

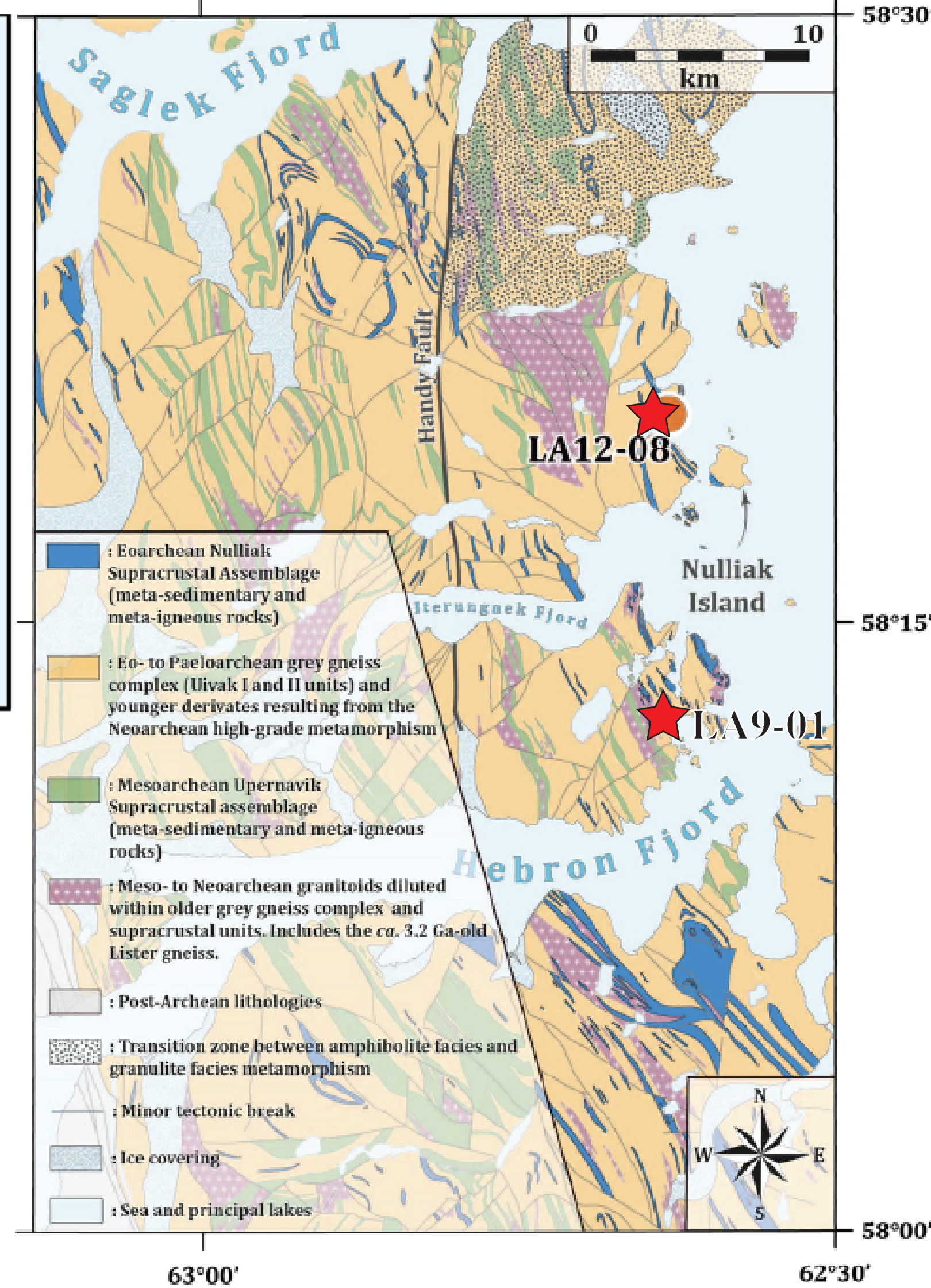
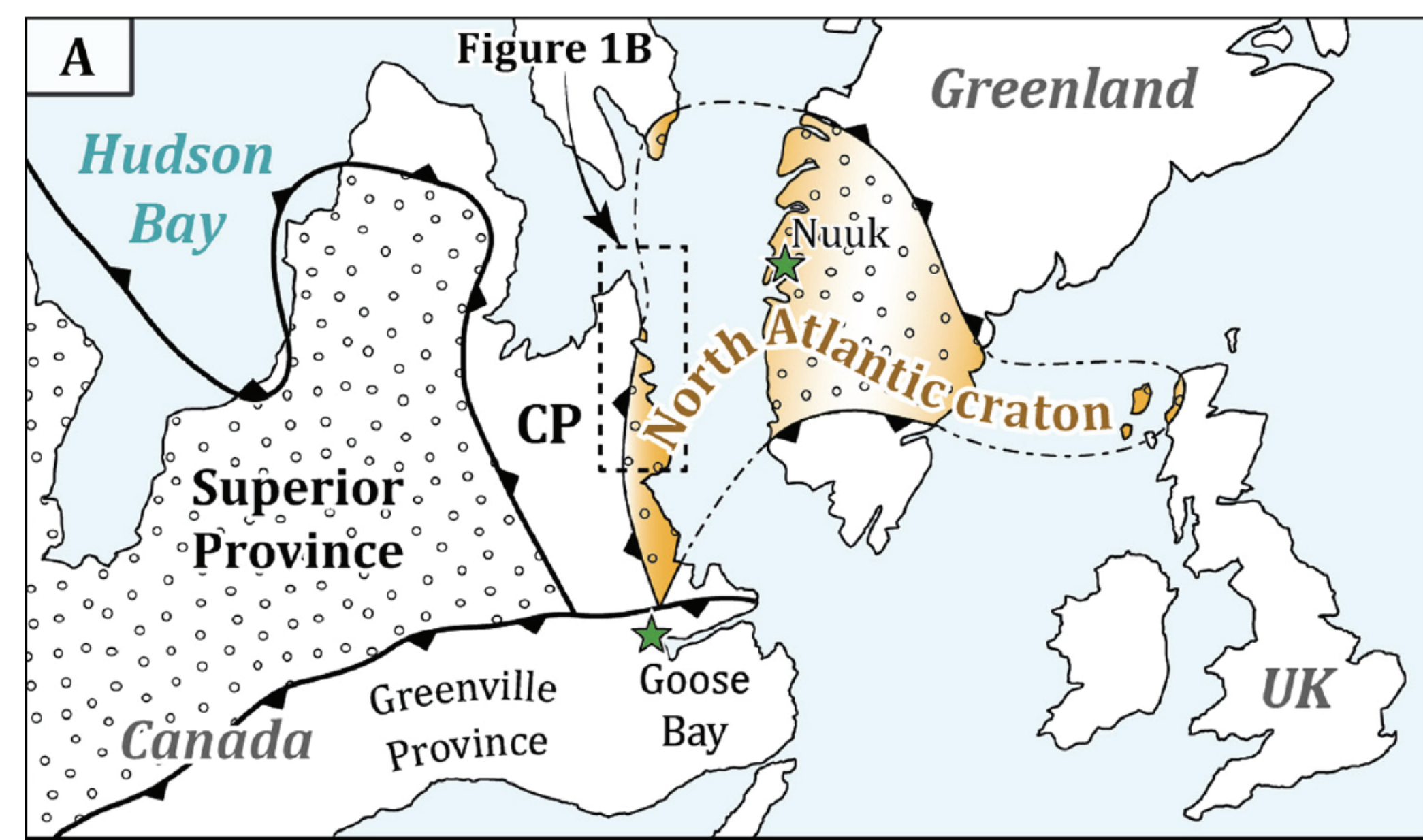
Large O- and Hf-isotopic variations in zircon from the Saglek Block (North Atlantic Craton) document reworking of mature supracrustal rocks as early as 3.5 Ga



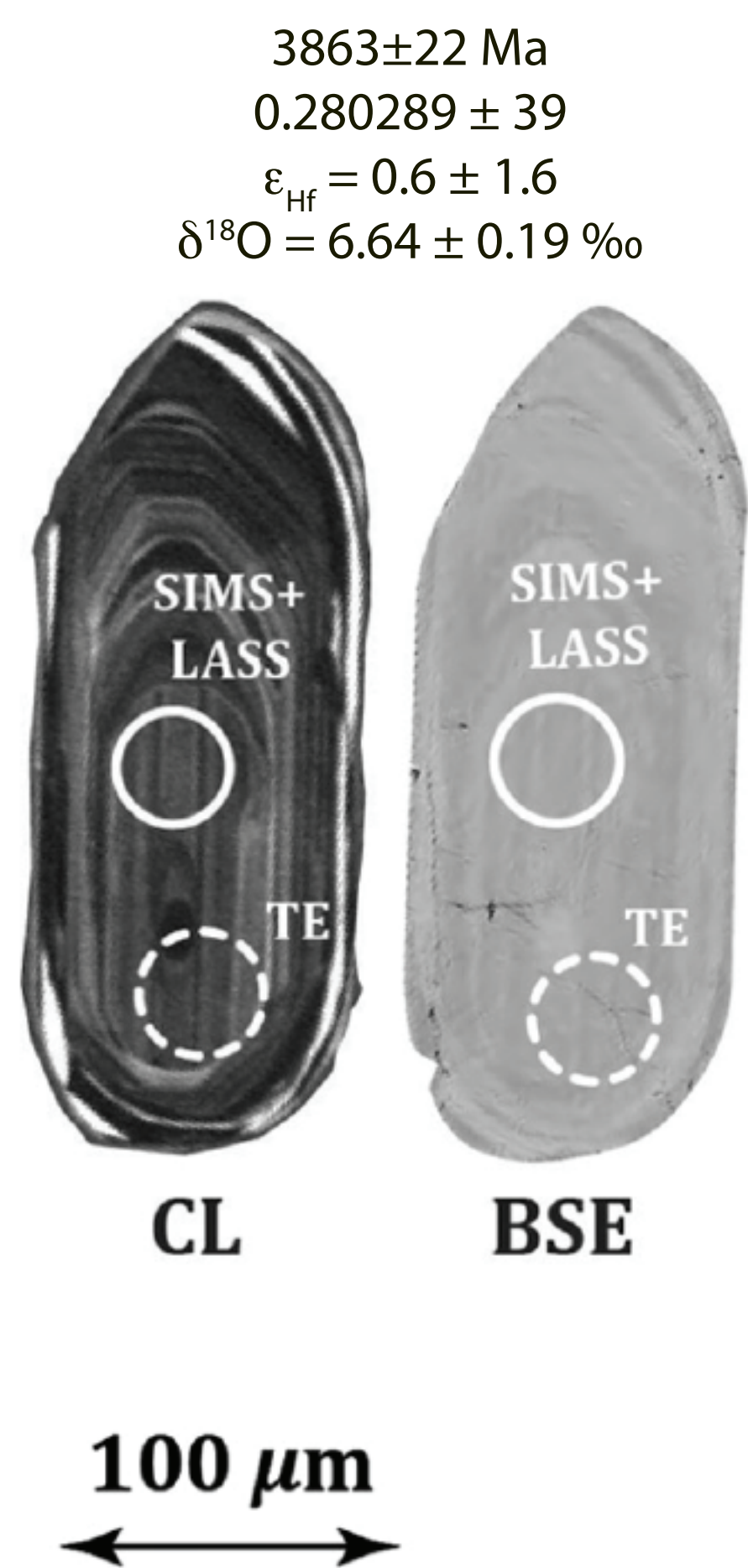
E. Thomassot¹, A. Vezinet², D.G. Pearson², R. Stern², Y. Luo², C. Sarkar²

1- CRPG-CNRS, UMR 7358, Université de Lorraine, 54501 Vandoeuvre-lès-Nancy, France.
2- Dpt of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, Canada

(emilie.thomassot@univ-lorraine.fr; vezinet@ualberta.ca)



The North Atlantic craton hosts extensive exposures of Eoarchean crust, spread through areas of Western Greenland and Northern Labrador (Canada). Of these two areas, the crust of the Saglek Block of Northern Labrador has received far less attention from the scrutiny of modern analytical methods than its better documented Western Greenland equivalent, the Itsaq Gneiss Complex.



2. Methods:

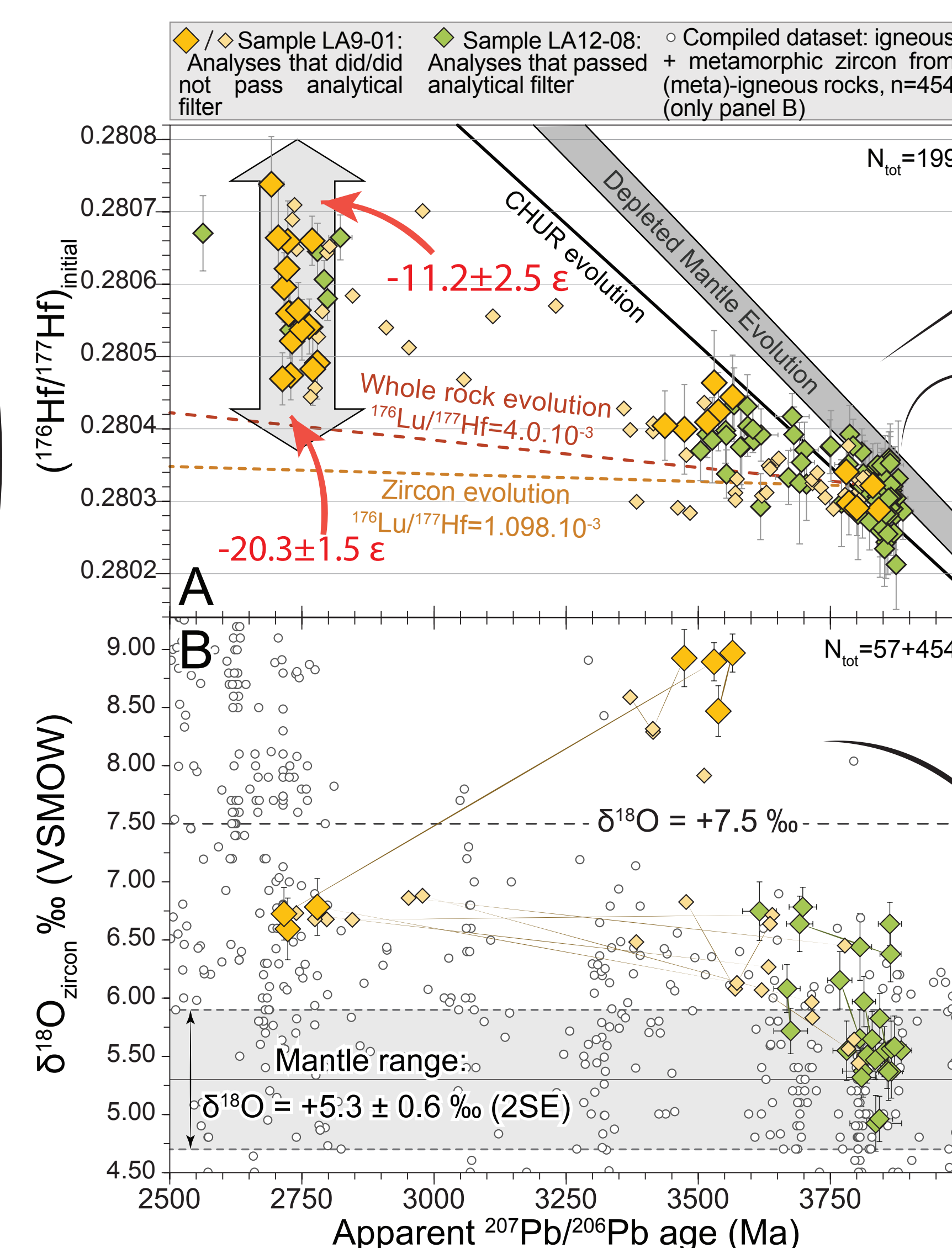
- **Petrography:** CL and BSE images, only pristine structures are considered
- **O-isotopes:** Secondary Ion Mass Spectrometry (SIMS) (spot size: 15 μm)
- **U-Pb/Hf:** Laser Ablation Split-Stream (LASS) on SIMS spots (only concordant ages are considered)
- **Trace element analyses:** LA-ICP-MS
- **Numerical modeling of metamorphic contamination on isochron**

1. Goal of the study

The present study aims to further constraint the timing and nature of the earliest metamorphic events reported so far in archaean rocks, in order to shed light on early recycling processes as well as on continental crust formation. Our spatially resolved geochemical study on zircon may have strong implications for the interpretation of whole rock data previously reported in archaean crustal rocks.

3. Results

3 distinct crystallisation events are recorded in a single rock: the paleoarchaean metamorphic event involed the recycling of a mature supracrustal precursor.

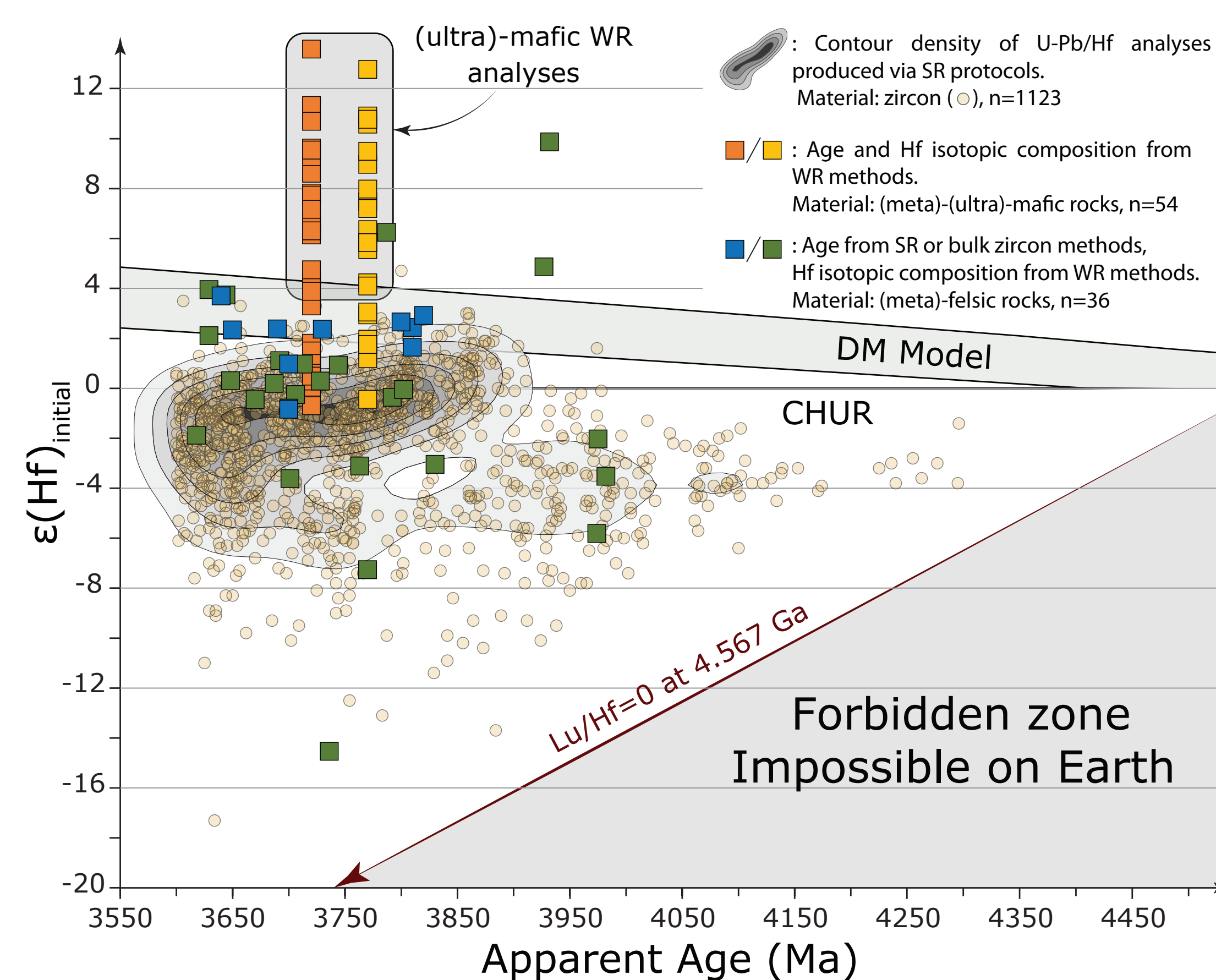


3 discrete groups of ²⁰⁷Pb/²⁰⁶Pb apparent ages :
 >3.7 Ga
 3.6-3.5 Ga
 <2.8 Ga

The 2 oldest groups have chondritic to subchondritic ε_{Hf} values (+1 ± 2.2 to -5.5 ± 1.8) while neoarchaean domains show large isotopic fractionation.

Paleoarchaean zircons display extreme δ¹⁸O values that do not overlap with younger or older domains.

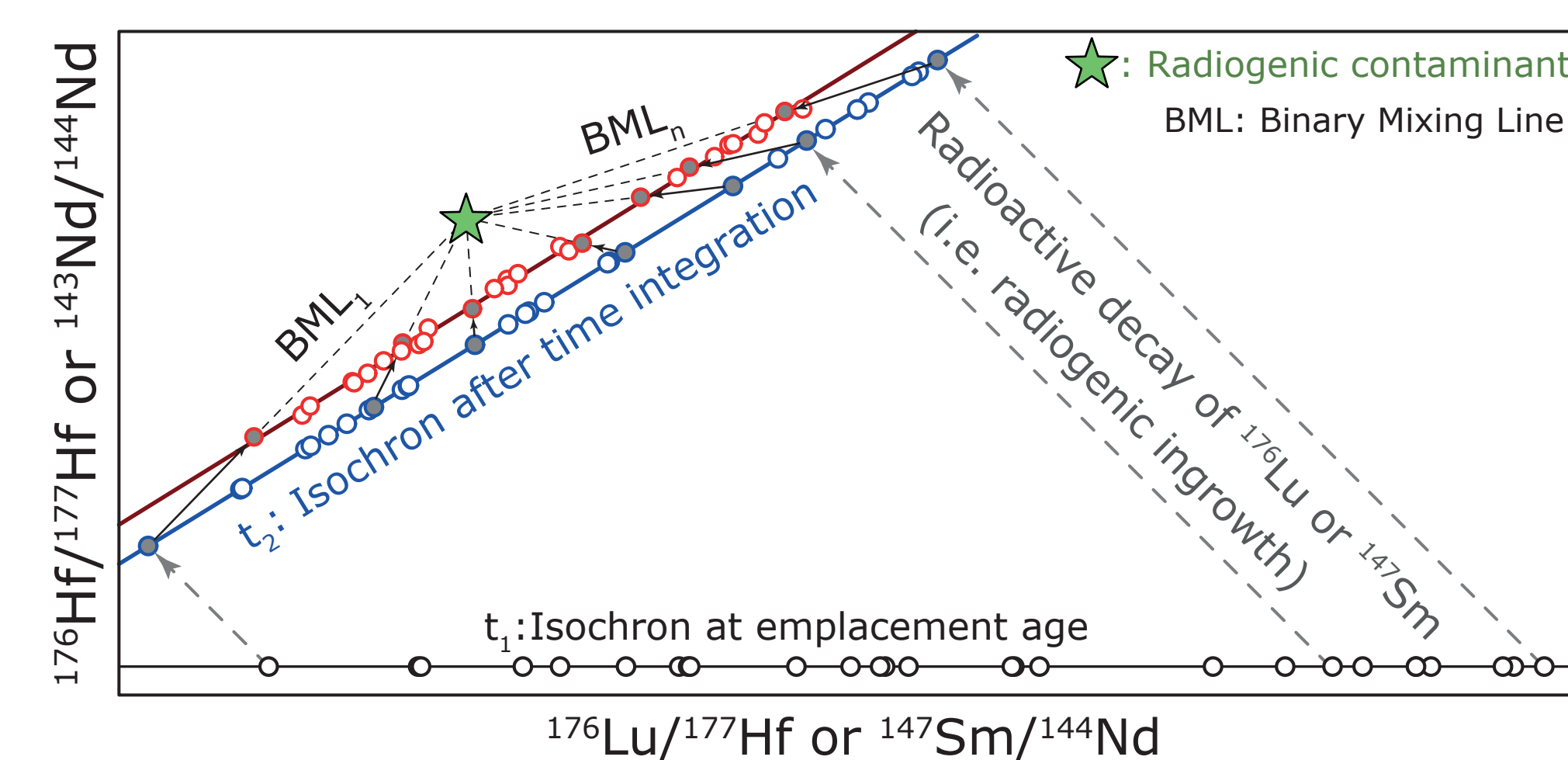
Observations that raise doubts about the radiogenic Hf compositions



Previous studies have reported highly radiogenic Hf values (up to +5 ε) from > 3.6 Ga crustal material. These results have been used to build striking interpretations about the processes that shaped the early Earth and infer highly depleted mantle domains before 3.6 Ga.

The effect of contamination by a radiogenic contaminant onto WR systems

If zircon is affected by external contamination, most mineral hosting Lu or Hf would likely be affected too. What would then be the isotopic signature of such contamination at whole-rock scale?



4. Conclusion :

High initial isotopic ratios measured on early Earth material via WR protocols may reflect secondary processes rather than the composition of the primary magma. This would imply that only negligible crust-mantle differentiation occurred before ca. 3.6 Ga

Results of R-modelling

Interaction of whole-rock systems from a rock suite with a single external contaminant

