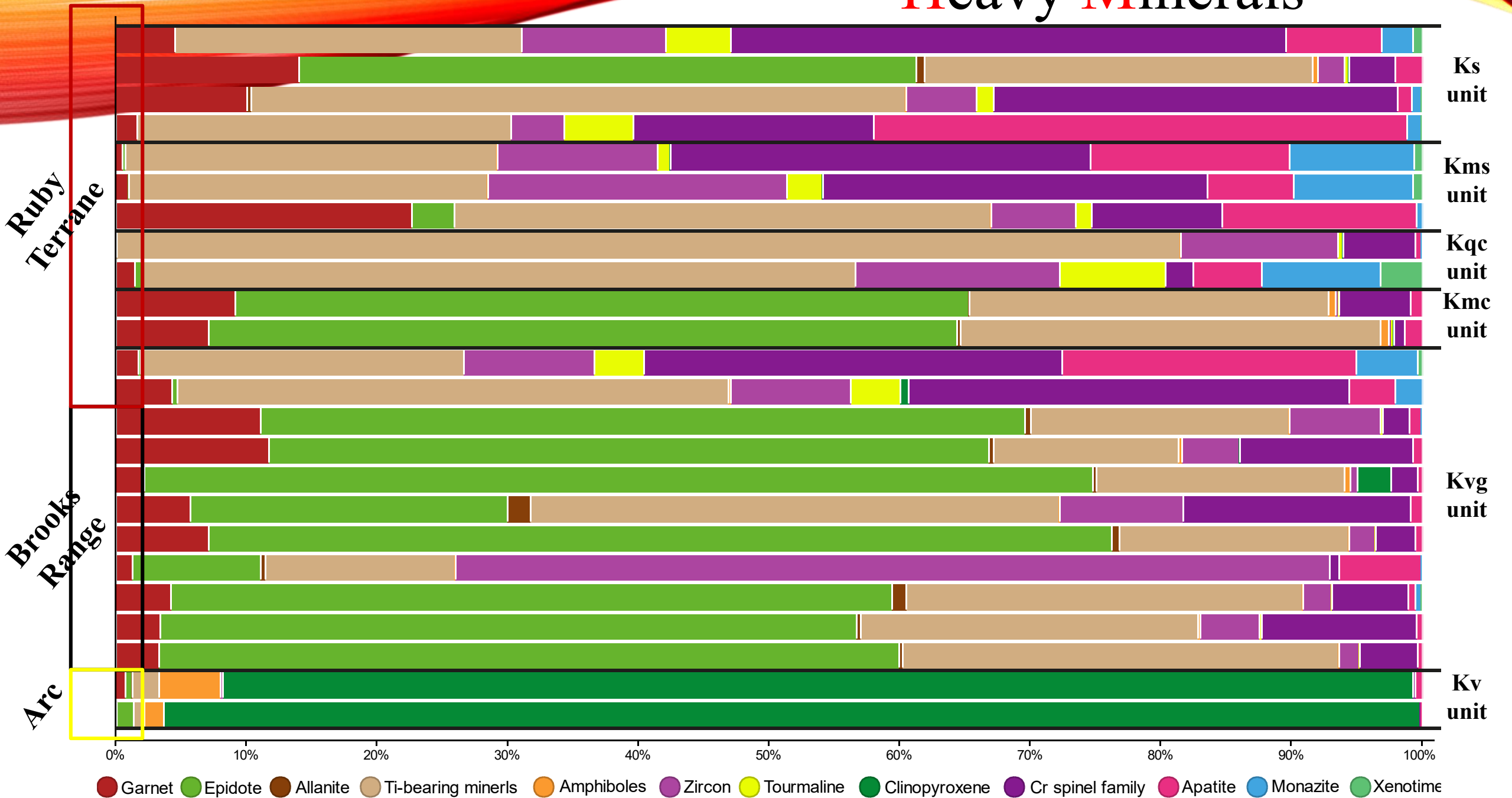

# Geological Background

- Oceanic terranes
- Cretaceous Basins
- Cretaceous Plutons
- Cenozoic Basin
- Devonian Plutons
- Cont/Metam Terranes
- Arc Terranes
- Sampling Areas
- Hidden Fault
- Outcropping Faults

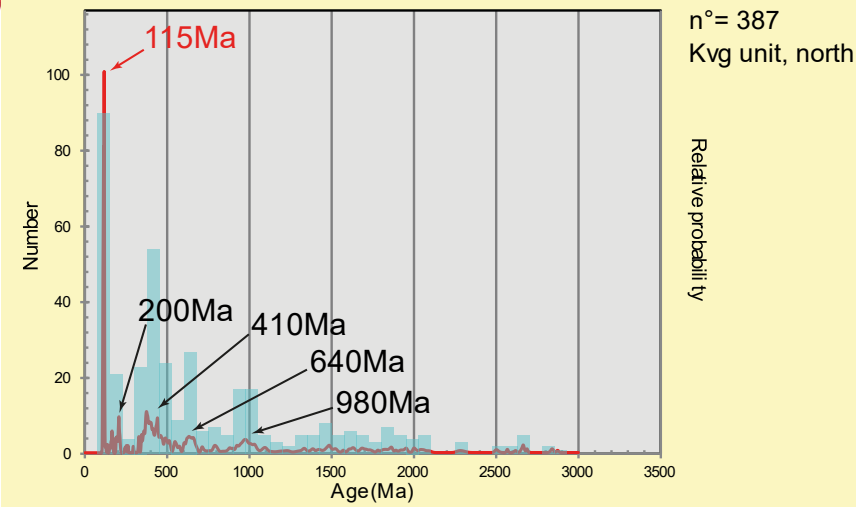
Seminara et al., 2025b (submitted to sedimentology)

Seminara et al., 2025b (submitted to sedimentology)

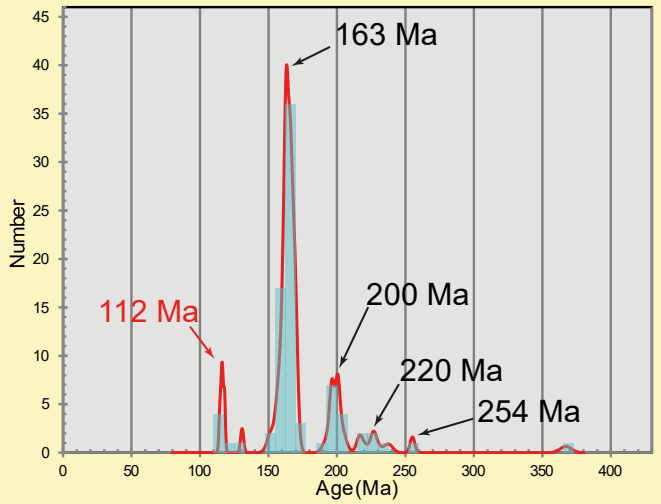
# Heavy Minerals



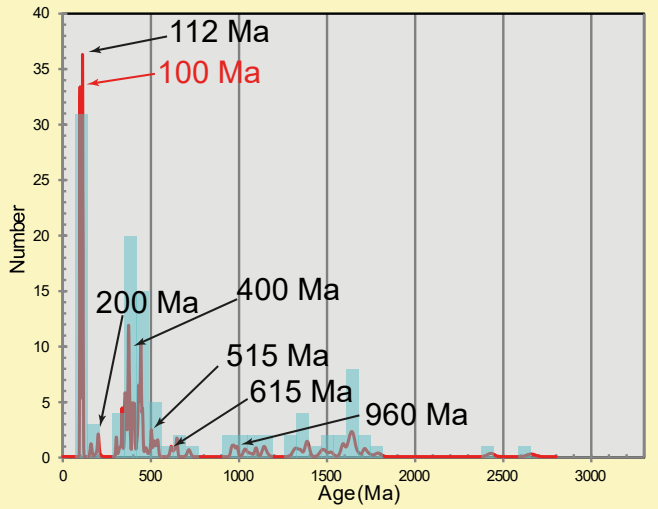
# Maximum Age of Deposition



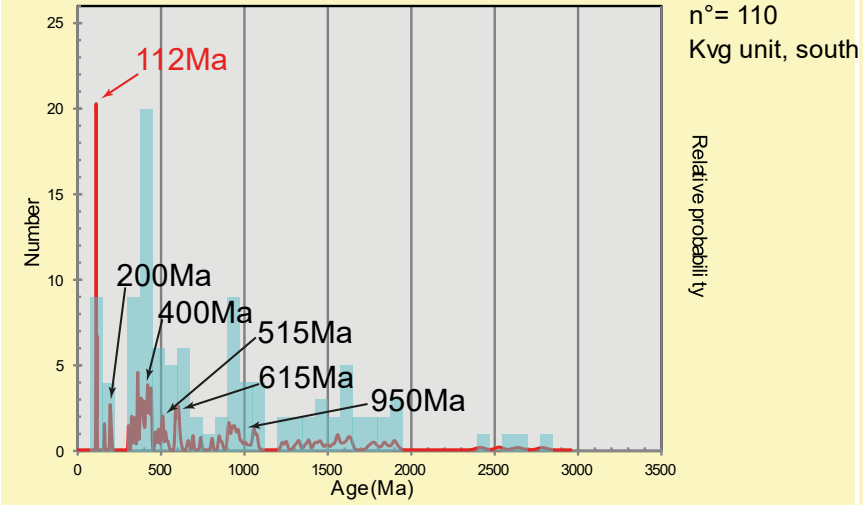

n°= 387
Kvg unit, north



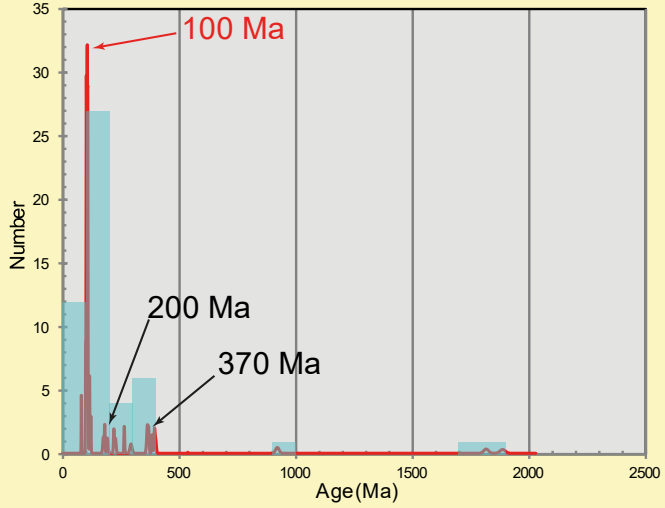

n°= 83
Kmc unit



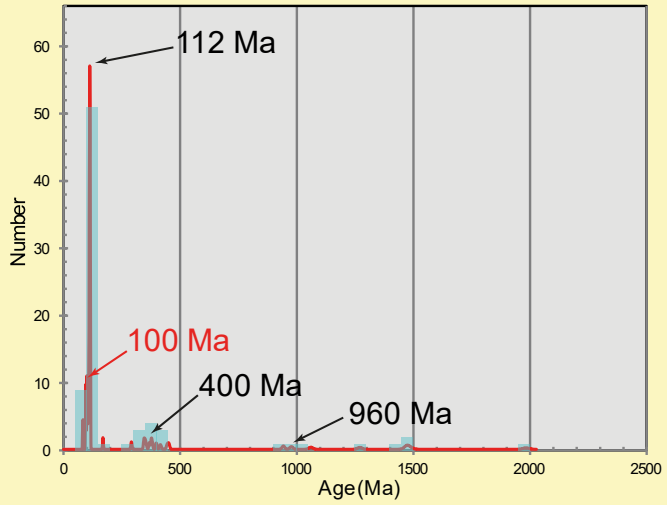

n°= 114
Kms unit




n°= 110
Kvg unit, south



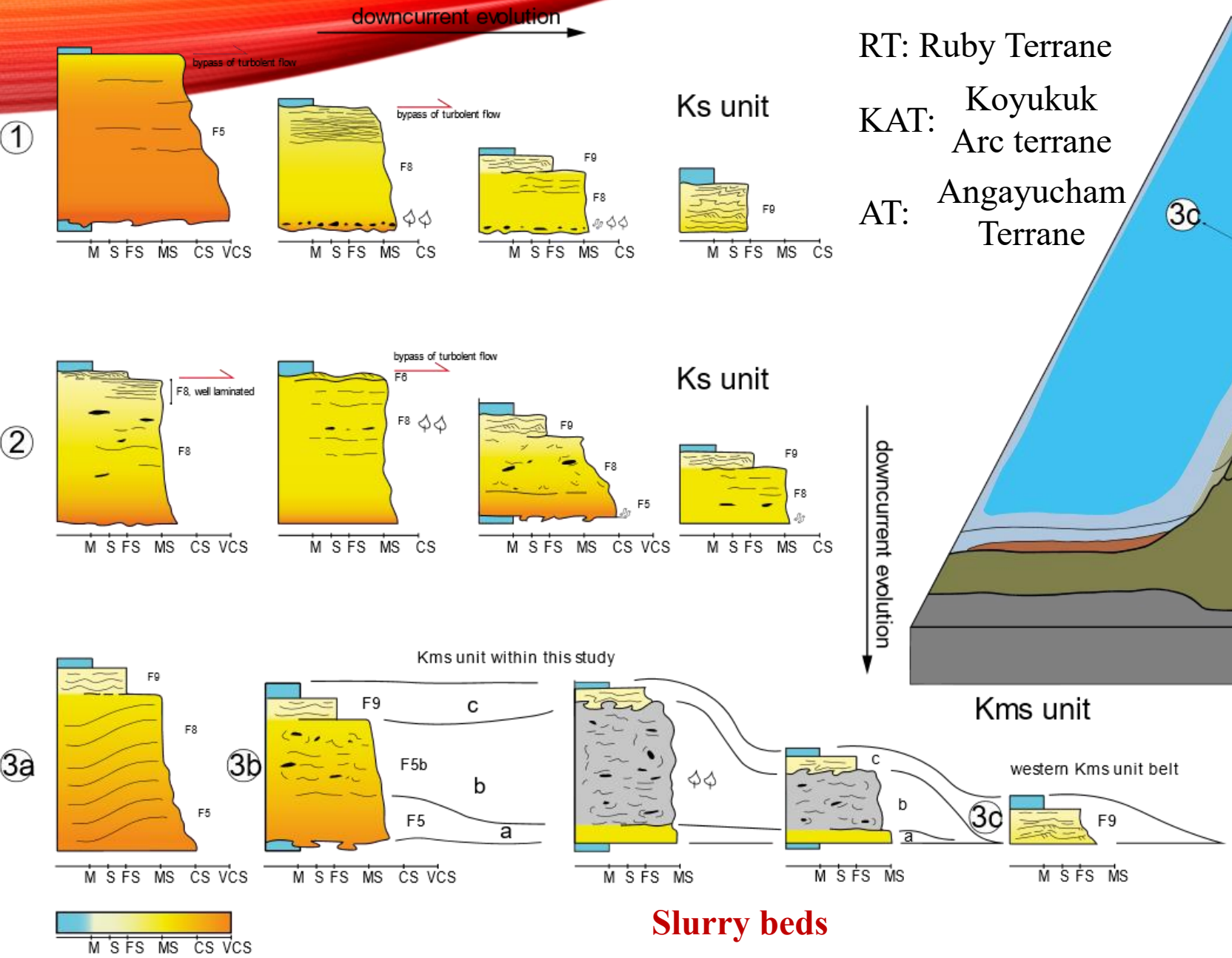

n°= 56
Kqc unit




n°= 80
Ks unit

Seminara et al., (in prep.)

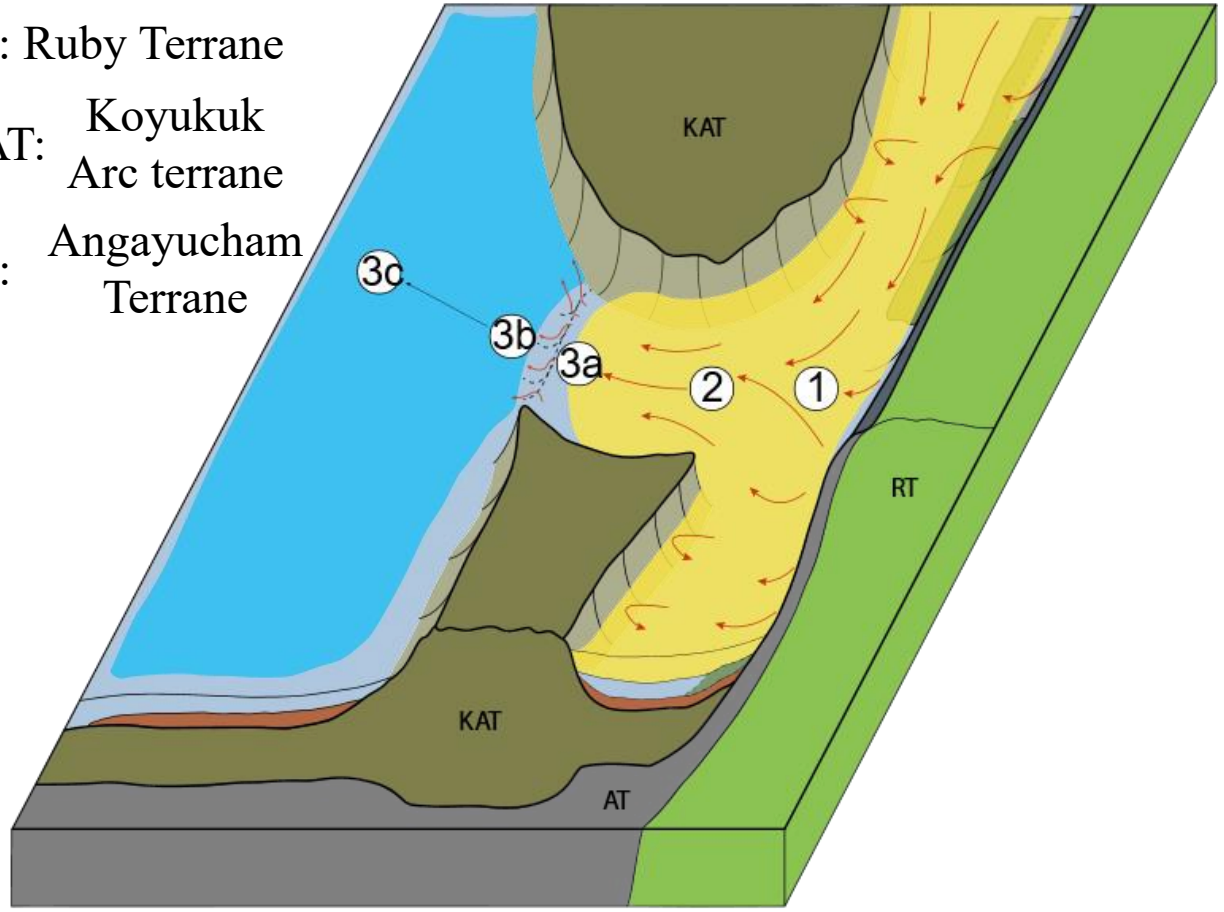
# Paleoenvironmental reconstruction

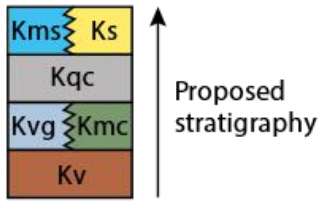



RT: Ruby Terrane

KAT: Koyukuk Arc terrane

AT: Angayucham Terrane

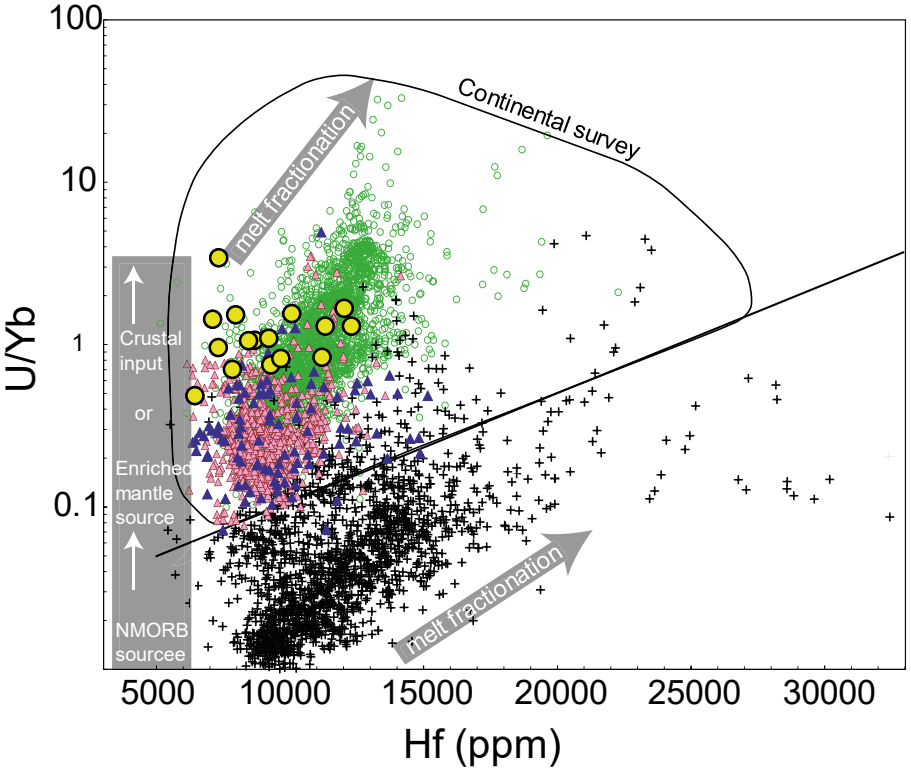


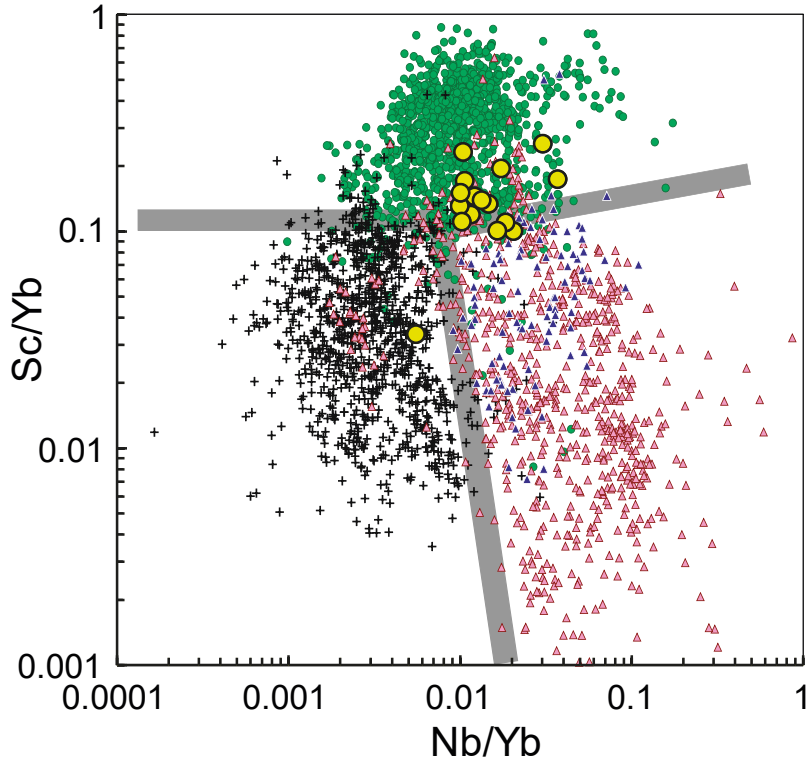



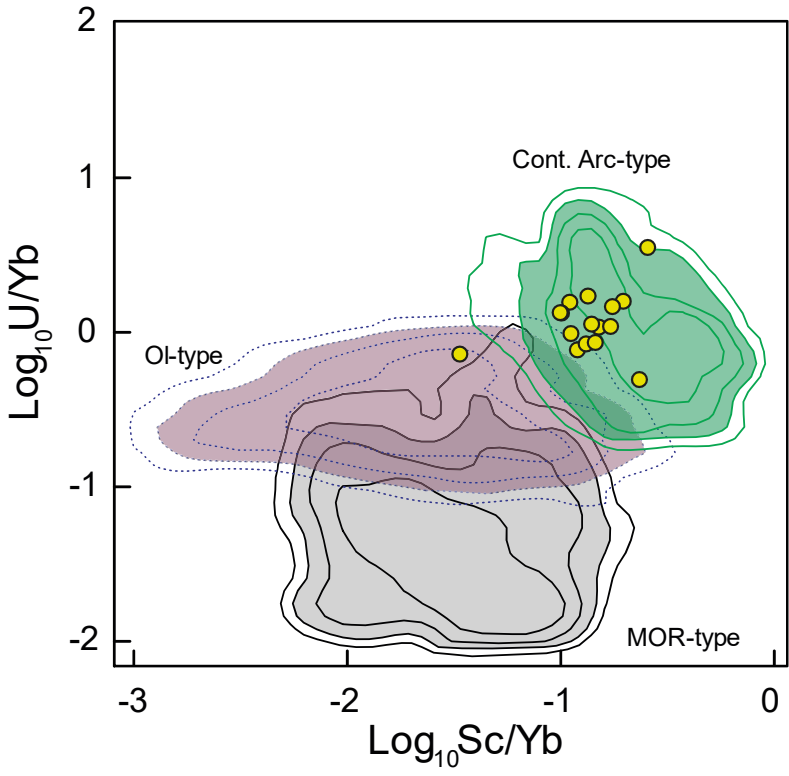

**Slurry beds**

Seminara et al., 2025b (submitted to sedimentology)

# Trace Element data




Iceland

Hualalai, Hawaii

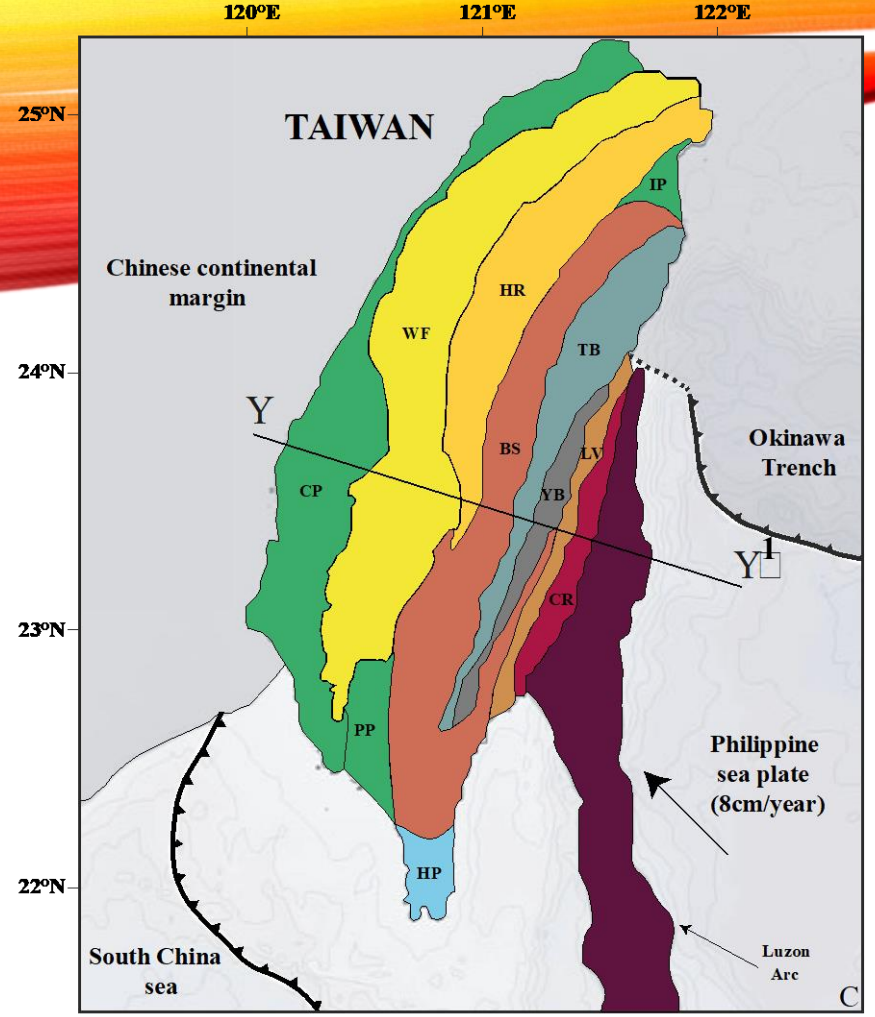
Mid-ocean ridge compilation

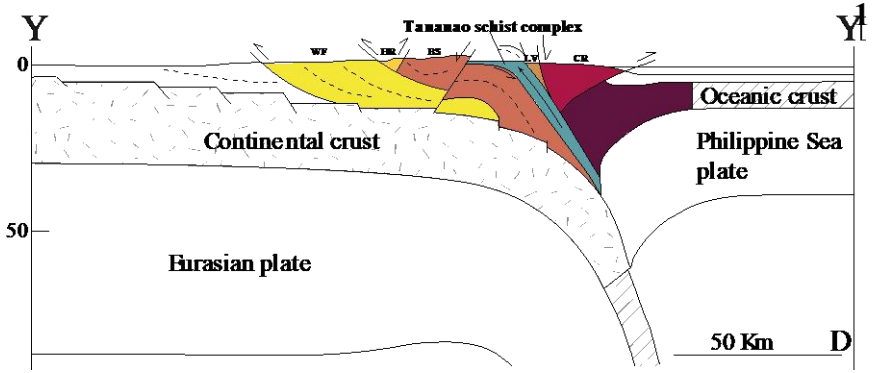
Continental arc compilation

Early Cretaceous YKB arc compilation

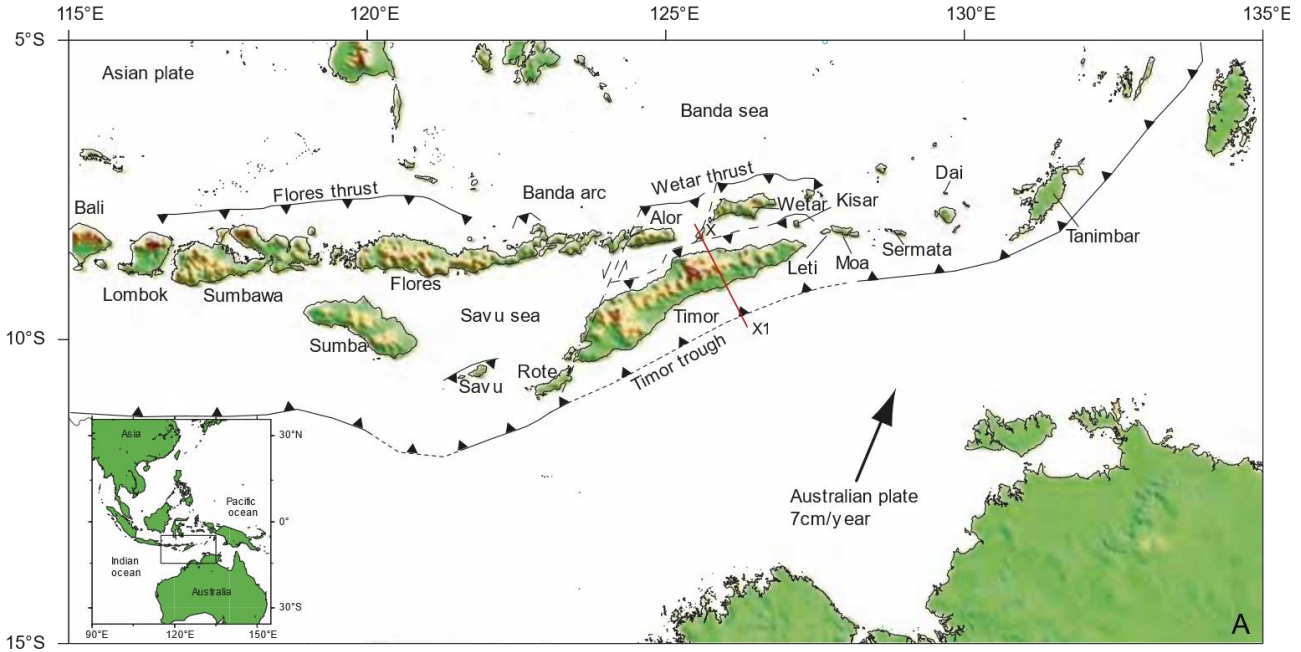
Seminara et al., (in prep.)

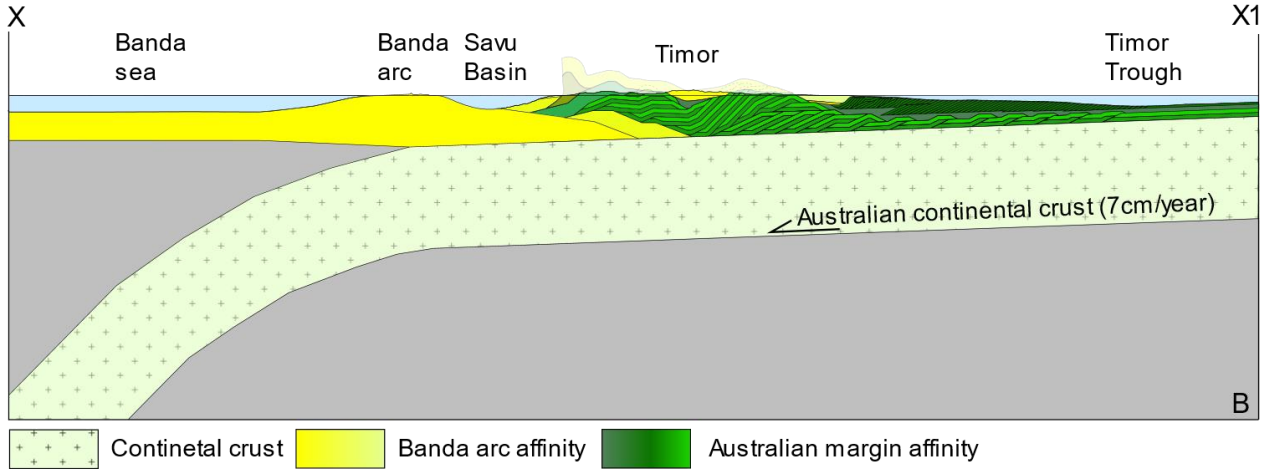
# South-east Asia Comparison




Seminara et al., 2025b (submitted to sedimentology)




Seminara et al., 2025a

# Conclusions

- **HM document three distinct populations: one related to the arc (rich in clinopyroxene), one sourced from the Brooks Range (rich in garnet and epidote), and one from the Ruby Terrane (rich in Cr-spinel).**
- **MAD and sedimentary features define the paleogeography and stratigraphy of the YKB.**
- **Slurry beds in distal facies record a shift in the main depocenter, the result of the Late Cretaceous uplift of the Ruby Terrane.**
- **TE in arc-aged zircons show a significant crustal component, suggesting that the continental Arctic Alaska margin was subducting beneath the intra-oceanic volcanic arc at the time of zircon formation.**
- **The comparison with the Banda Arc and the Taiwan margin in south-east Asia enhances our understanding of basins formed in arc-continent collisional setting, allowing the development of models applicable to both ancient and modern systems.**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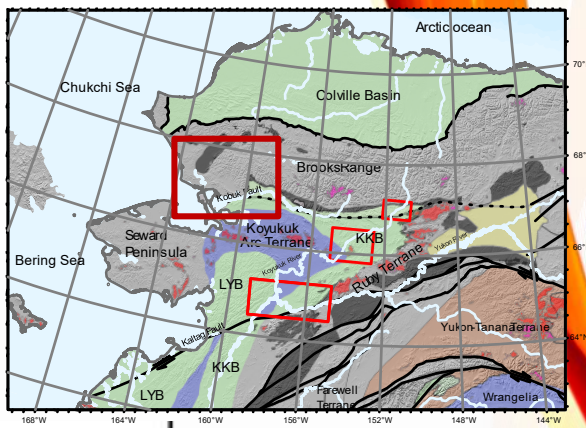
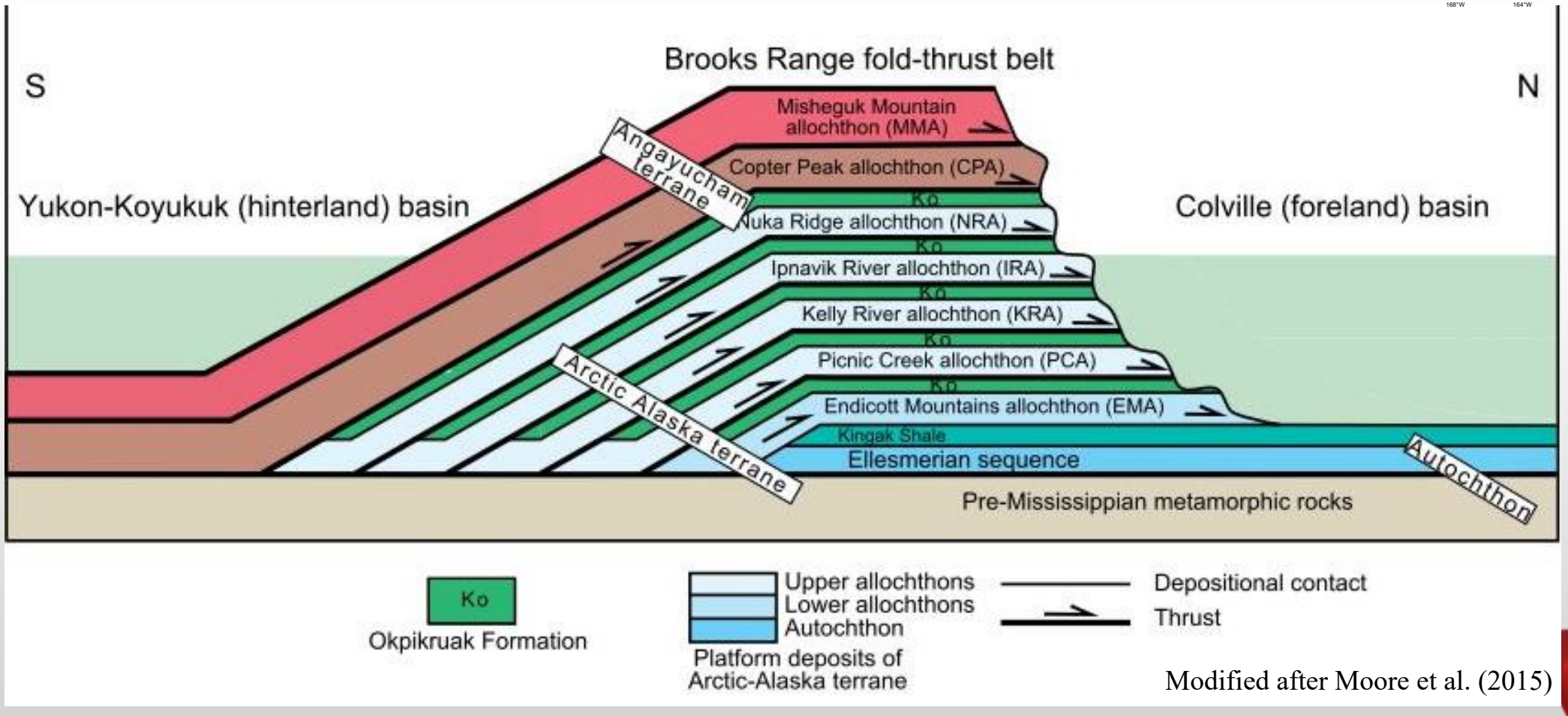
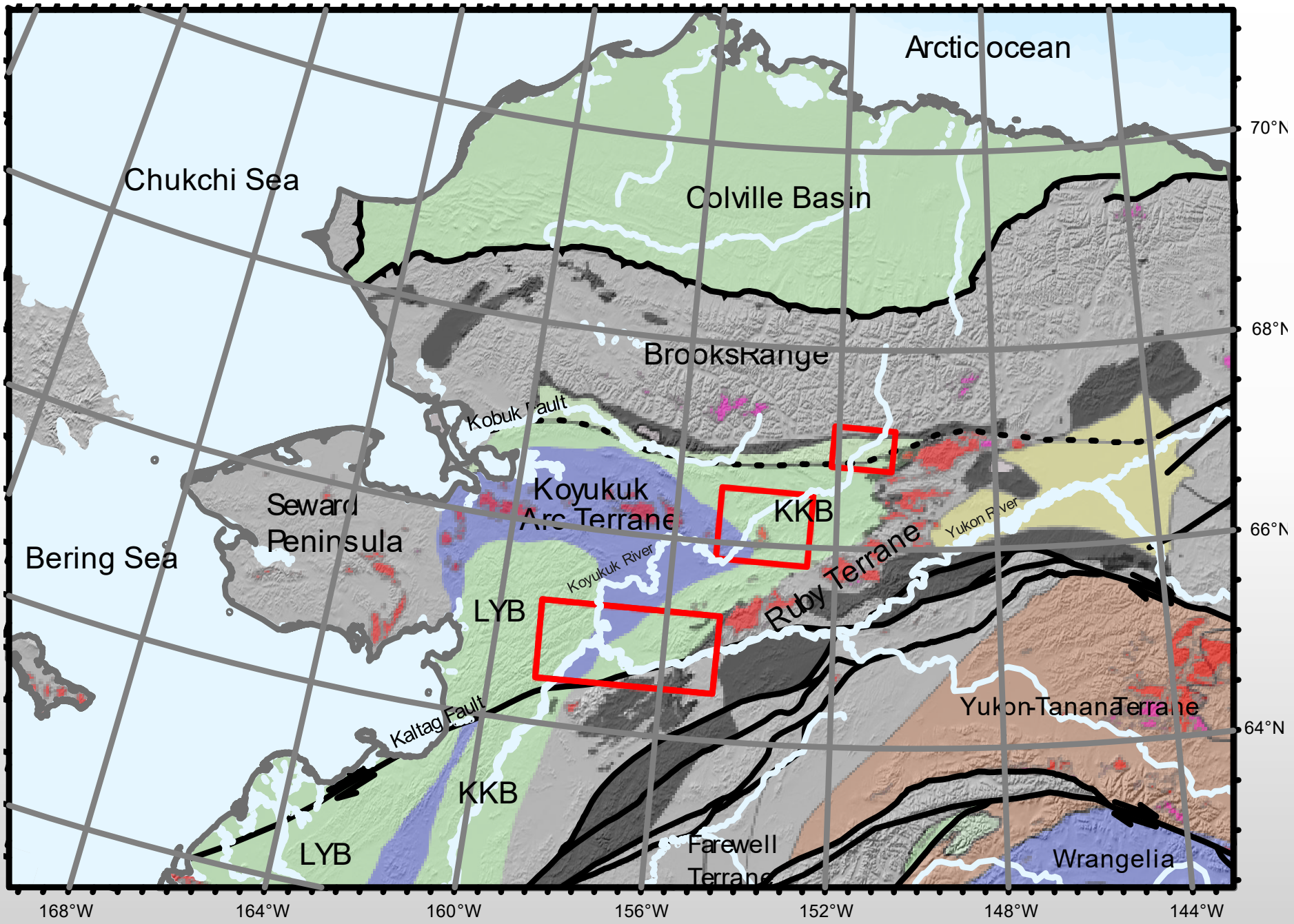
# Western Brooks Range




Modified after Moore et al. (2015)

Seminara et al., 2025b (submitted to sedimentology)




# KKB and LYB

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- Cretaceous Basins
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# Koyukuk Arc Terrane

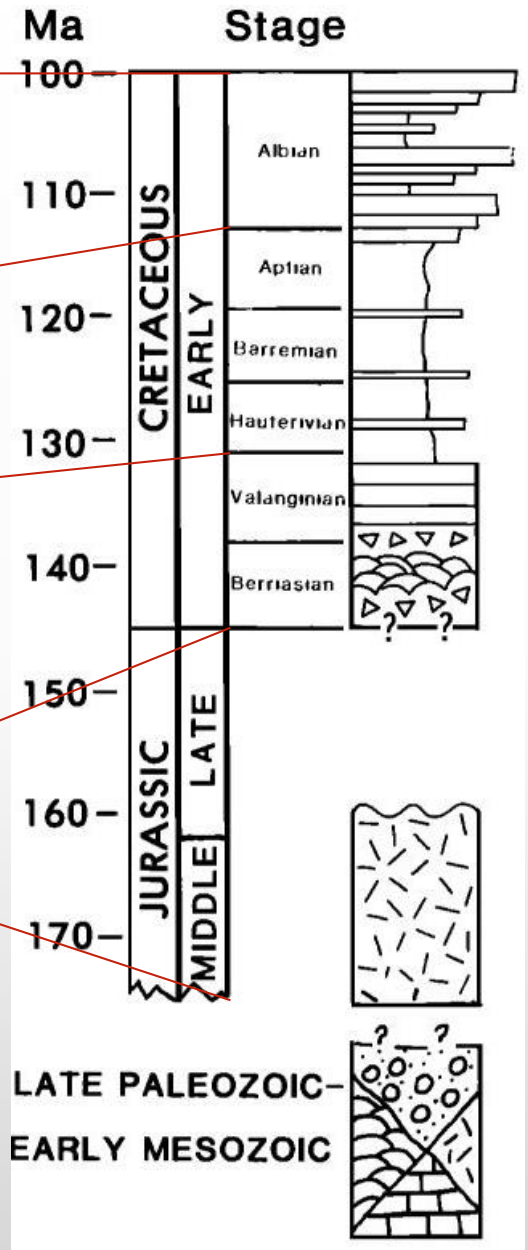
Overlap assemblages (Kvg unit and above)

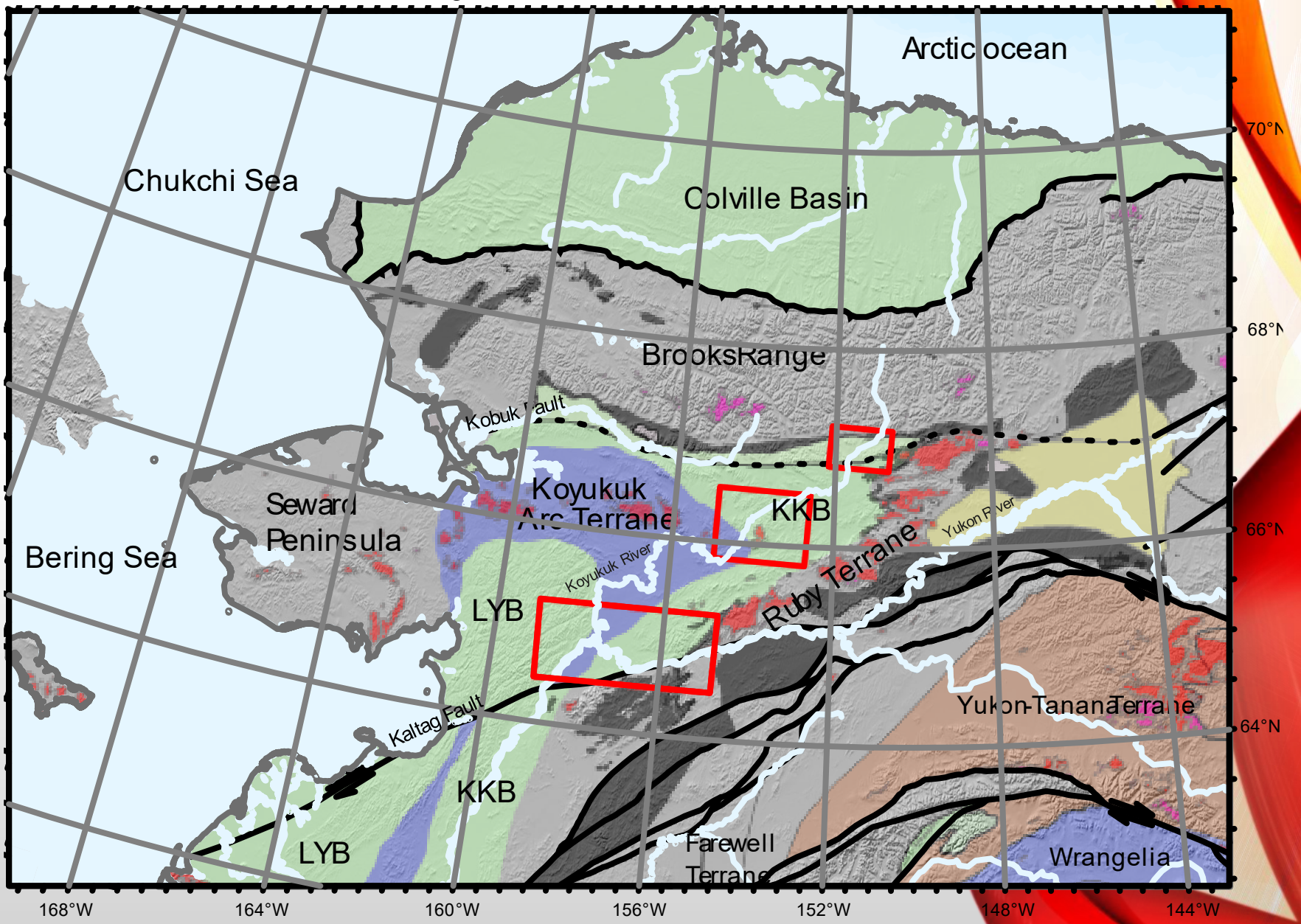
Unit 4 volcanics & volcaniclastics, shallow marine to deep marine

Unit 3 non marine, shallow marine, volcanic & volcaniclastics

Unit 2 intermediate to felsic plutons

Unit 1 pillow basalts

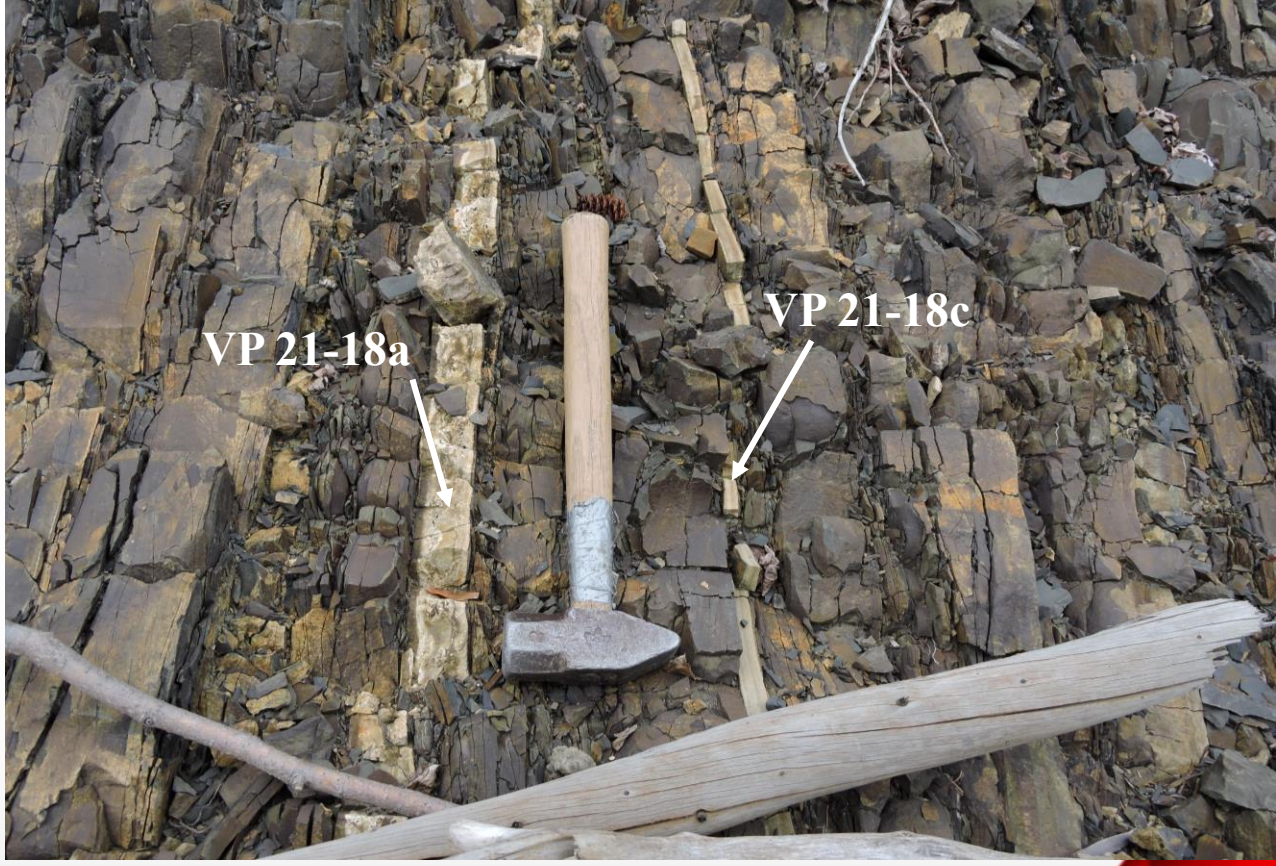



Modified after Box and Patton (1989)


# Kv unit

Basaltic and andesitic lava flows interbedded with volcanogenic sediments. K-Ar ages vary from 134Ma and 118Ma. A single U-Pb zircon age from a tuff (VP21-35a) is about 138Ma.




# Kvg unit

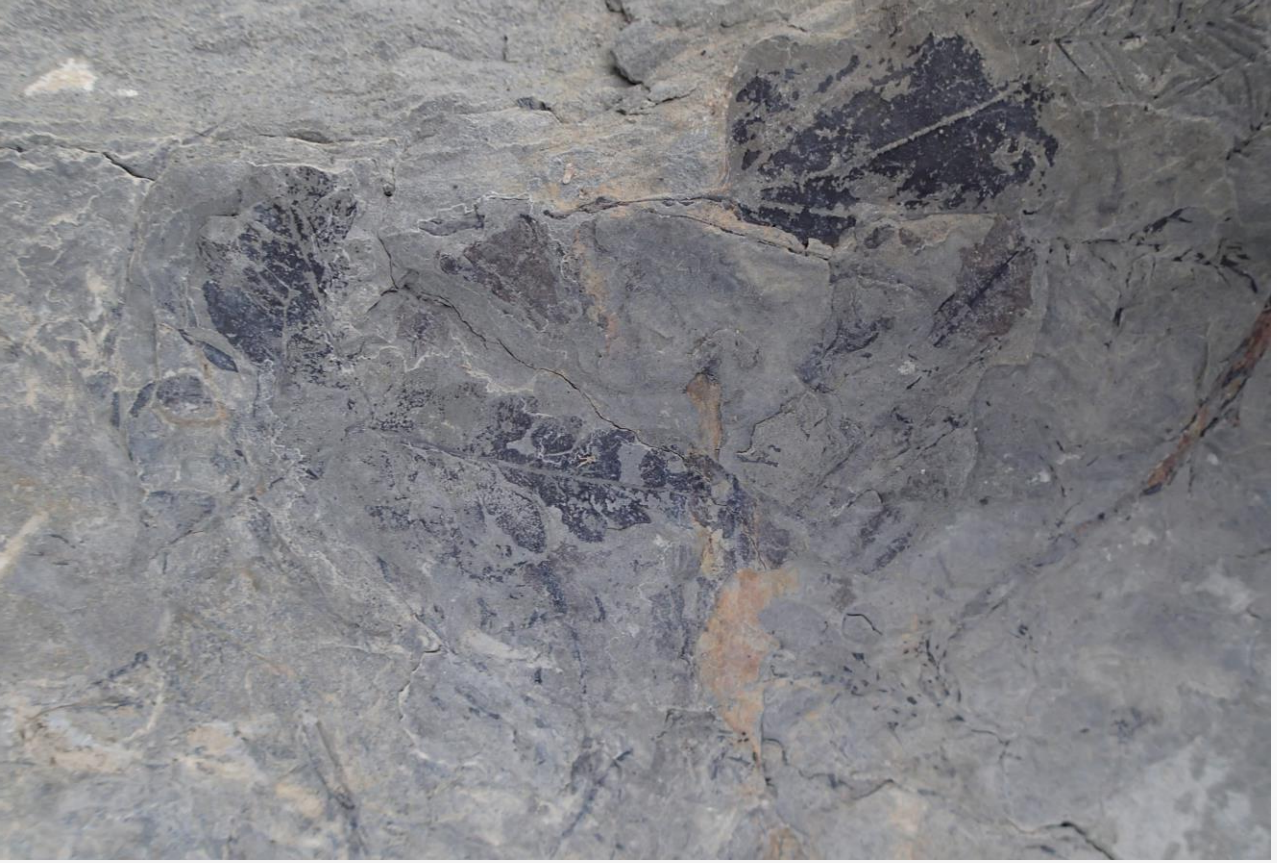
Volcaniclastic greywacke with Albian molluscs are interbedded with tuffaceous layers.
Two of these (VP21-18a and VP21-18c) are dated at 112Ma and 110Ma (Albian).

# Kmc and Kqc units

The former consists of conglomerate and greywacke with a strong mafic and calcareous imprint. Cretaceous molluscs are widespread. The latter is comprised of quartz rich deposits with plant fossils of Cretaceous age; it's mainly conglomeratic and rims the basin to the north and east.

# Kms unit

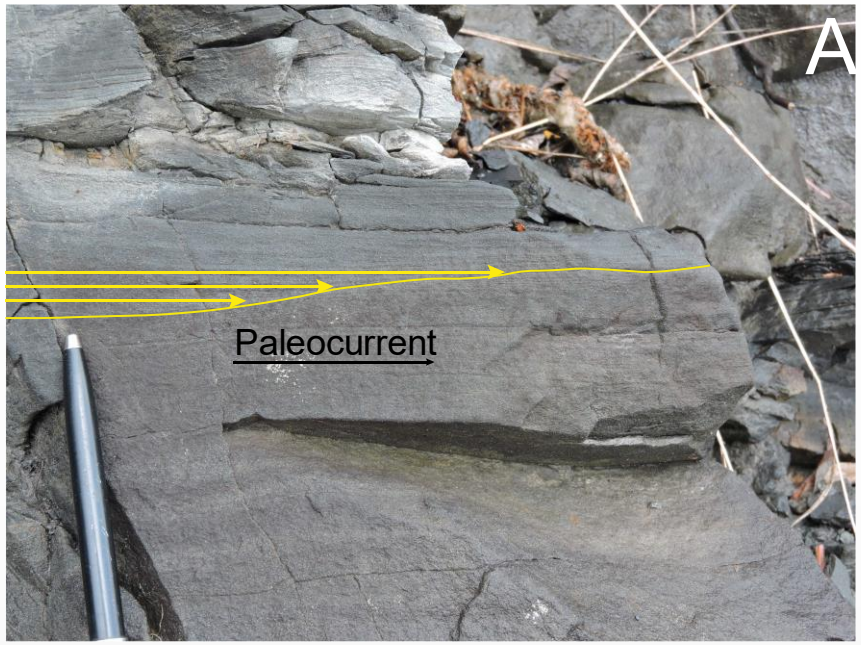
Fine to coarse sandstone interbedded with shaly layers. Interpreted to be the marine tongue of the Ks deposits.

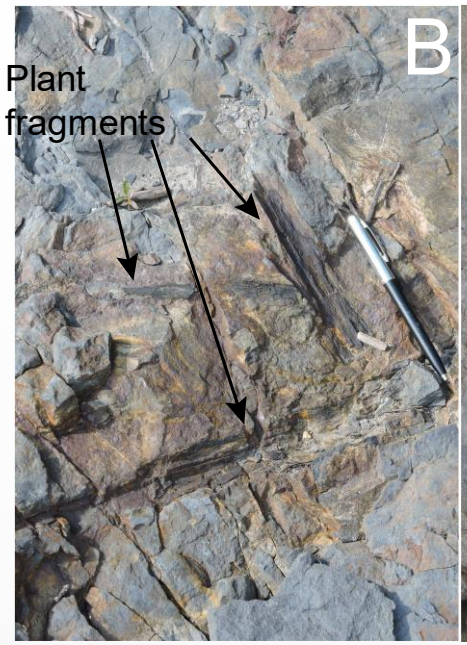


# Ks unit

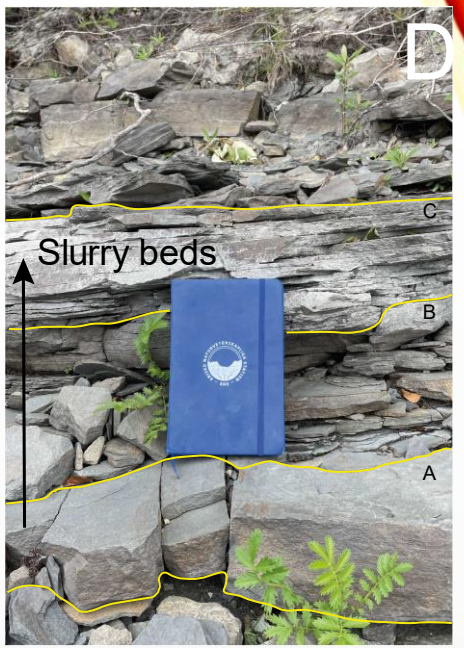
Late Cretaceous in age, this unit consists of alternating sandstone and shale layers deposited in fluvial to shallow marine environments.

# Sediment Characterization

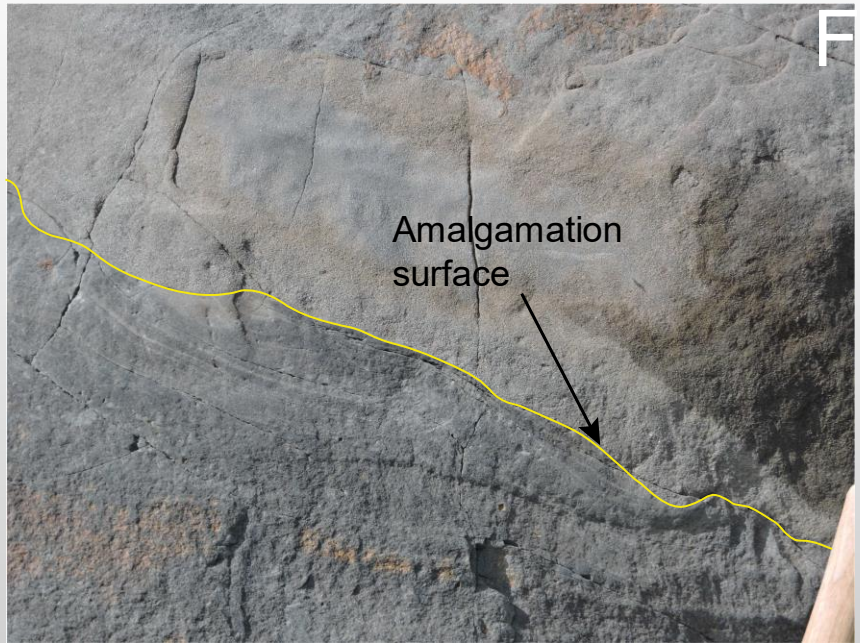


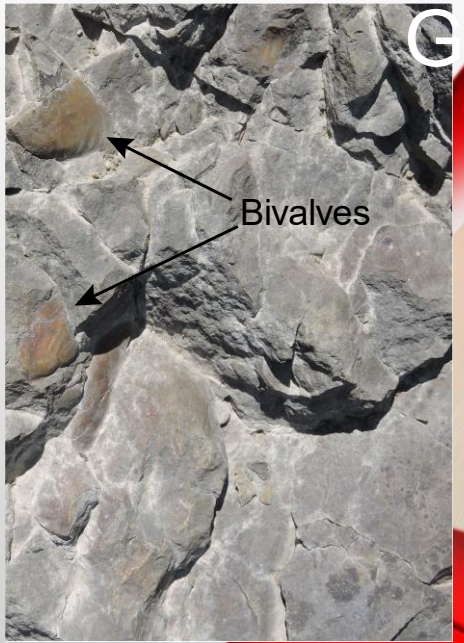











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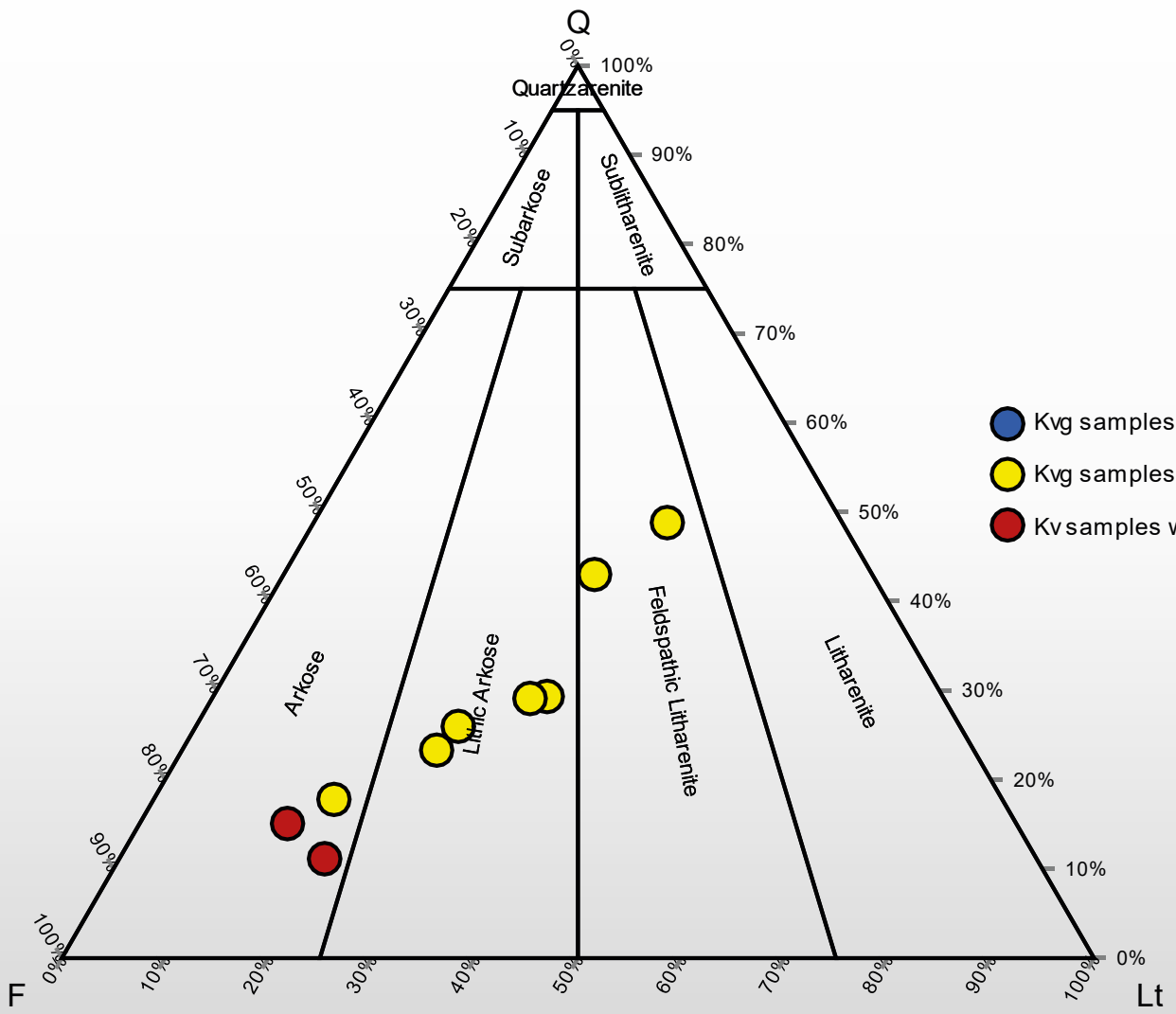


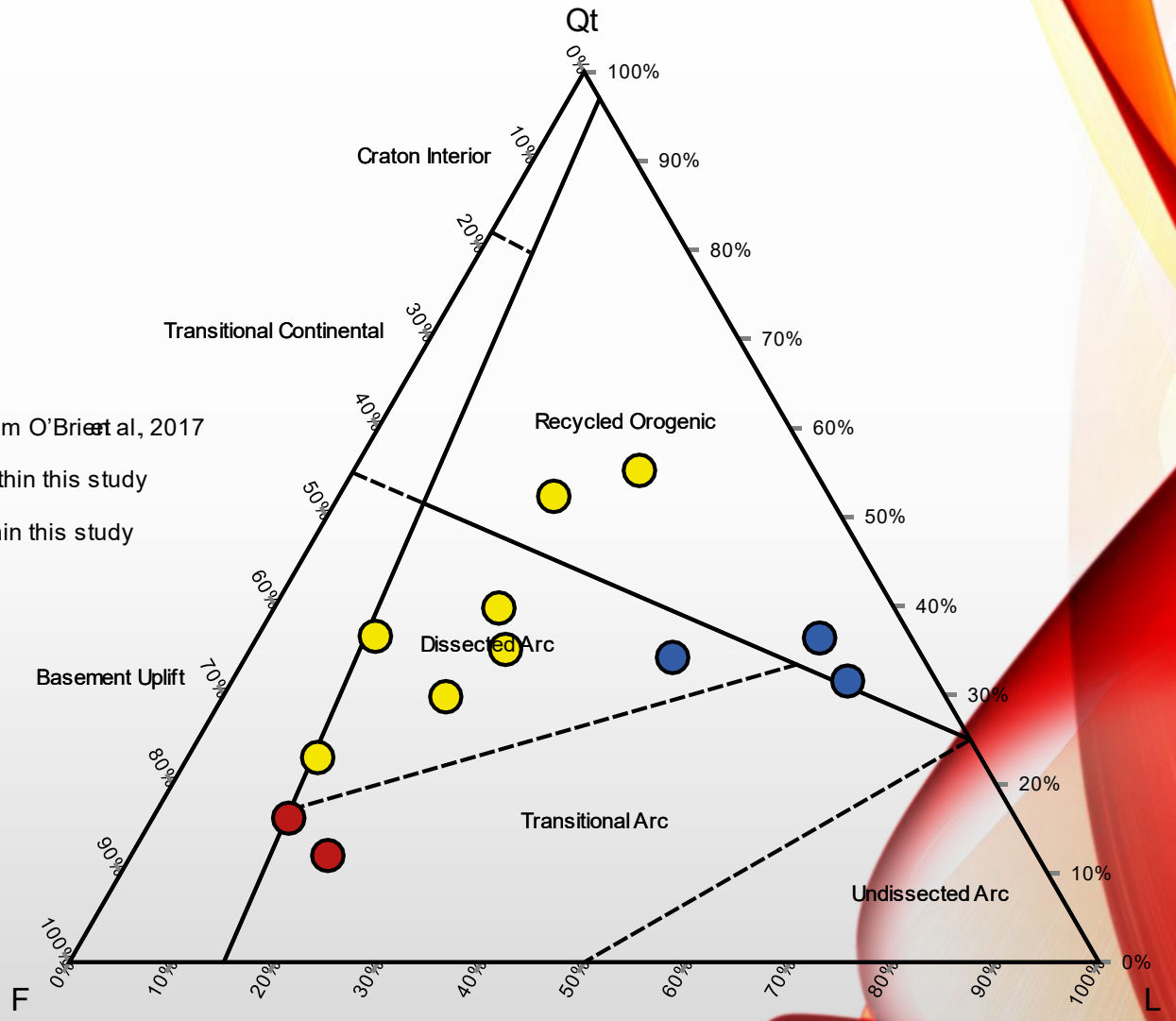


Seminara et al., 2025a

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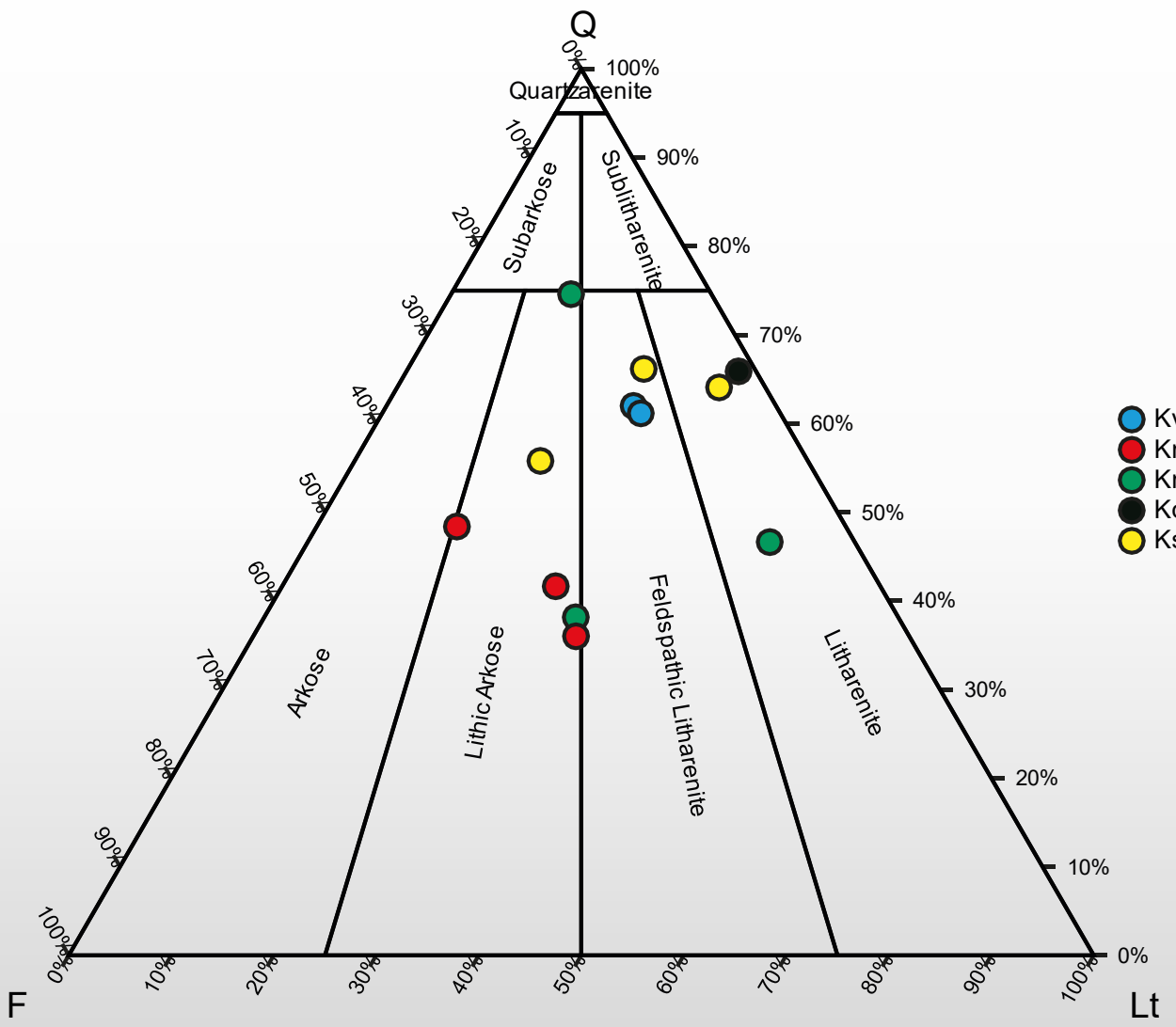
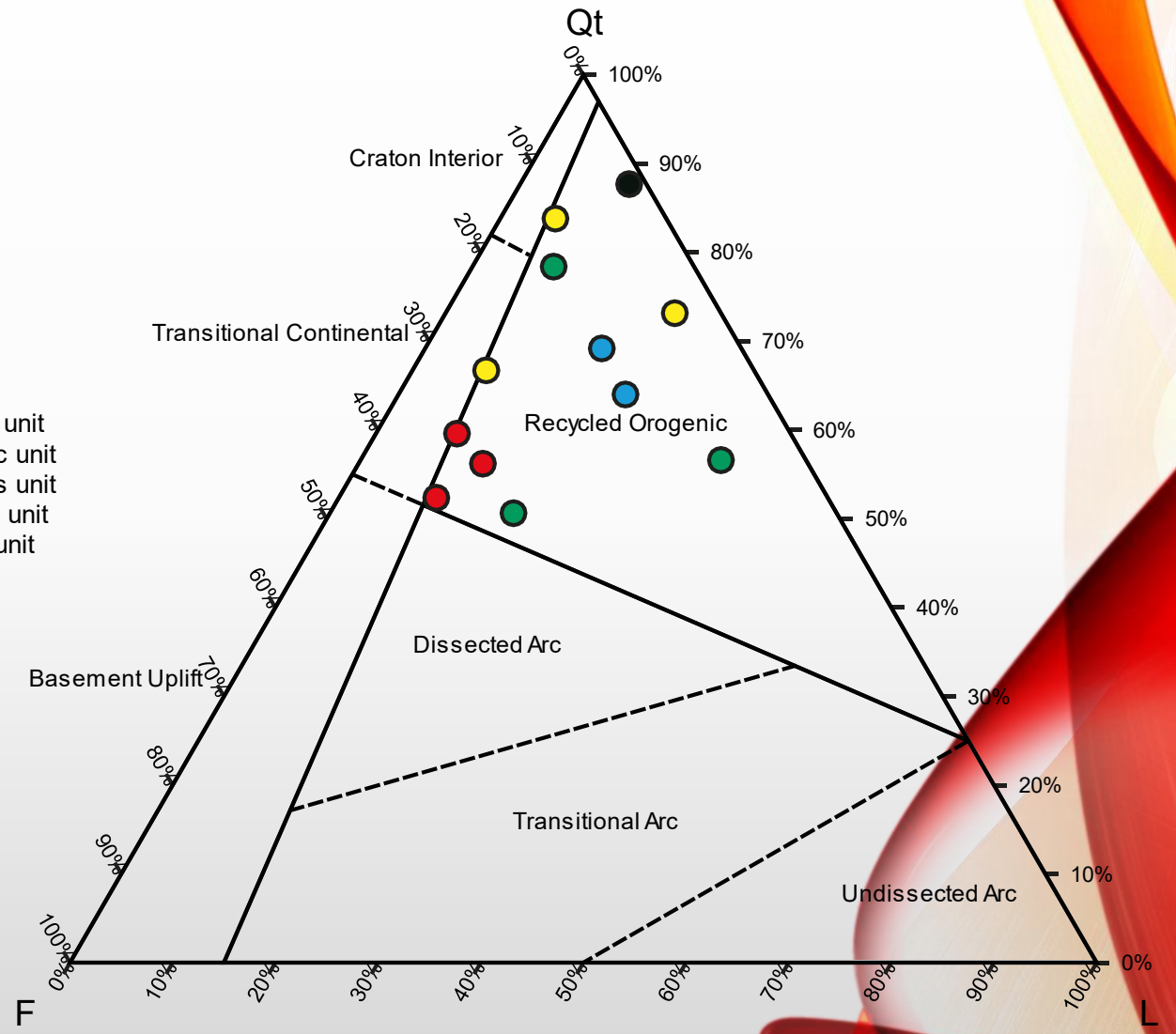
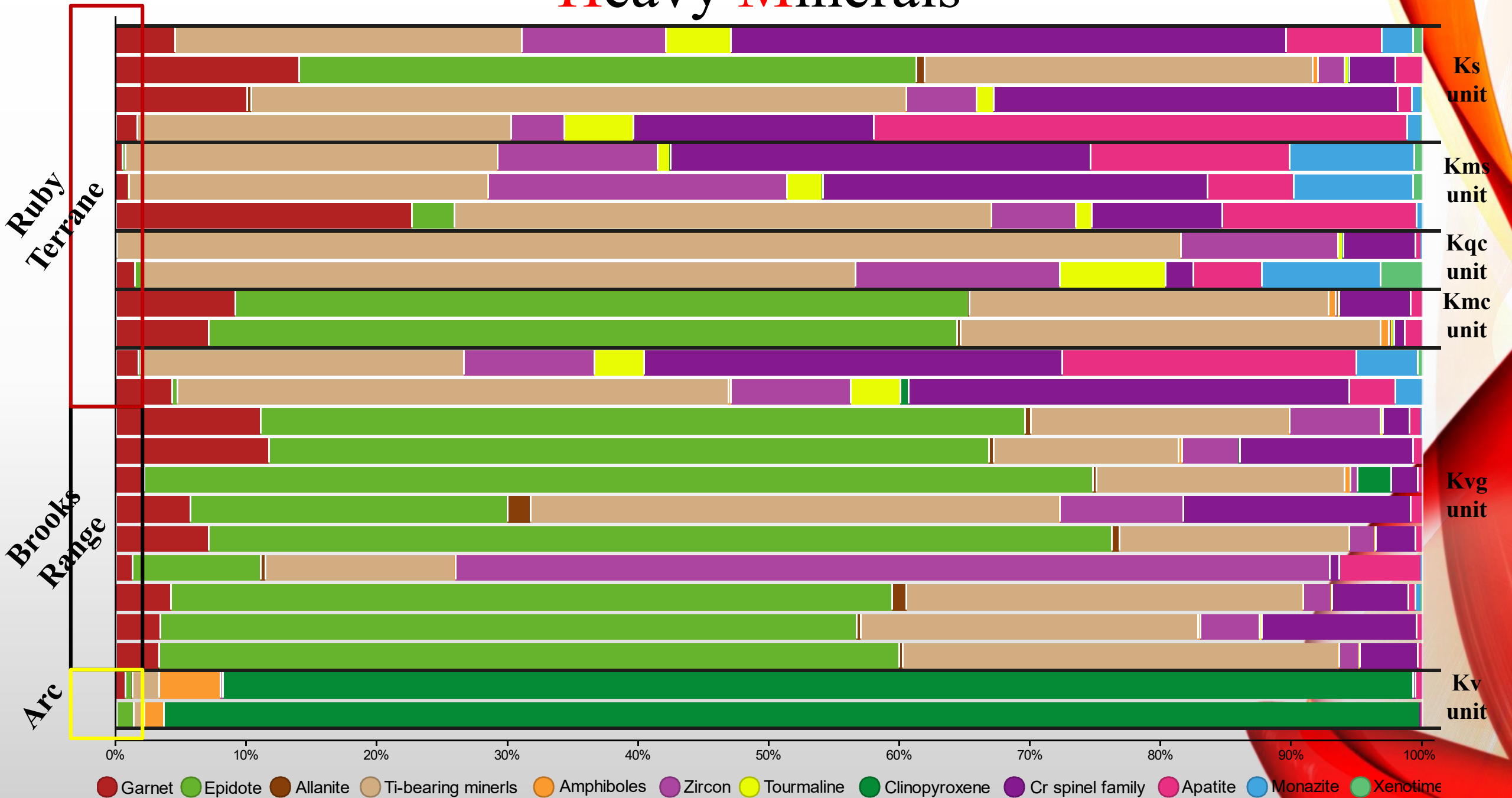



Seminara et al., 2025b (submitted to sedimentology)

Seminara et al., 2025b (submitted to sedimentology)

# Heavy Minerals



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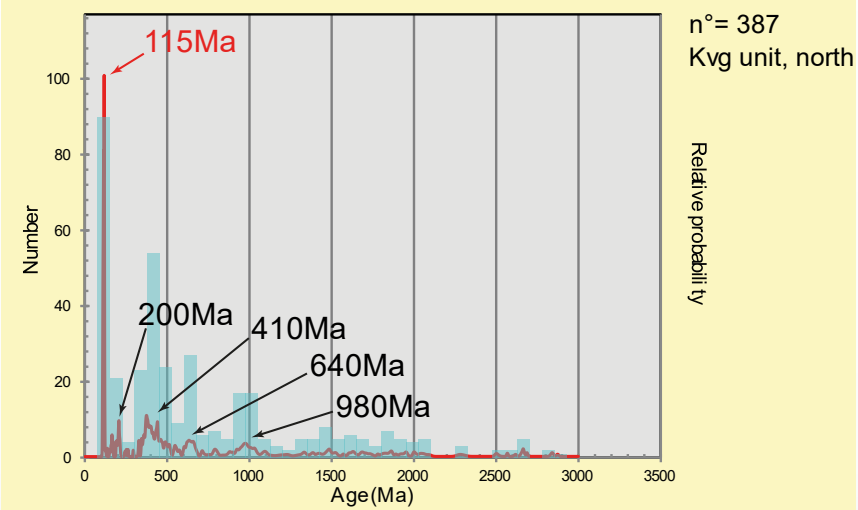


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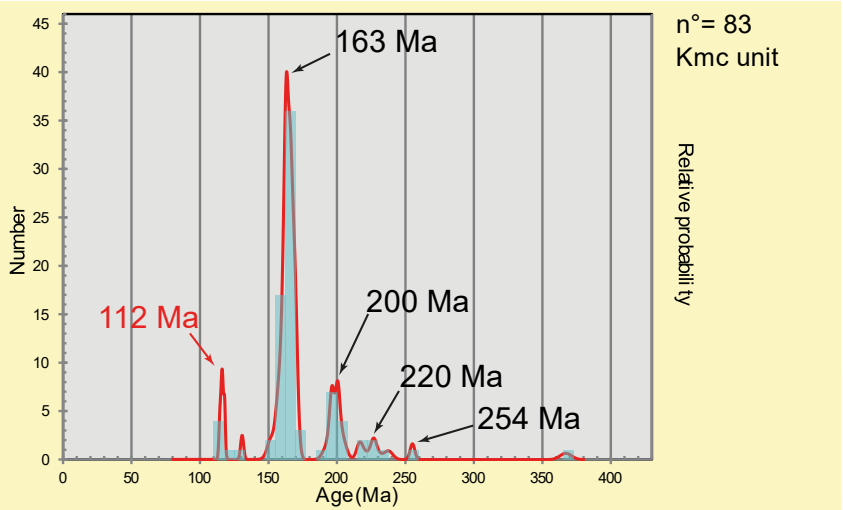
Kvg unit, north

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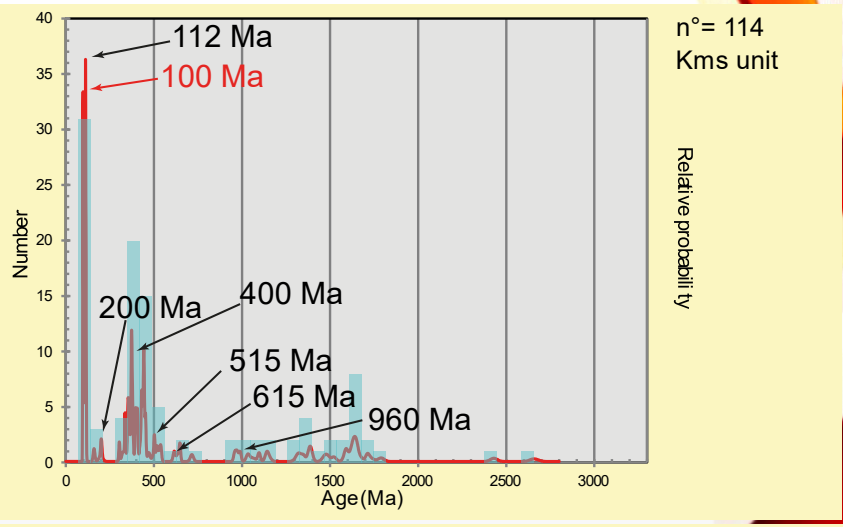
Kmc unit




n°= 114
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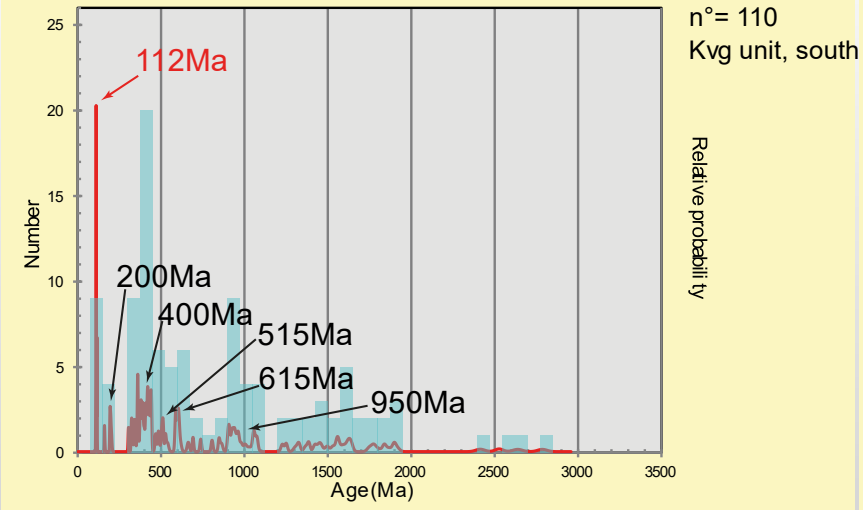
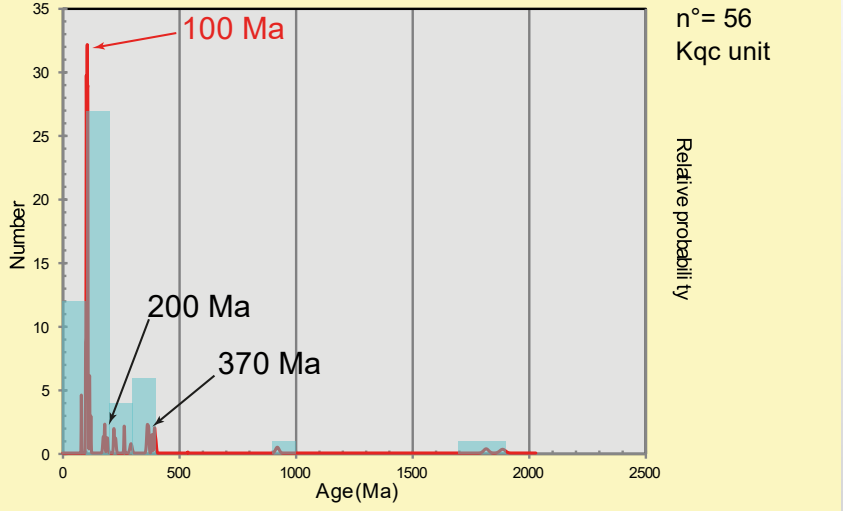
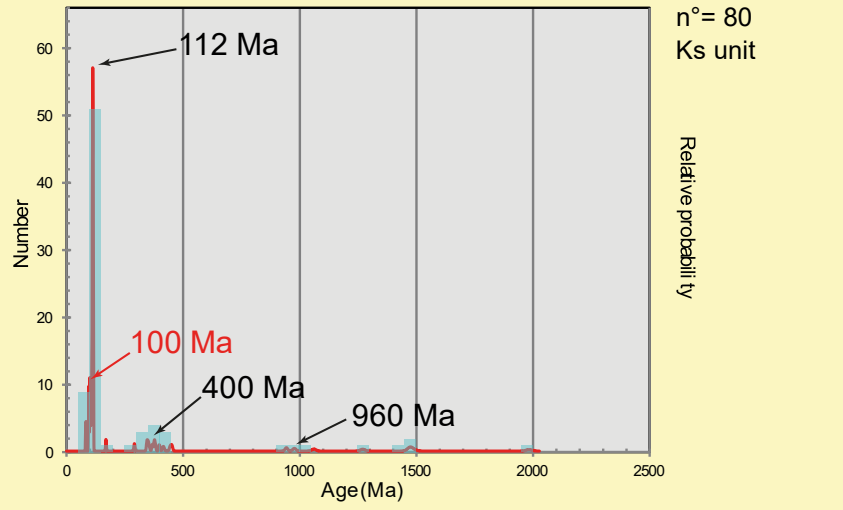



n°= 110
Kvg unit, south



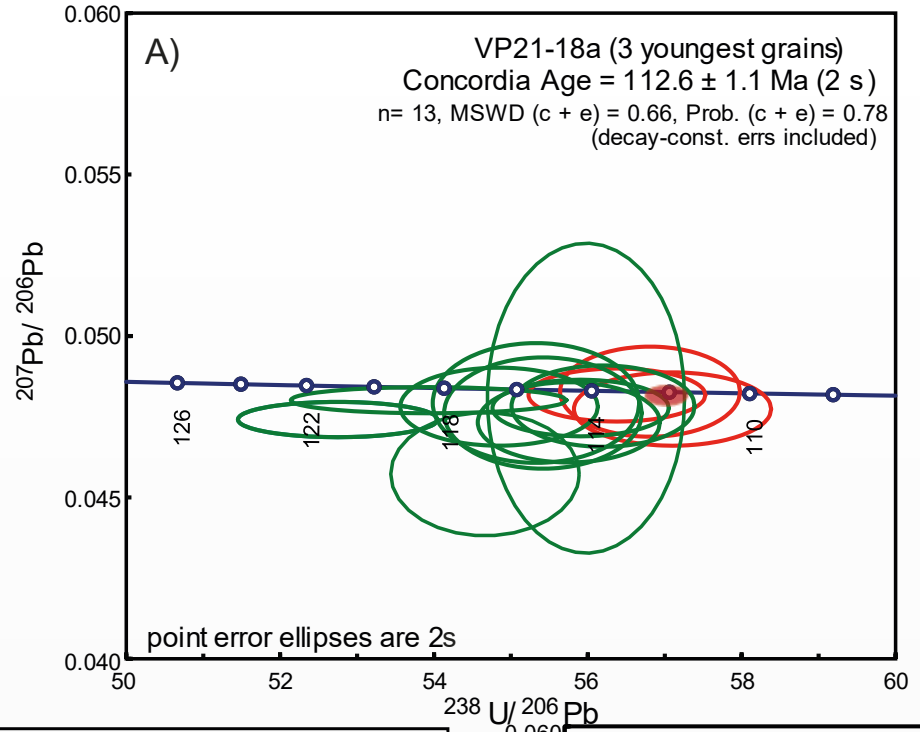

n°= 56
Kqc unit

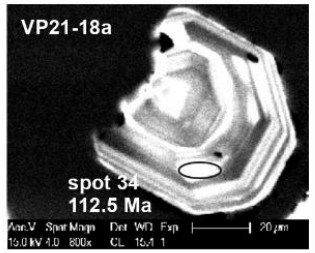


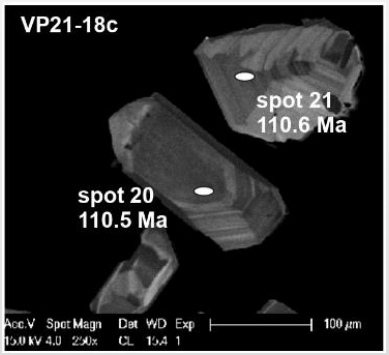

n°= 80
Ks unit

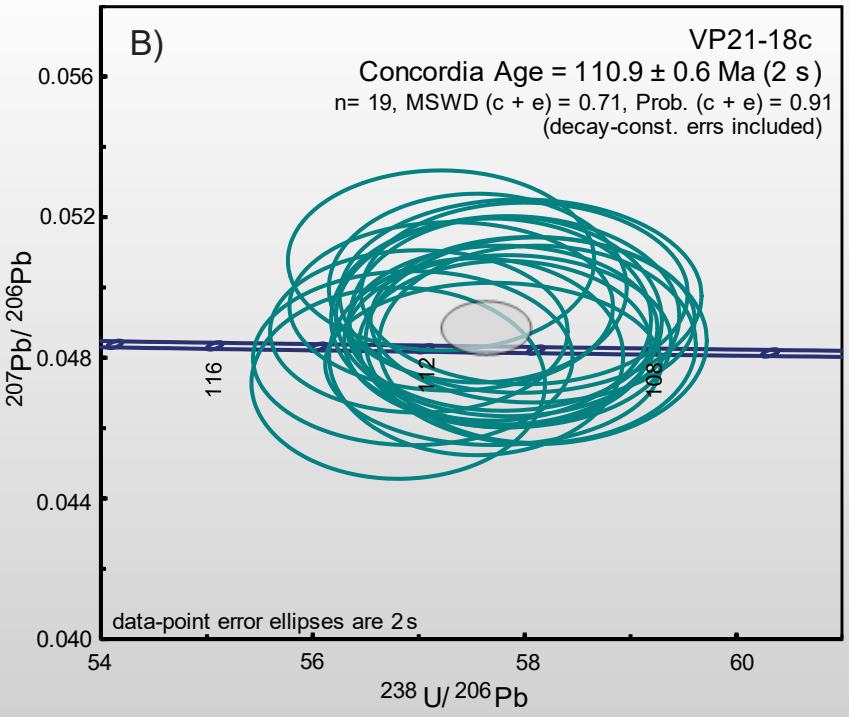
Seminara et al., (in prep.)

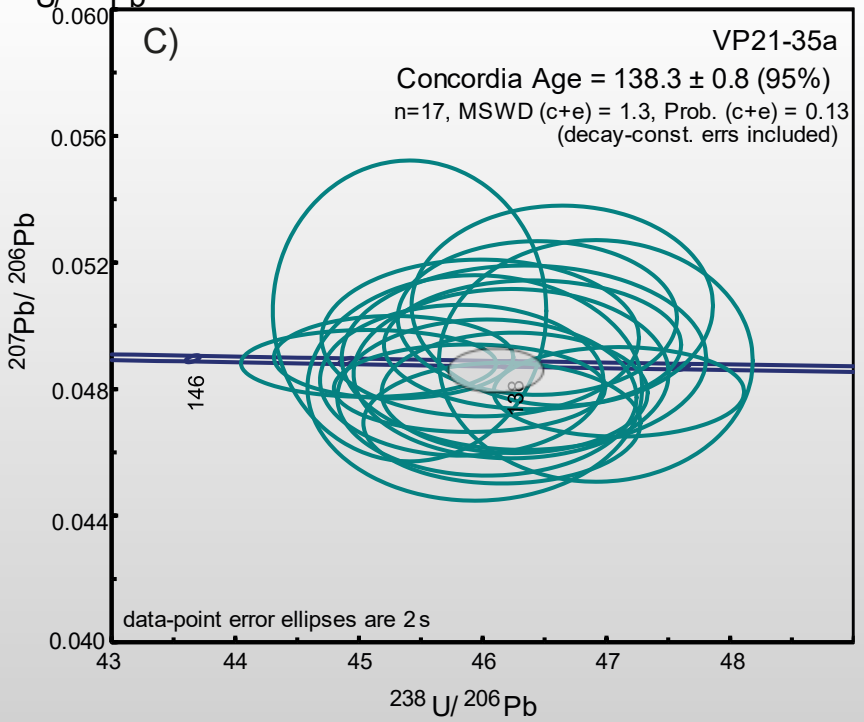
# U-PB tuff ages

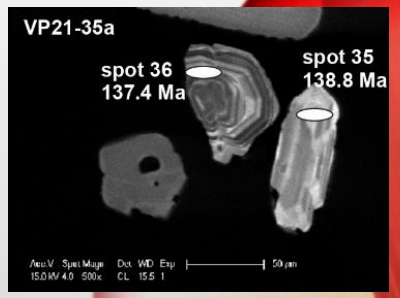


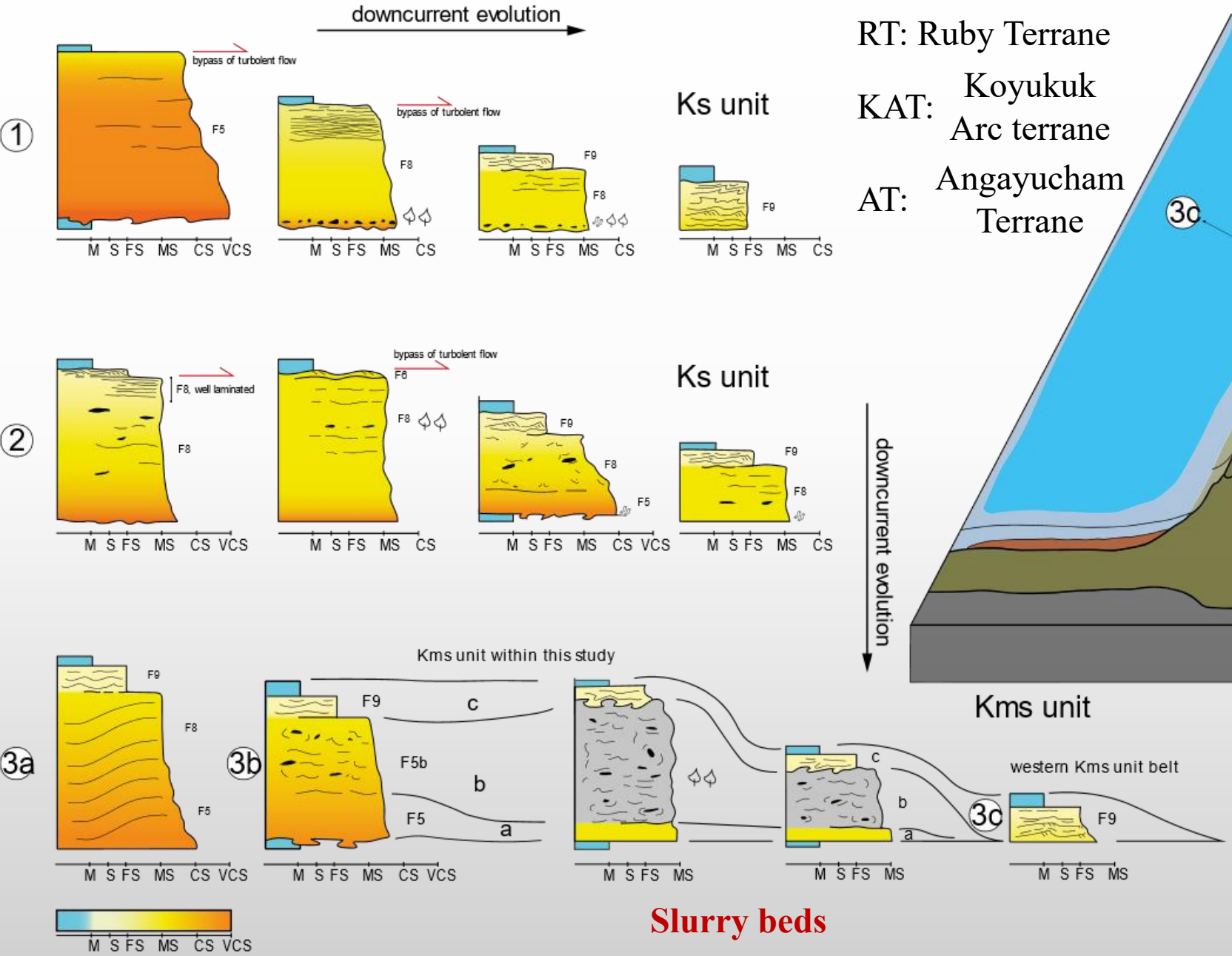




Seminara et al., 2025a

# Paleoenvironmental reconstruction

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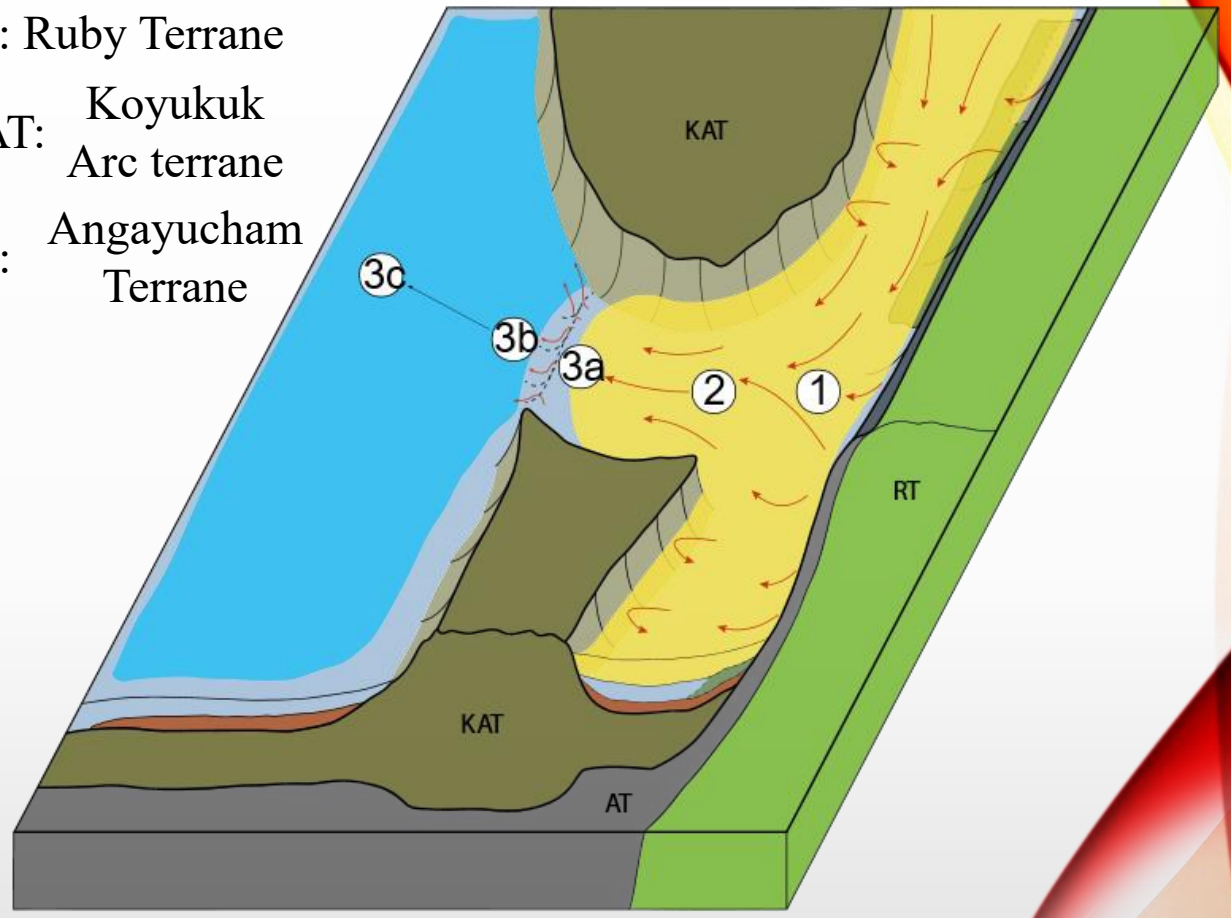


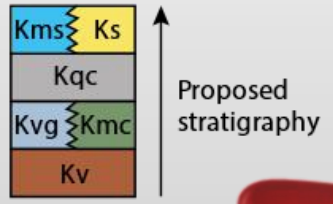


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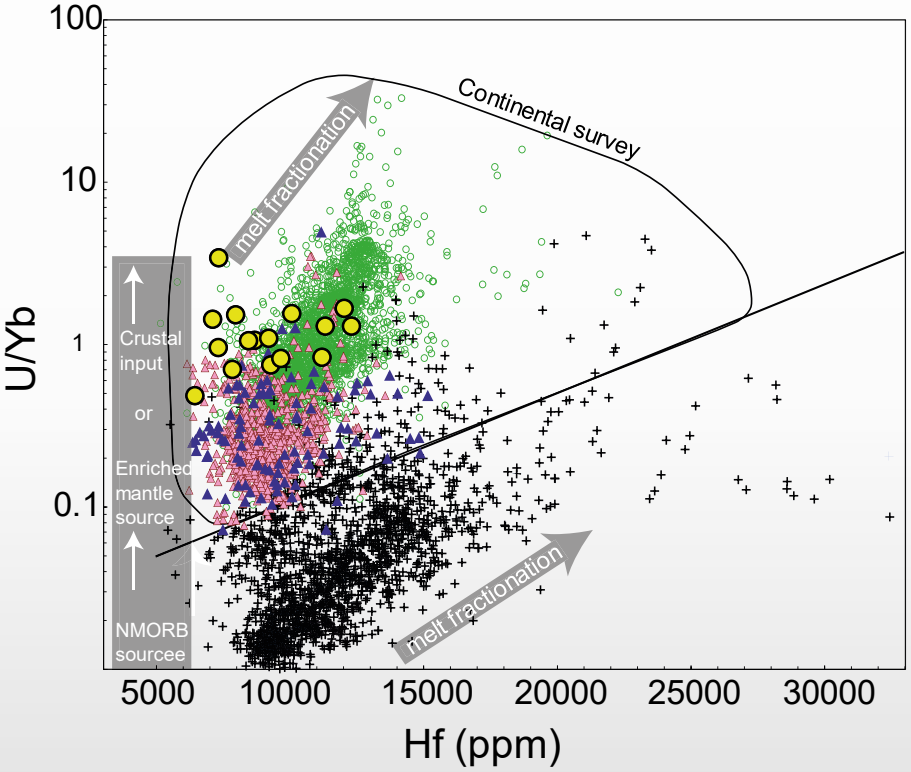
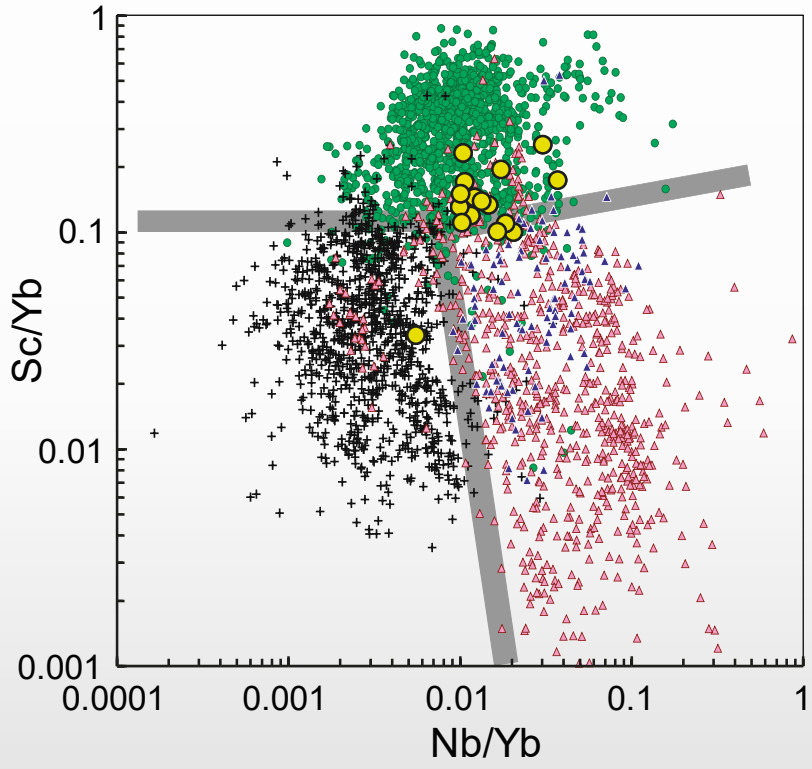
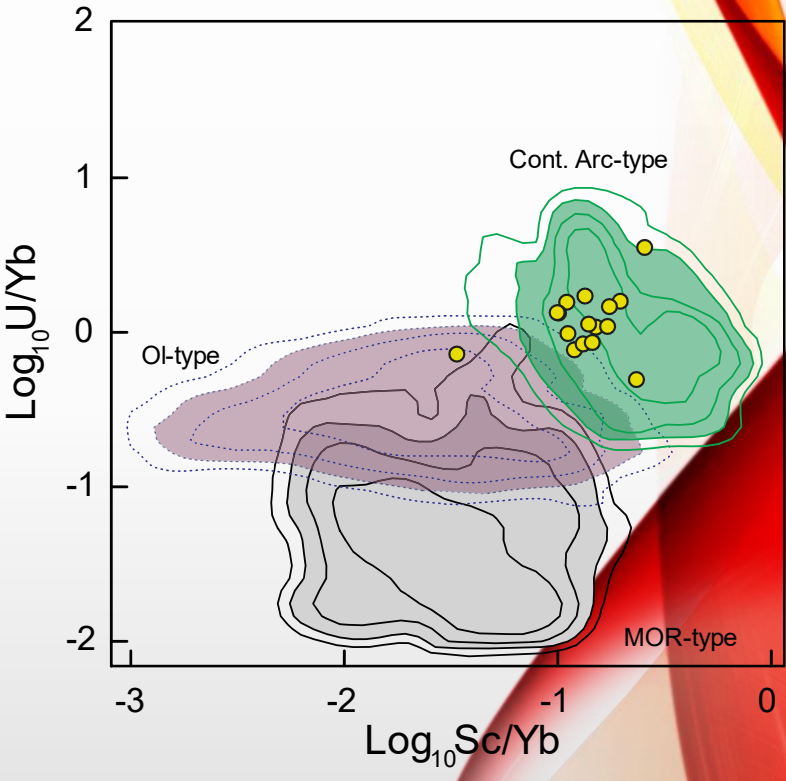



Iceland

Hualalai, Hawaii

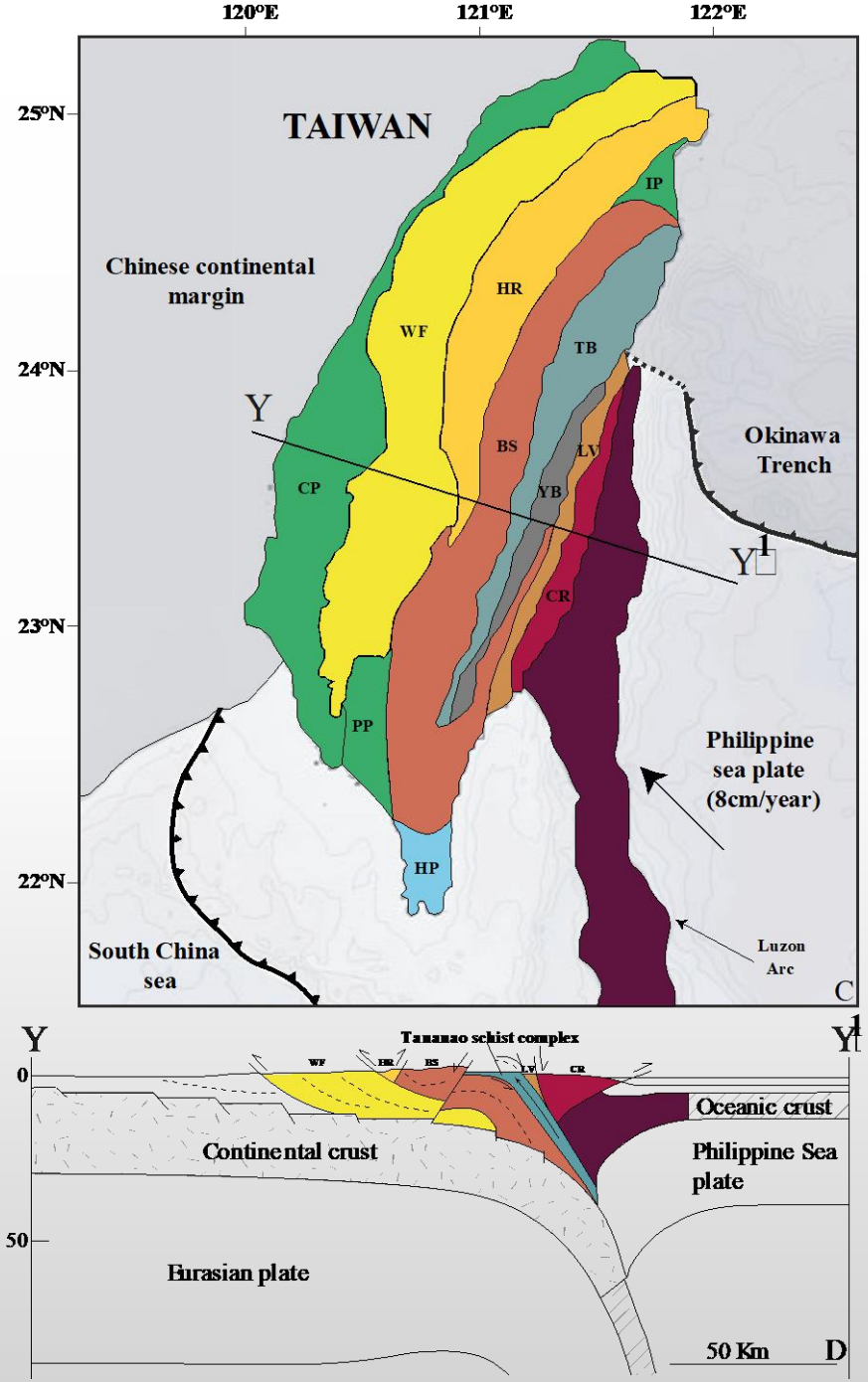
Mid-ocean ridge compilation

Continental arc compilation

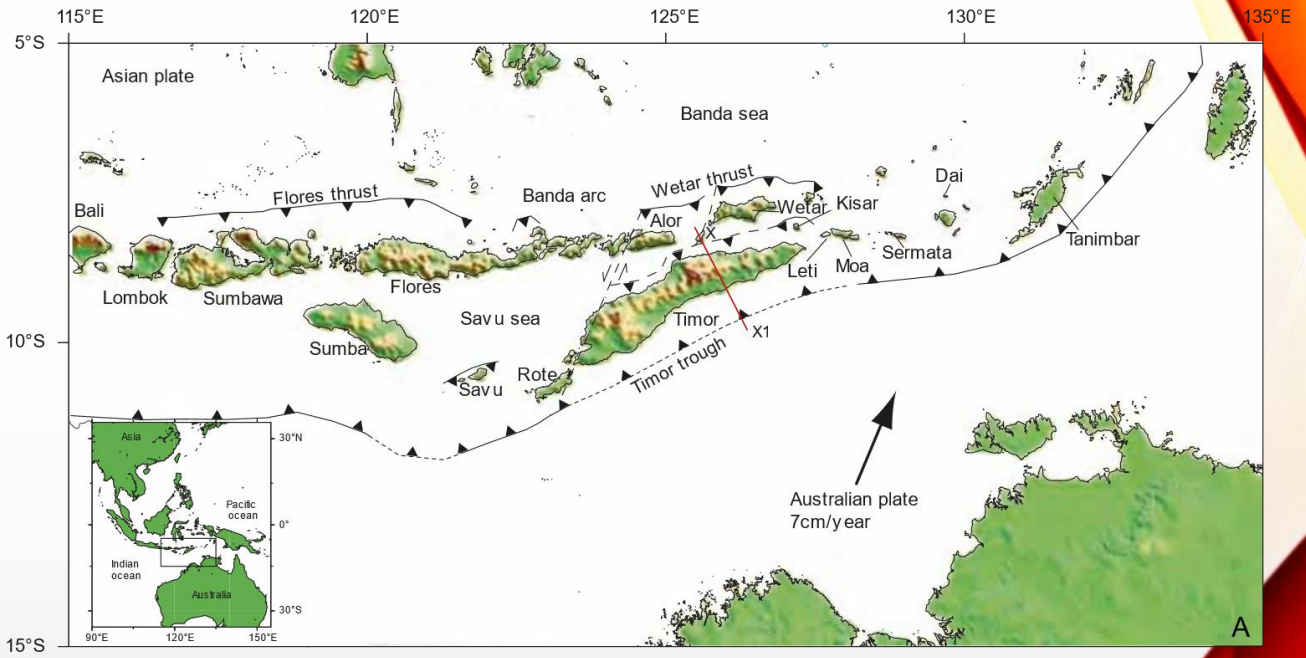
Early Cretaceous YKB arc compilation

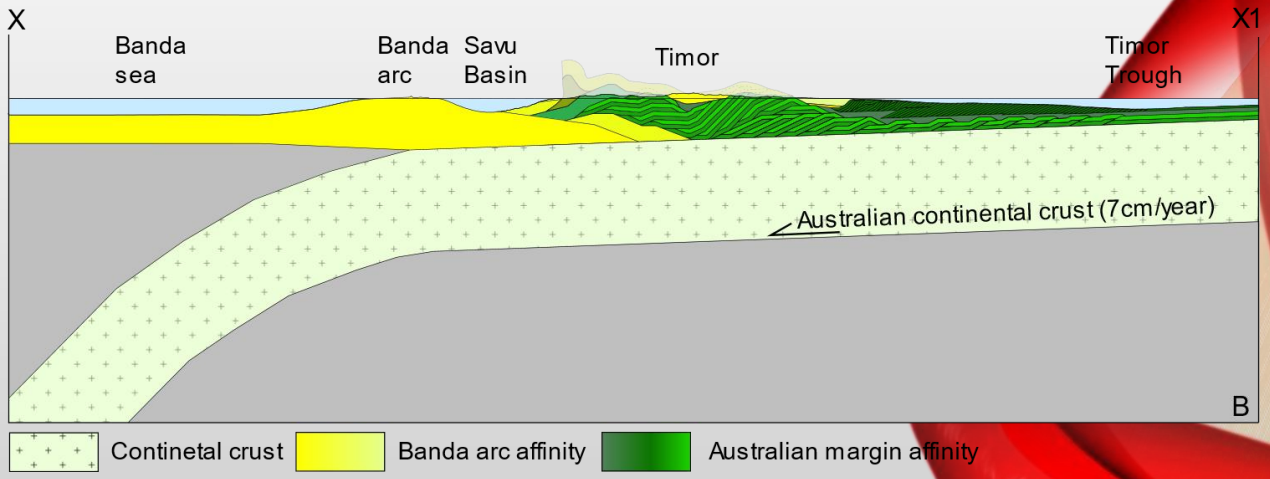
Seminara et al., (in prep.)

# South-east Asia Comparison




Seminara et al., 2025b (submitted to sedimentology)




Seminara et al., 2025a