



Government of Canada  
Gouvernement du Canada

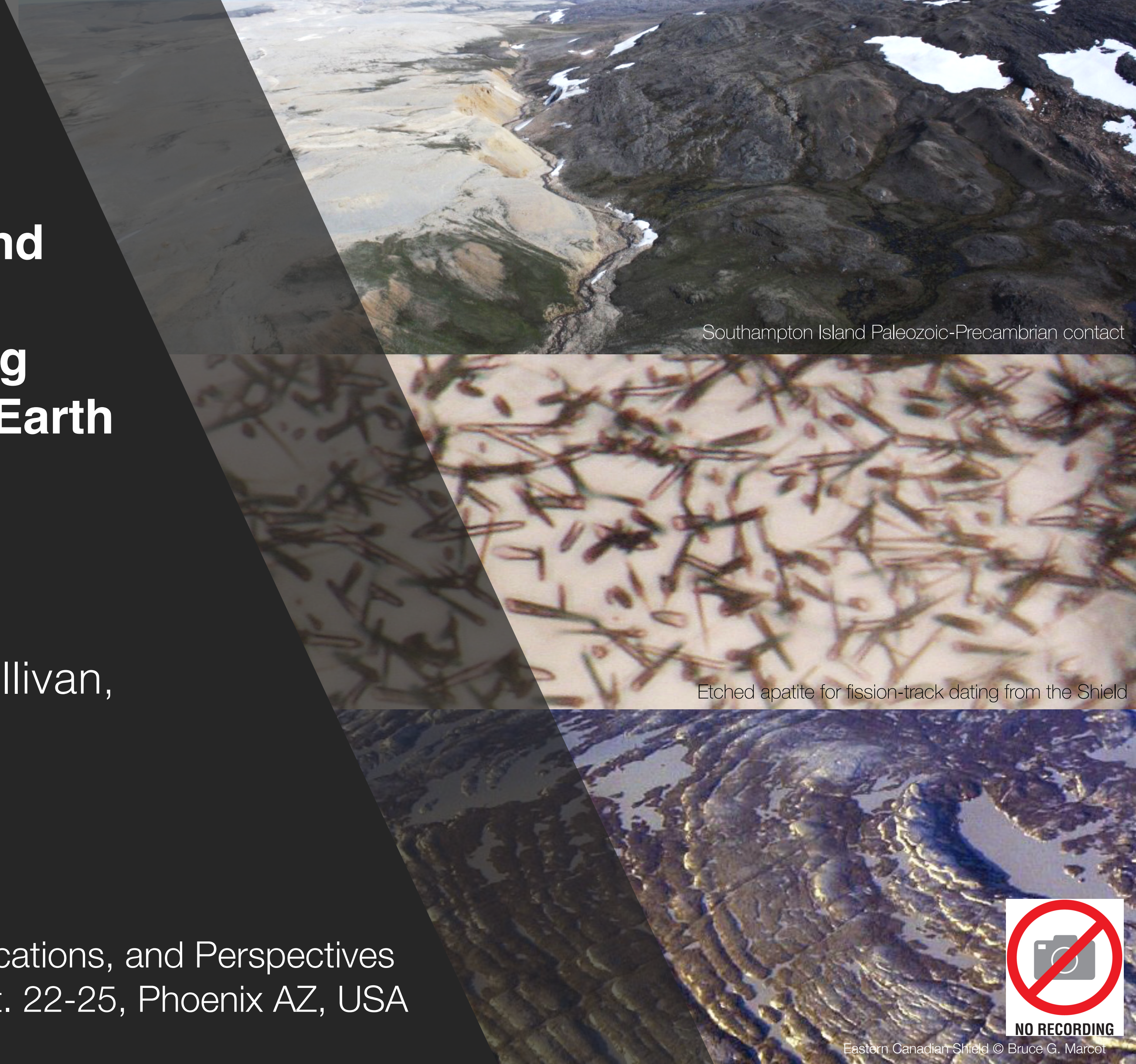
# Creating the Canadian Shield and the 'greatest' unconformity: Enhanced crustal erosion during Rodinia breakup and Snowball Earth glaciations

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Paper 79-12 Session T43.  
Diversifying Geochronology:  
Innovations in Techniques, Applications, and Perspectives  
2019 GSA Annual Meeting, Sept. 22-25, Phoenix AZ, USA



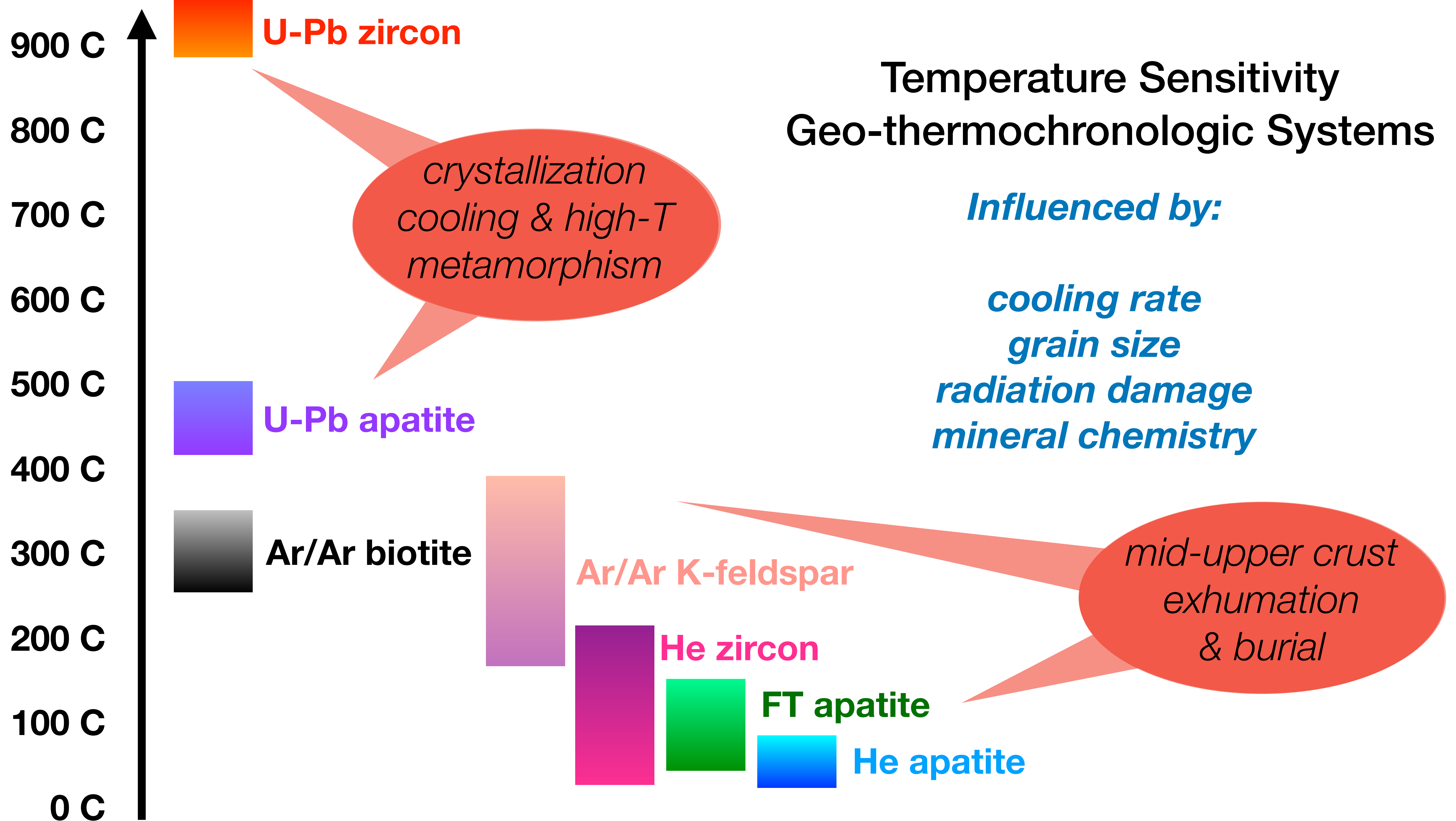
Southampton Island Paleozoic-Precambrian contact

Etched apatite for fission-track dating from the Shield



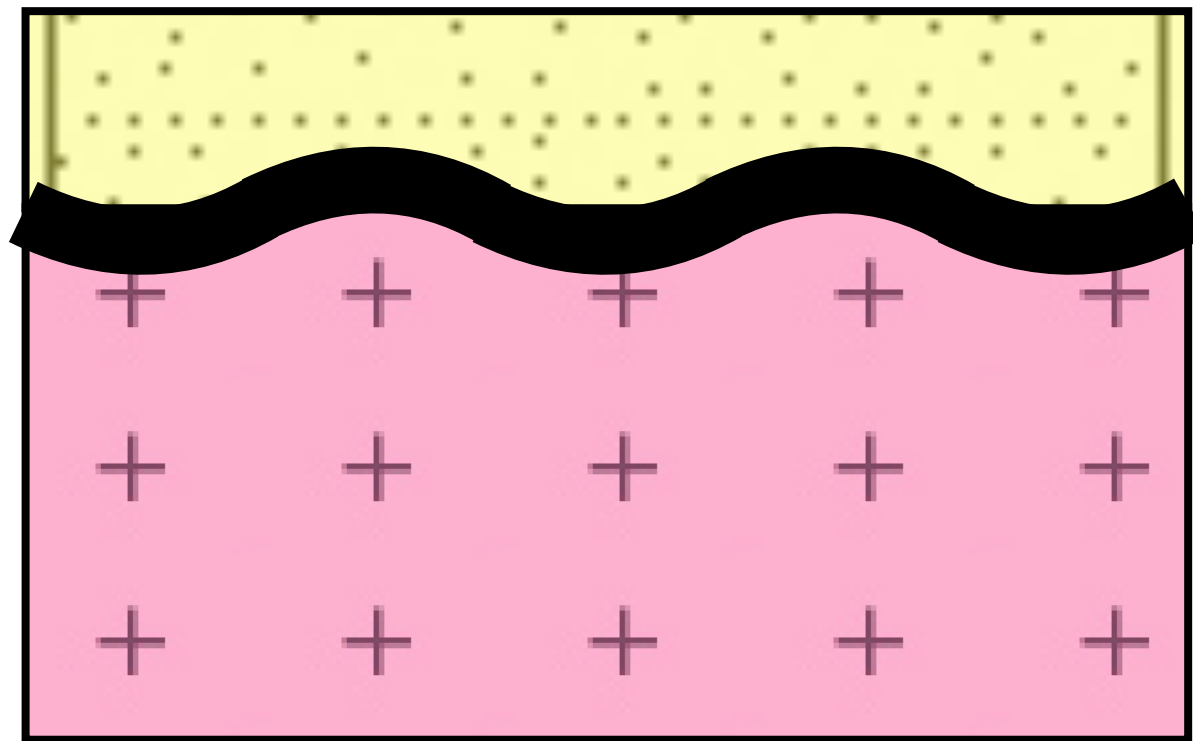
Eastern Canadian Shield © Bruce G. Marcot





**~ 1200 Ma absent  
26% of Earth history**

**~ 500 Ma**

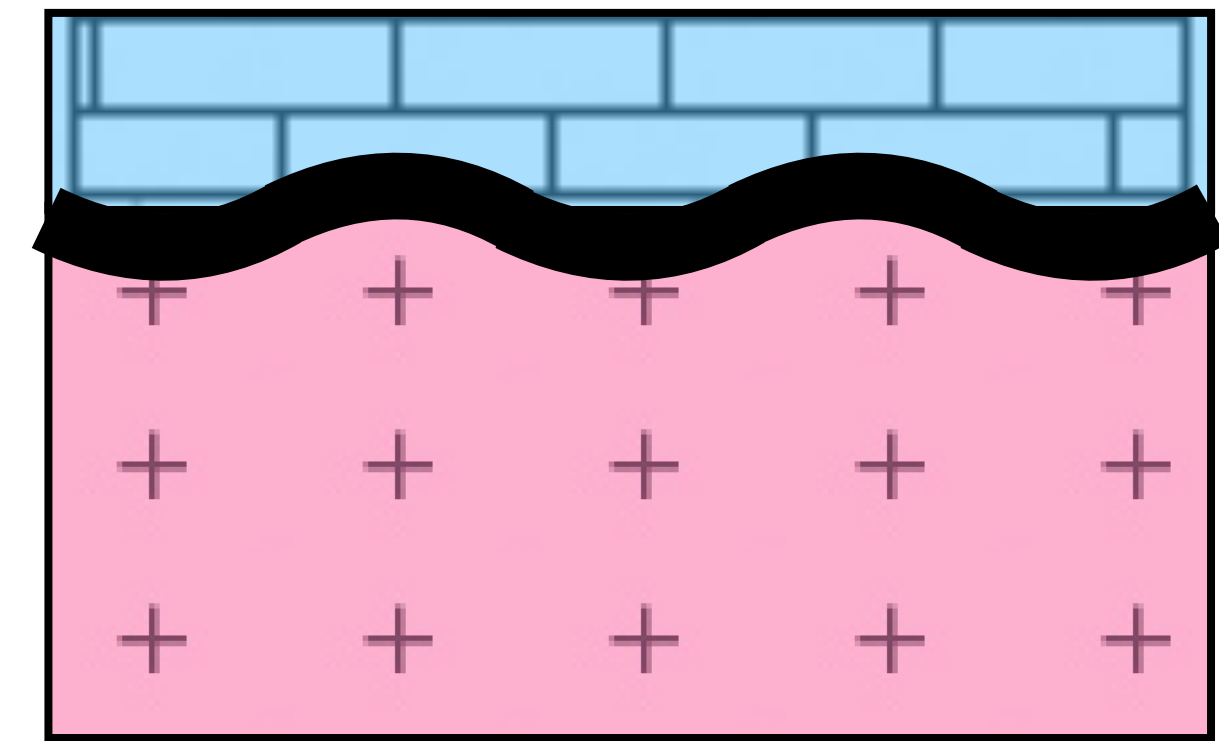


**~ 1700 Ma**

Great Unconformity  
Powell 1869  
Grand Canyon, USA

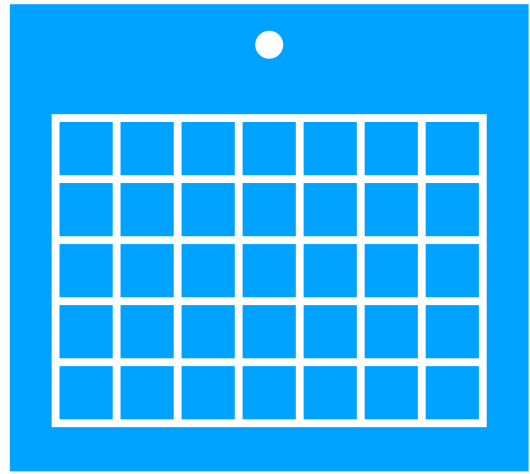
**~ 2250 Ma absent  
50% of Earth history**

**~ 450 Ma**

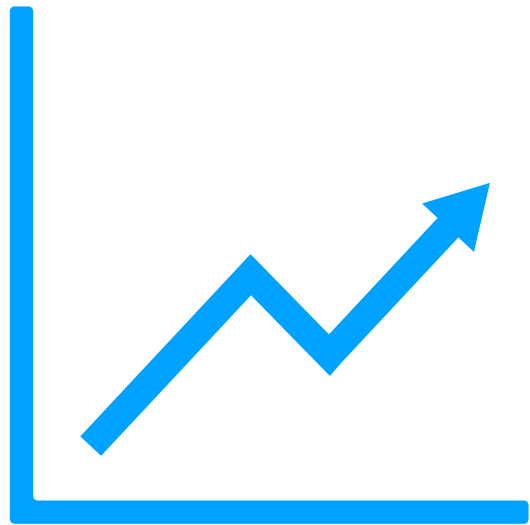


**~ 2700 Ma**

Canadian Shield  
Hudson Bay Lowlands  
Ontario, CAN



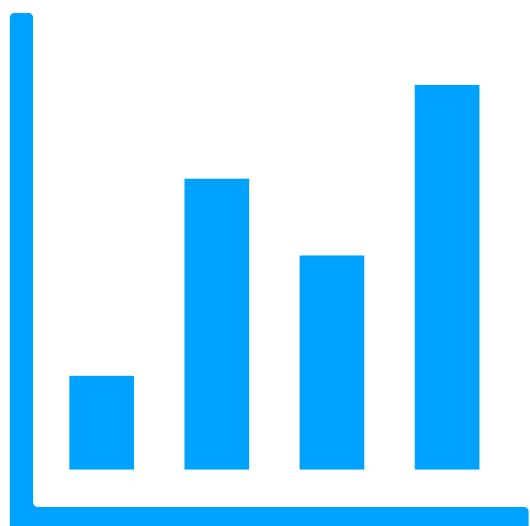
**When was the Canadian Shield eroded ?**



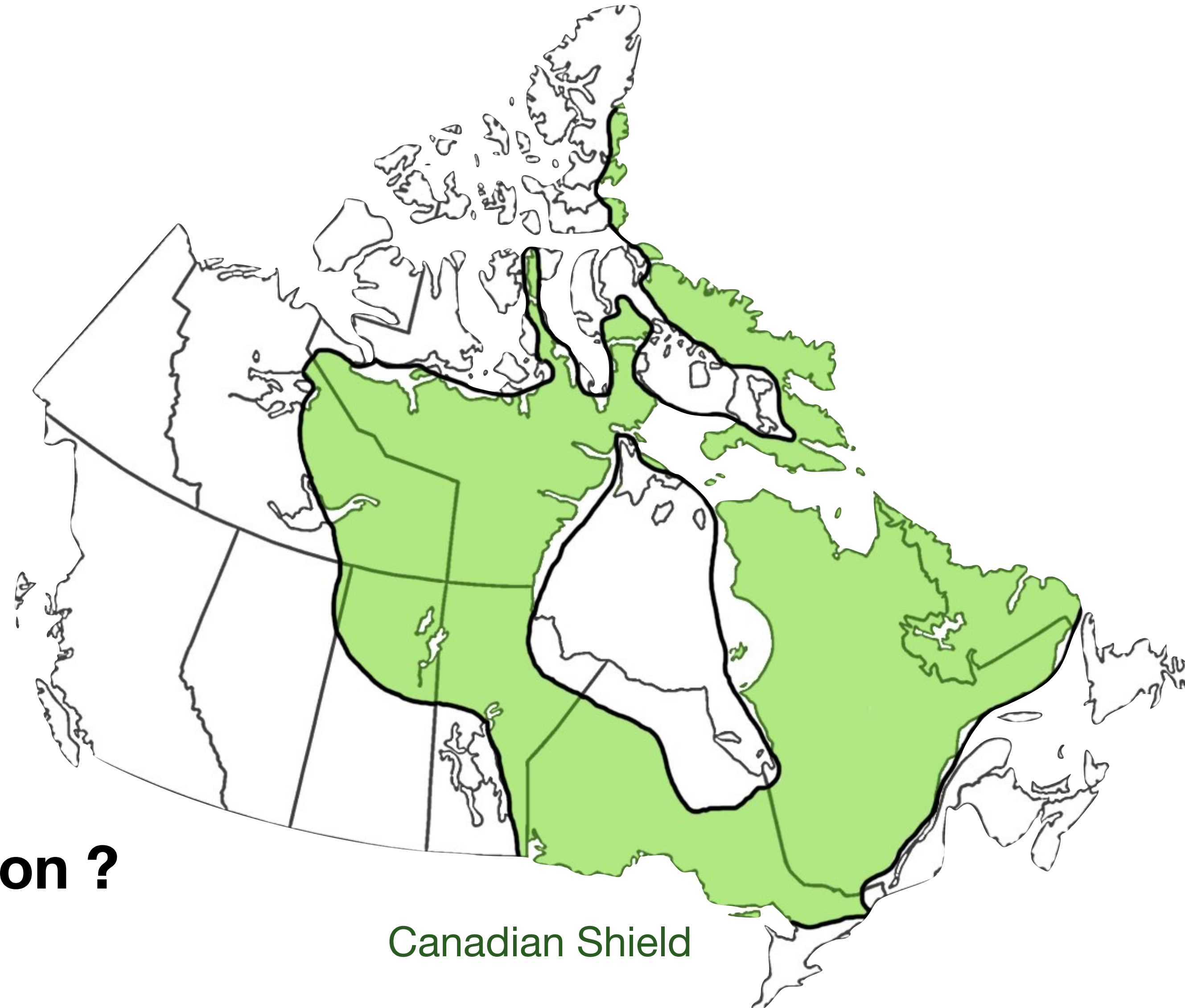
**Gradual ?  
or more episodic ?**



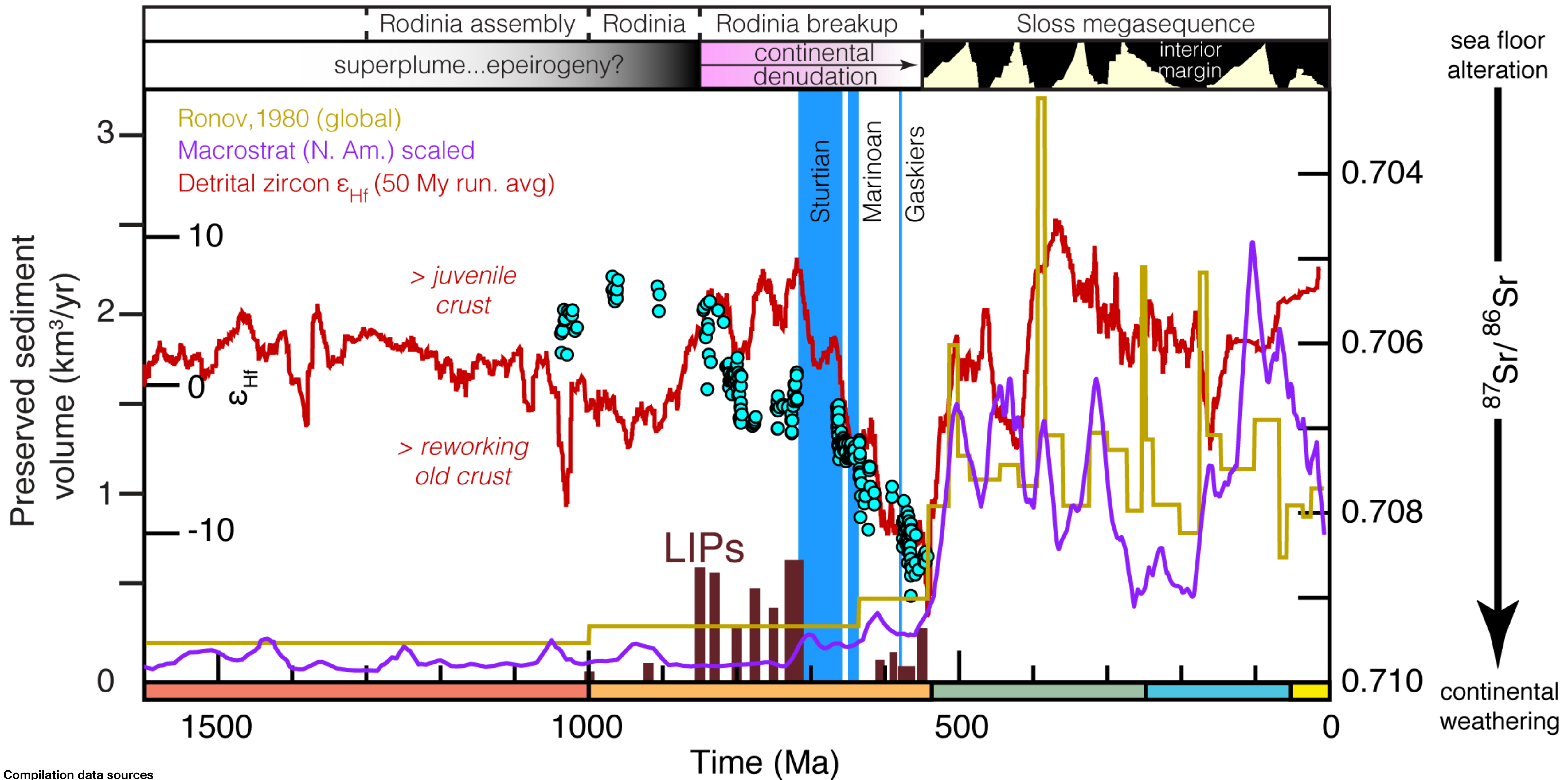
**Timing ?**



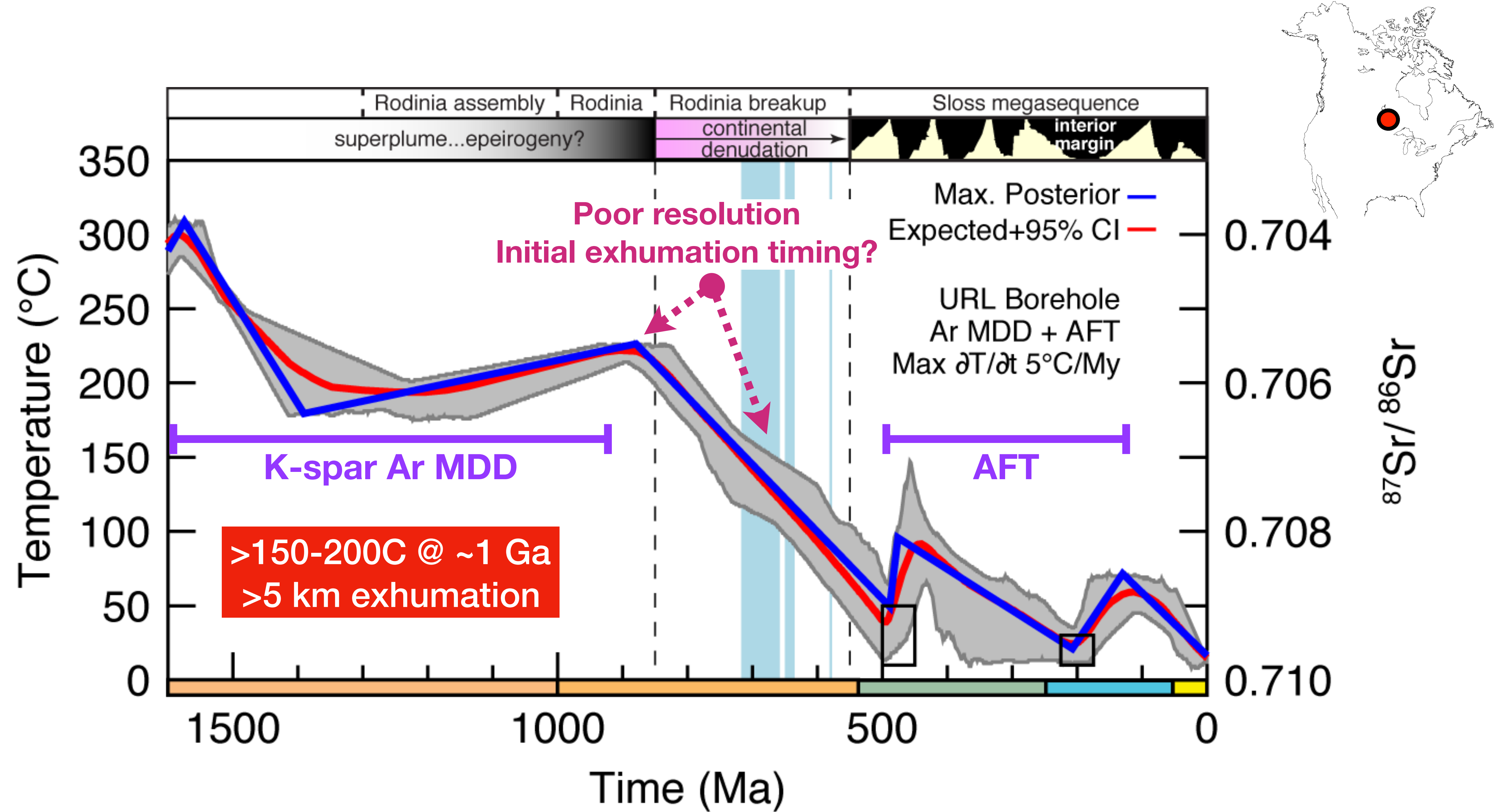
**Magnitude of exhumation ?**



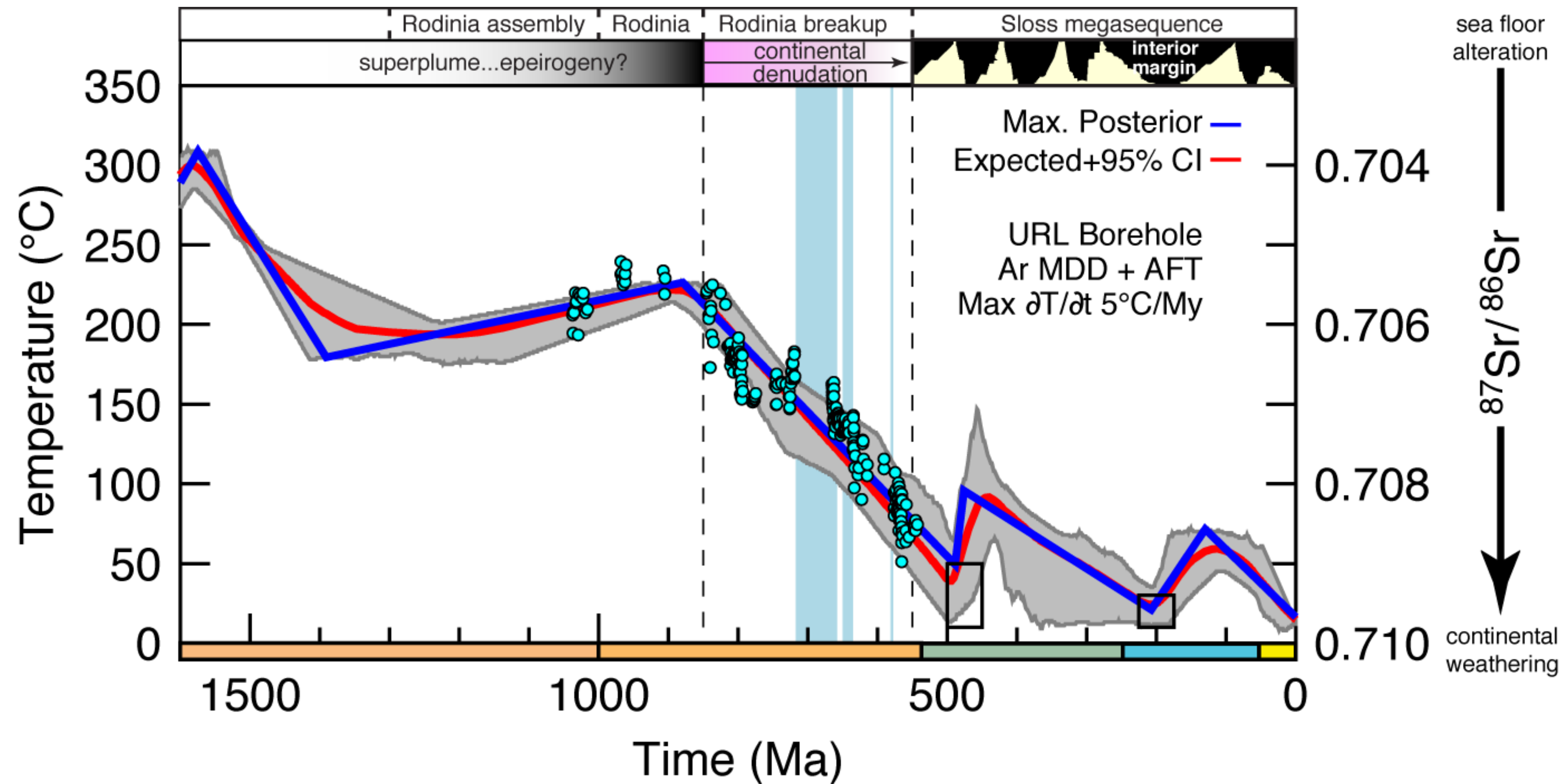




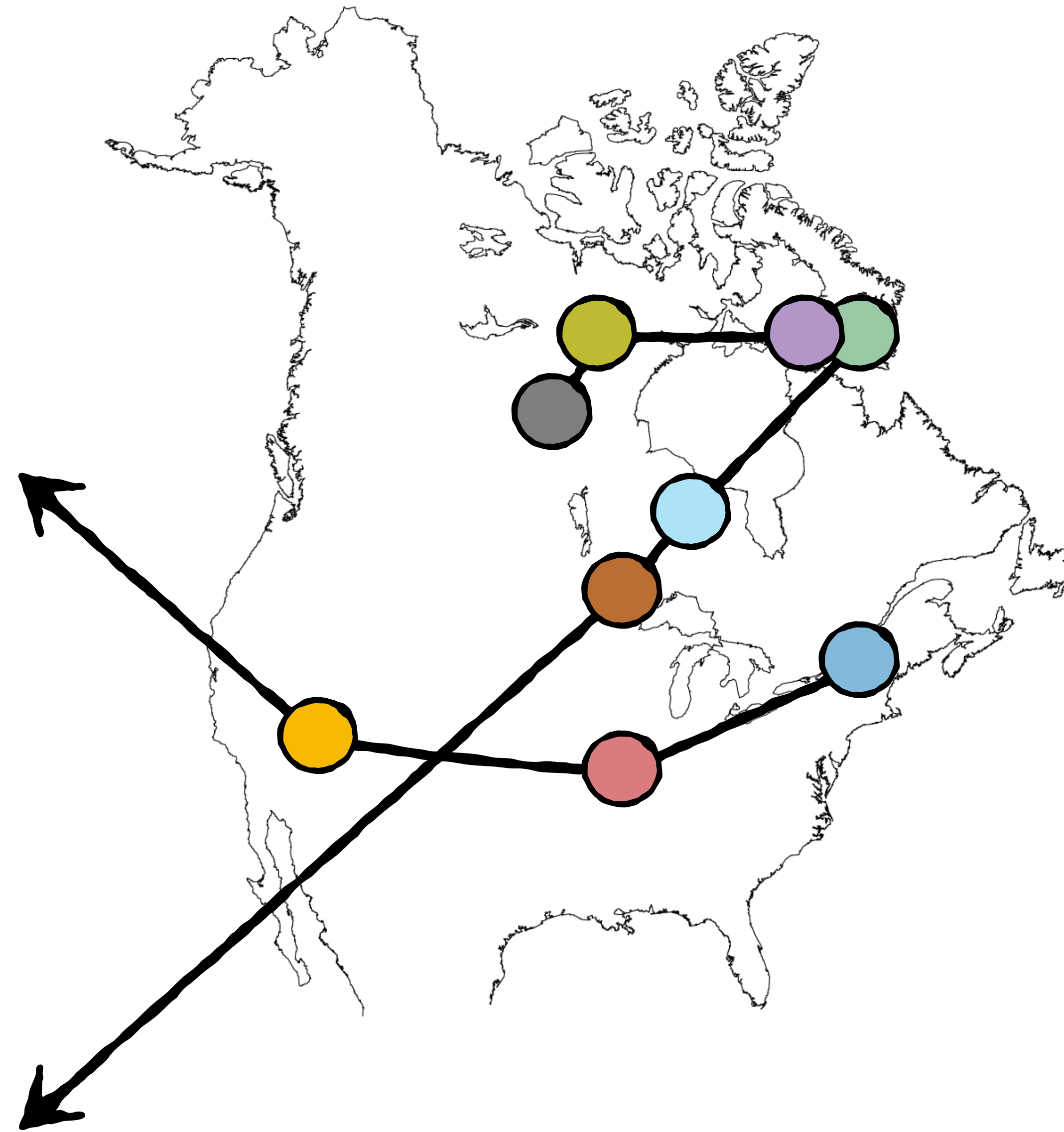
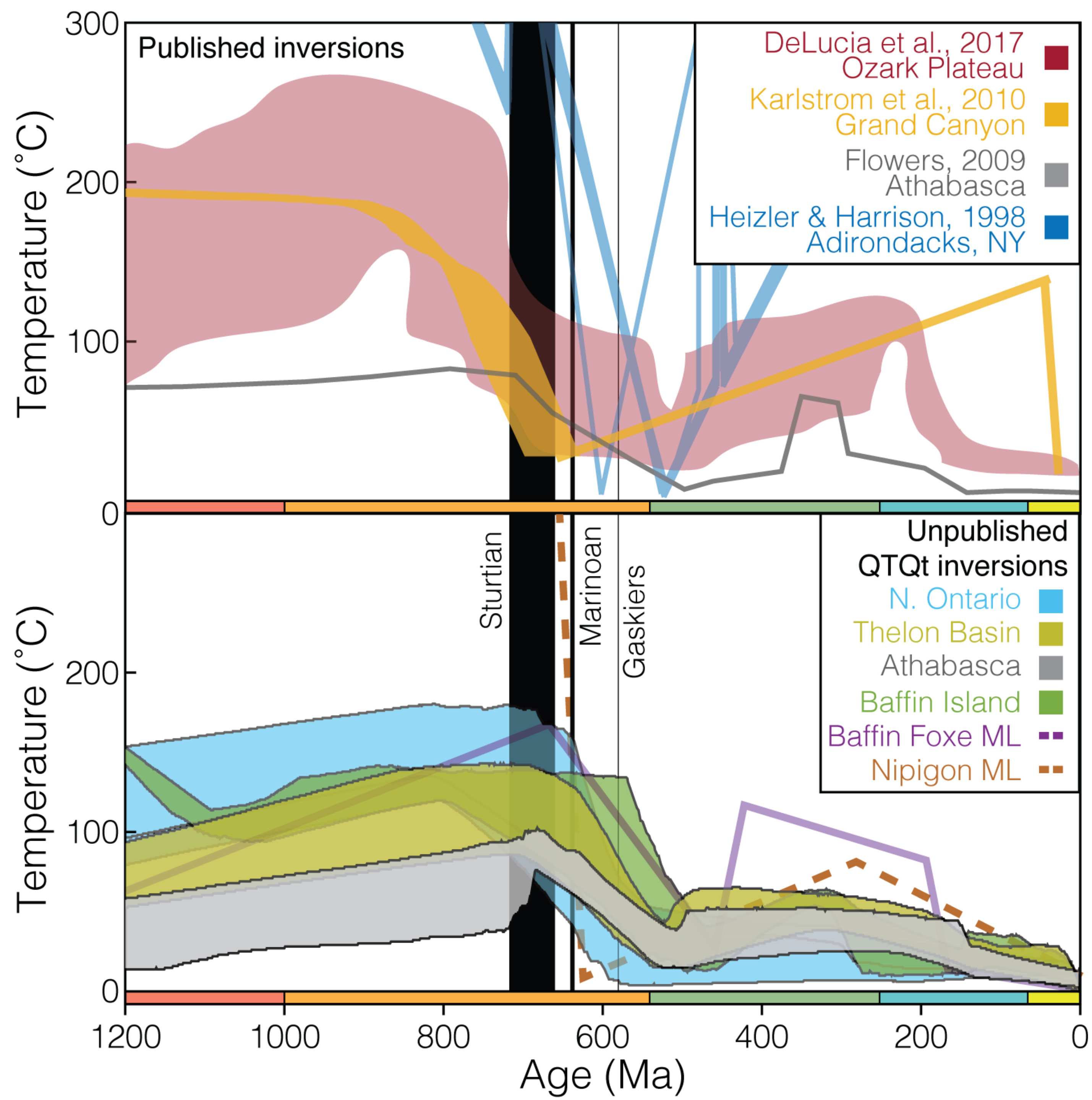




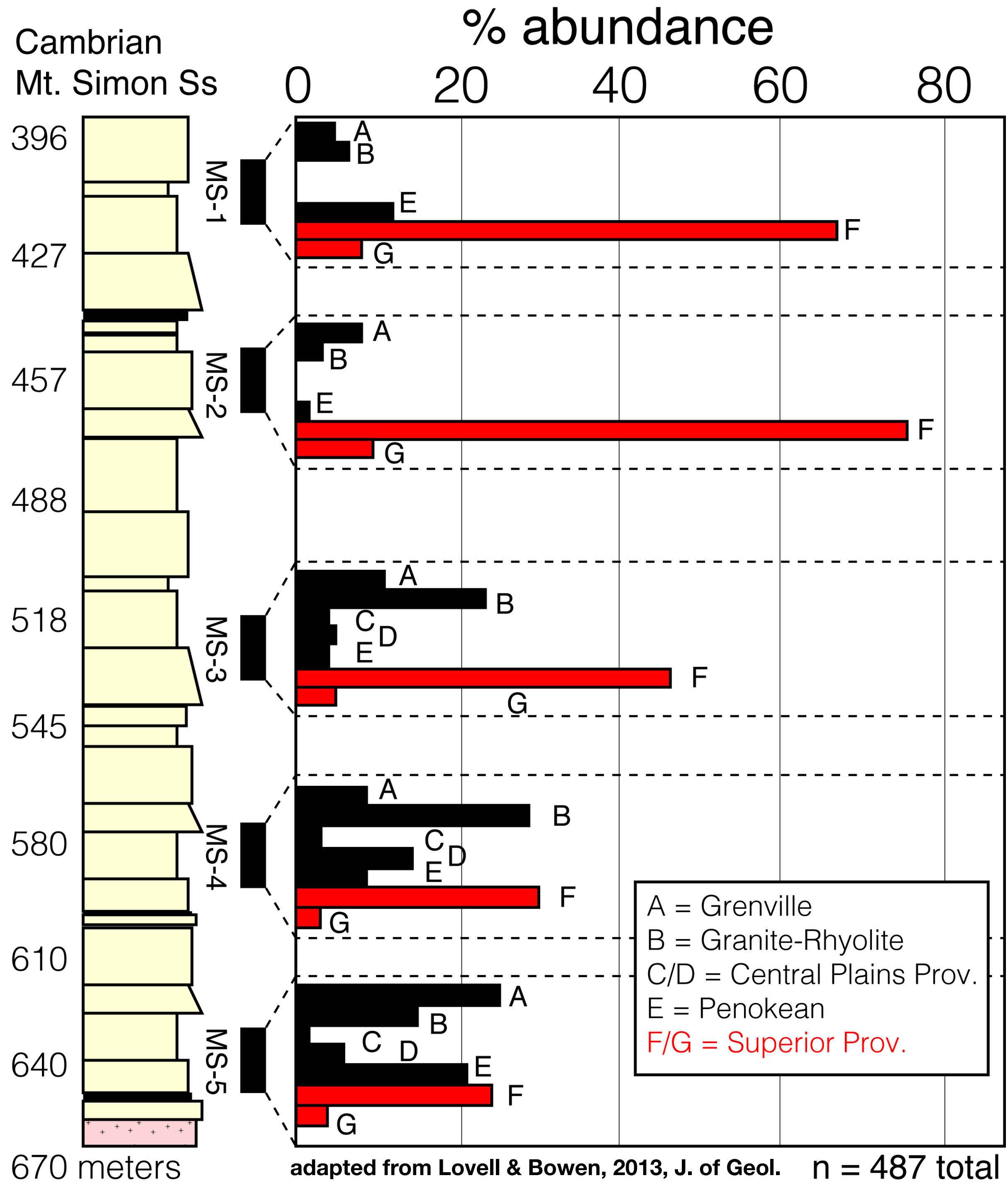




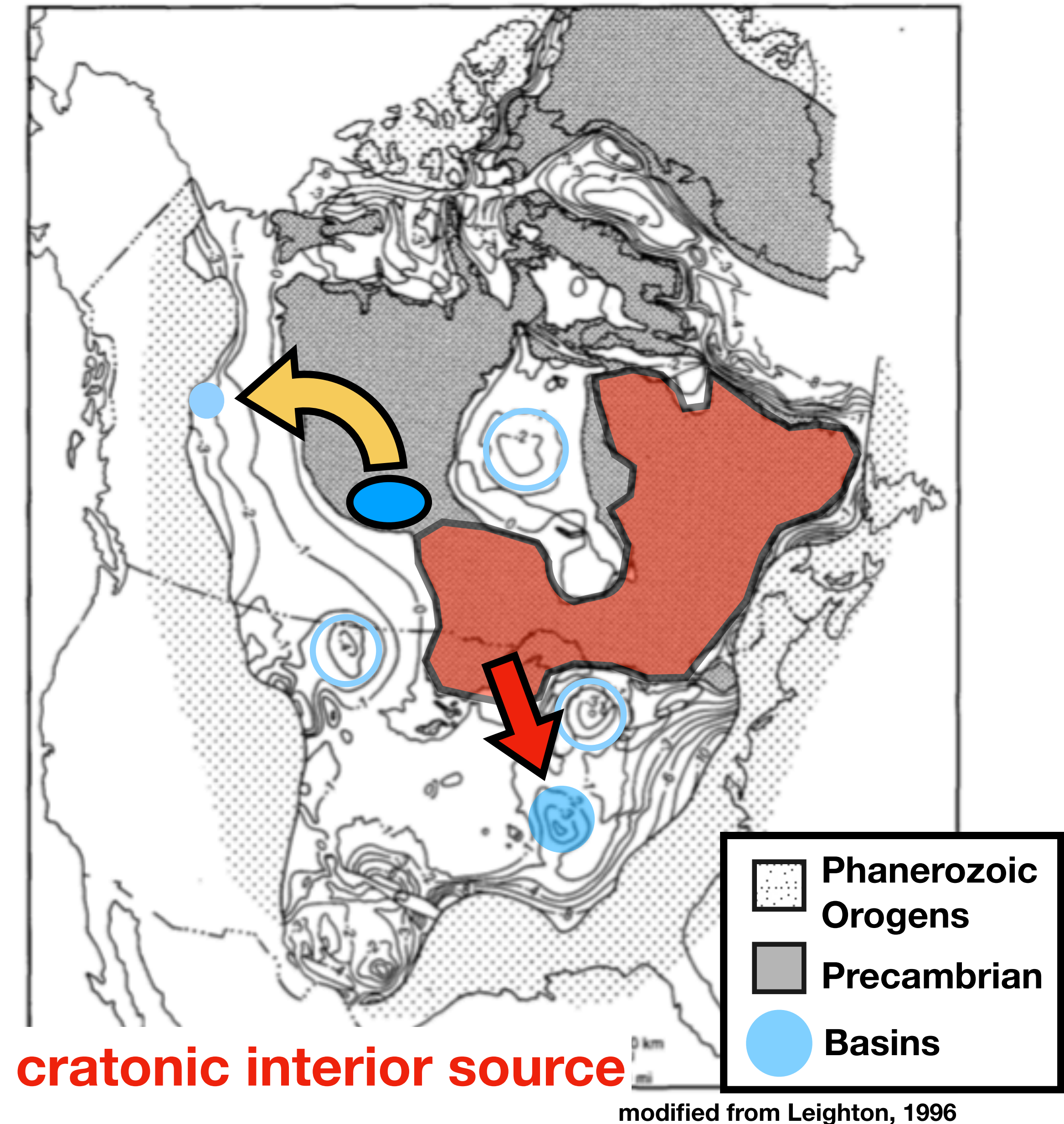






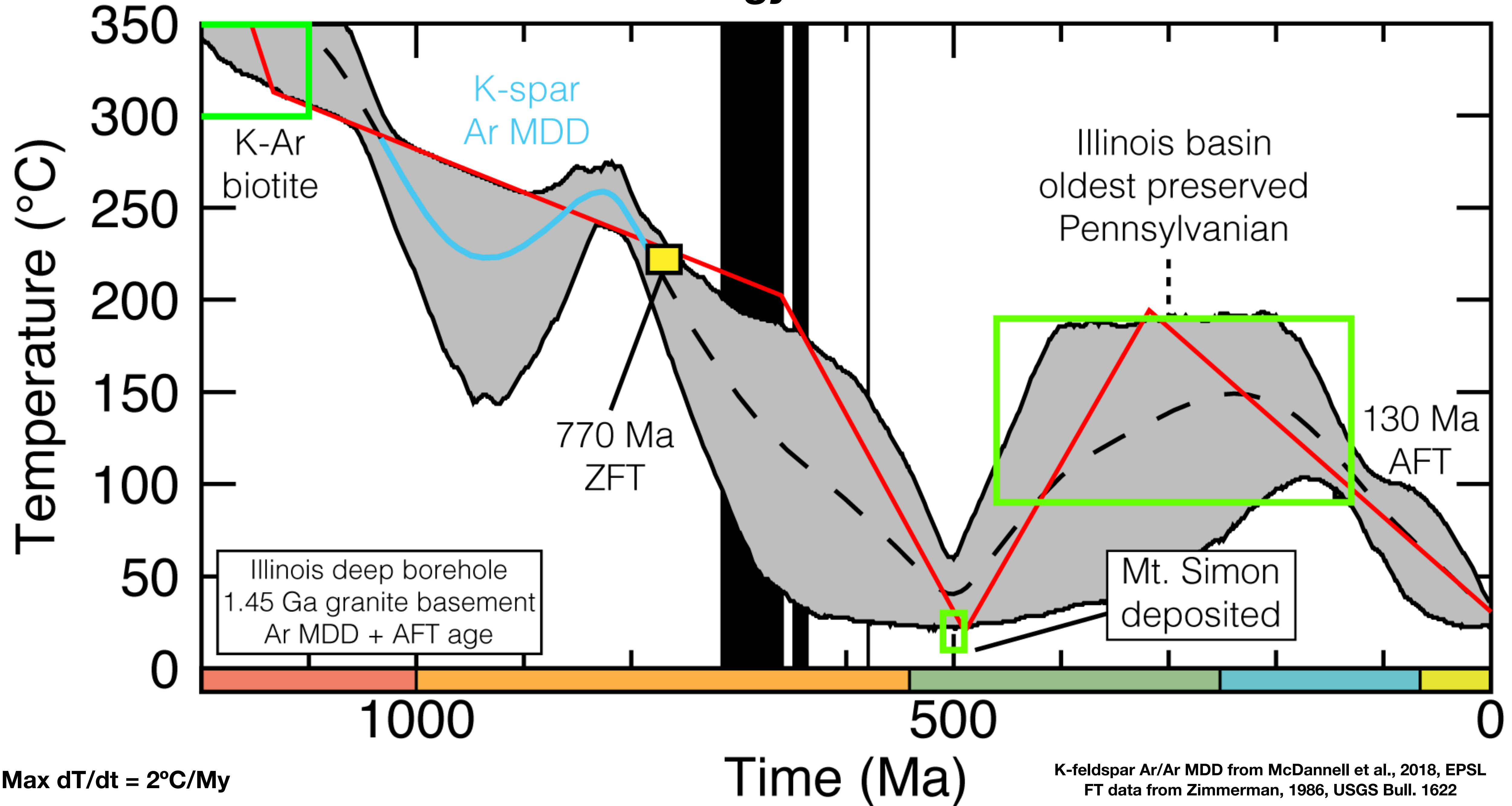


## Other evidence of Shield erosion?



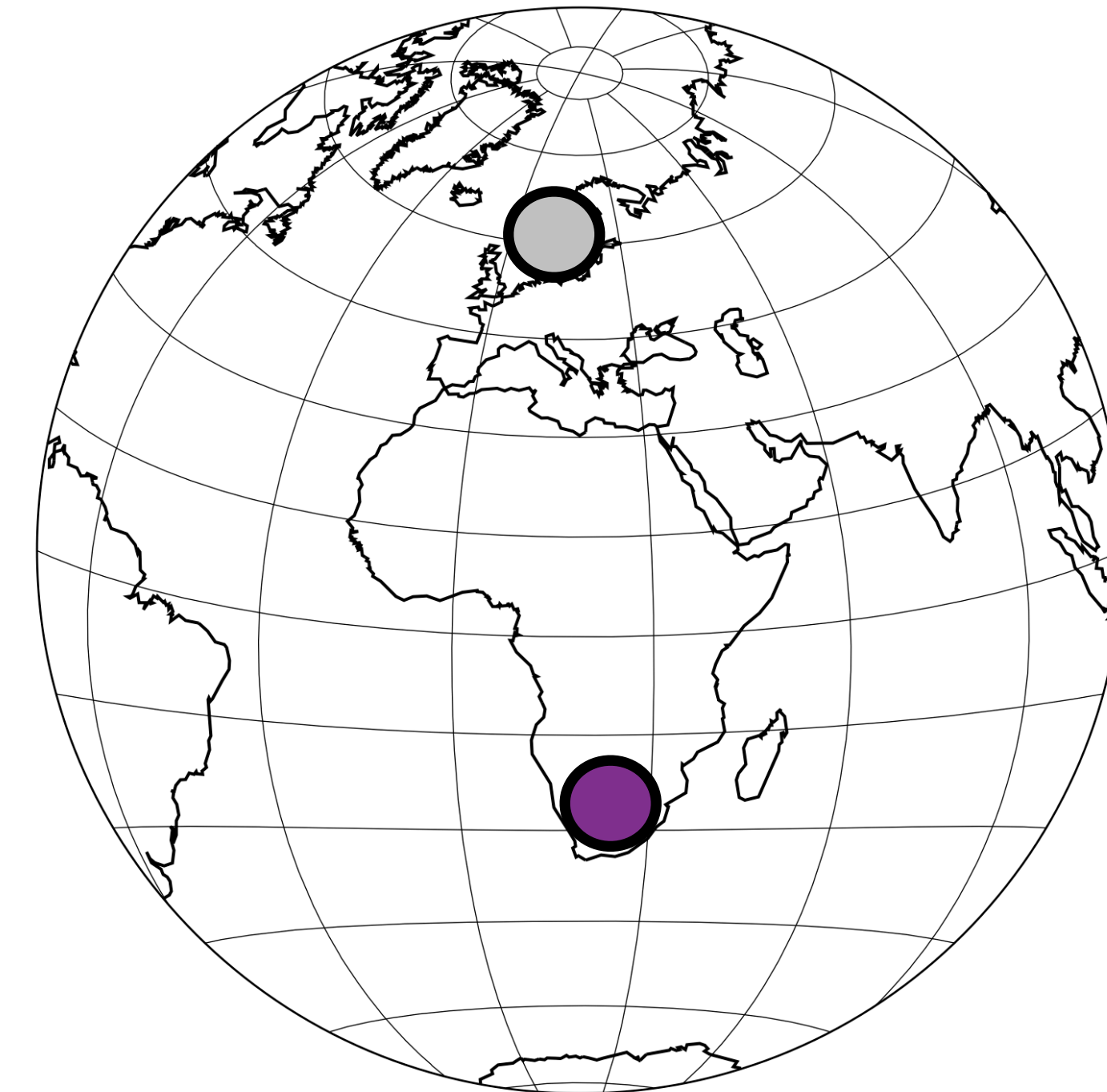
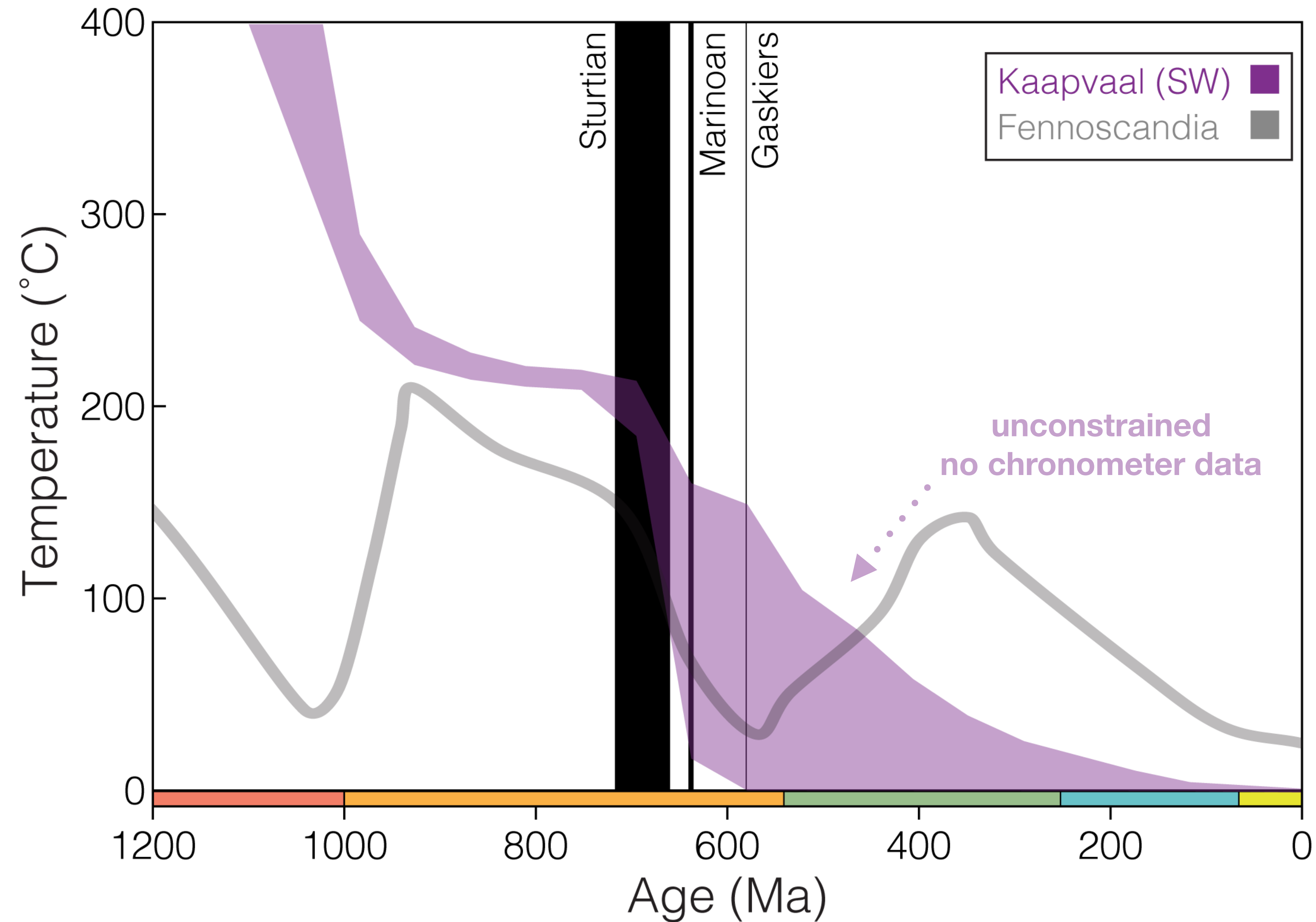


# Bedrock thermochronology + Mt. Simon sandstone





# ***WORLD WIDE SIGNAL ?***





# Conclusions

Major exhumation of the Canadian Shield occurred in the Neoproterozoic (post-1 Ga)

Timing of cooling and exhumation is similar for samples 100s km apart.

Suggests widespread erosional exhumation from depths of ~3-8 km (@25C/km)

Grenville foreland and distal sands could contribute to ~1-3 km of shield cover (inclusive)

Exhumation broadly synchronous with Rodinia breakup and more so with Snowball Earth glaciations

*Future: Multiple thermochronometers (e.g. Ar MDD, ZHe, AFT, AHe) and improved inversion methods required to fully resolve exhumation timing*



Thank you

Questions?

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***Hypotheses to test with continued work***

*(1) Cratonic exhumation was widespread during the Neoproterozoic*

*(2) Cratonic exhumation was to first order broadly synchronous in the Neoproterozoic*

*(3) Cratonic exhumation was synchronous with Snowball Earth glaciations in the Neoproterozoic*