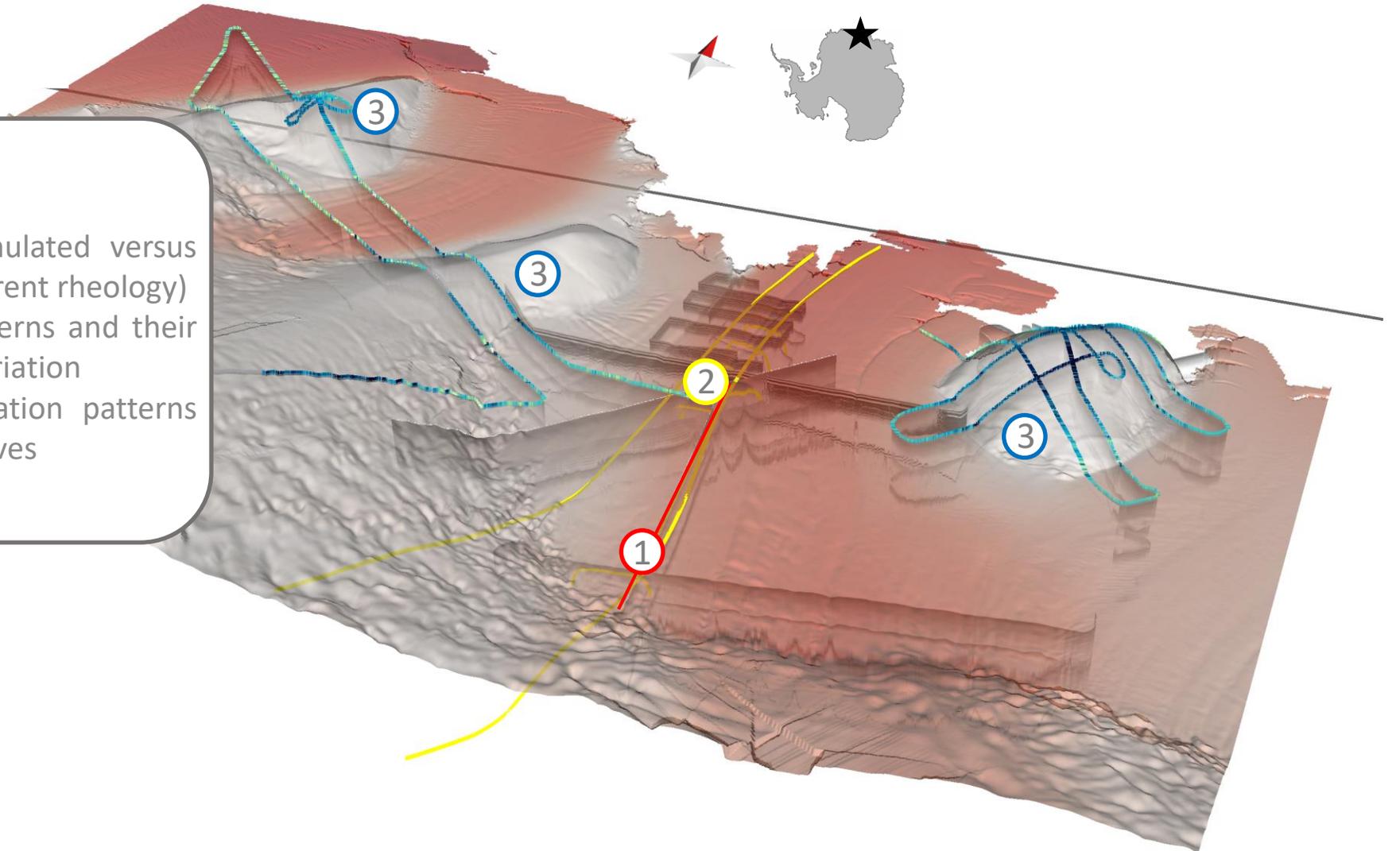


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Study aims

1. Characterize locally accumulated versus advected ice shelf ice (different rheology)
2. Establish surface melt patterns and their geospatial and temporal variation
3. Establish surface accumulation patterns across ice rises and ice shelves

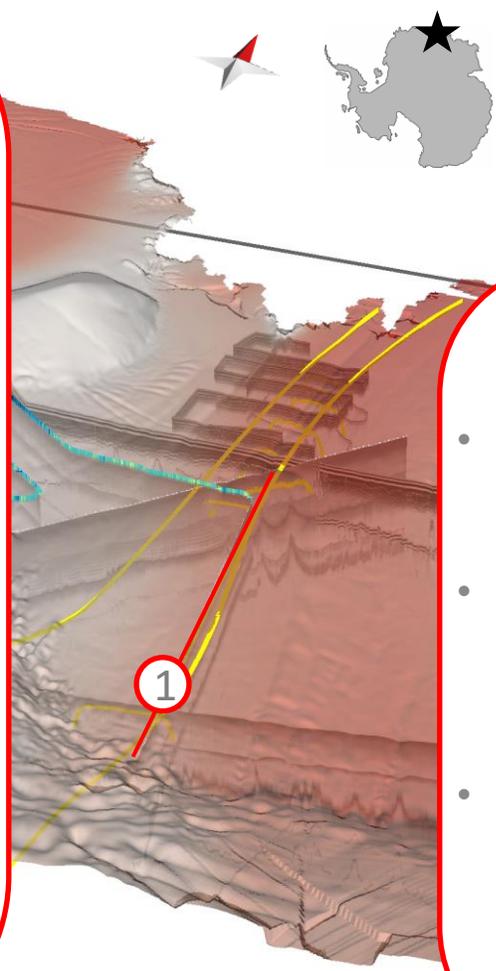
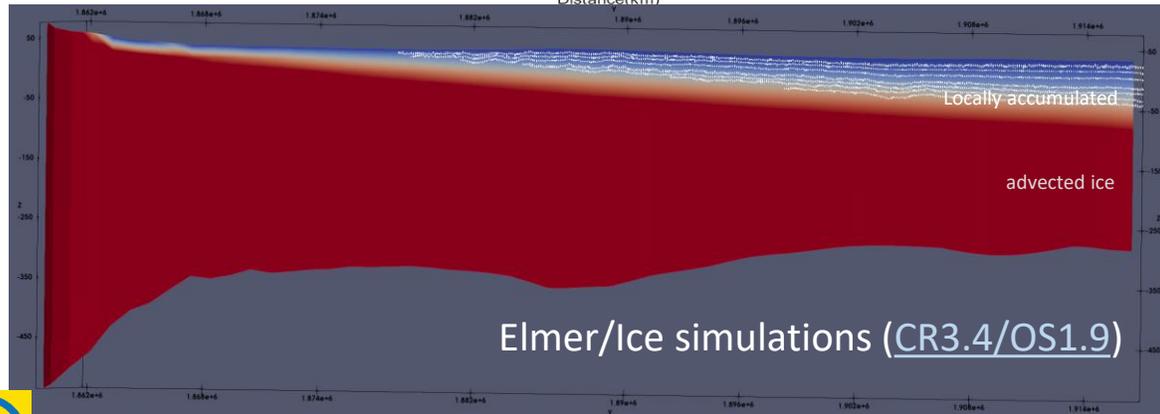
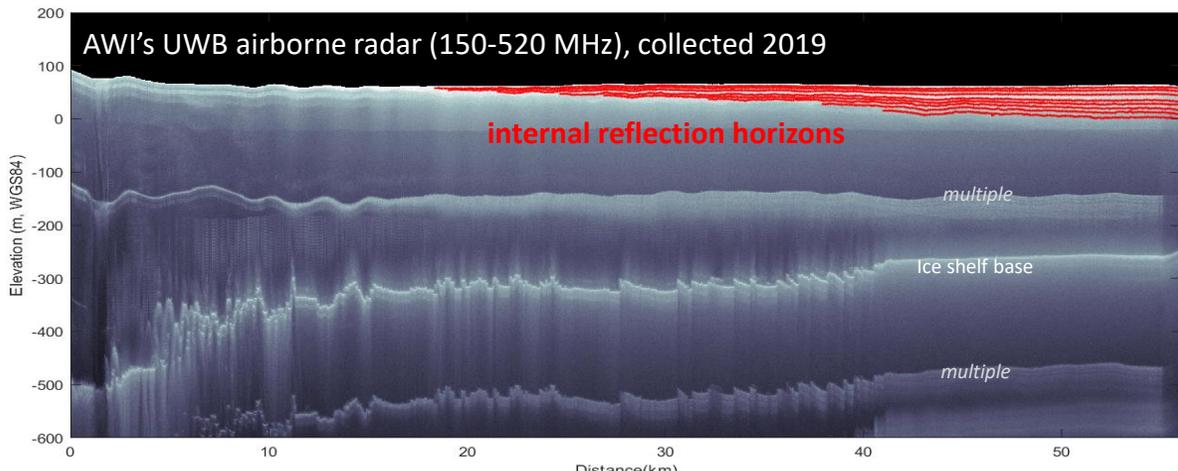


Ice shelf internal reflection horizons reveal ice provenance, dynamics, surface accumulation and oceanic melt

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1

Advected vrs. locally accumulated ice



Main takeaways

- Internal reflector horizons (IRH) can be traced near the ice shelf surface where undisturbed by melting and refreeze.
- In one along-flow radar profile localized accumulation is preserved from the grounding line onwards (localized melting at the grounding line).
- Elmer/Ice simulations reveal that at the Roi Baudouin Ice Shelf (RBIS) the ratio between advected and accumulated ice is 3:1 – important implications for ice rheology.



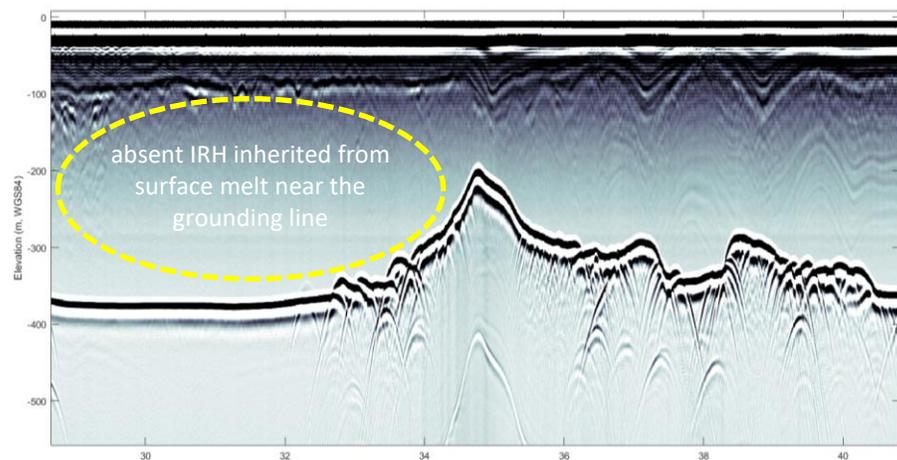
Sharing not permitted

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2

Zone of no IRH in all radar profiles downstream from a zone of surface melt



Low frequency ground-based radar (10 MHz), collected 2010

Surface melt at grounding line (Lenaerts et al., 2017)

2

Main takeaways

- Absent IRHs in data from all radar (airborne and ground-based) traced within flowlines from ice advected from zone of surface melt
- Temporal stability of surface melt pattern near the grounding line, since ice advected 400 years downstream shows same zone of absent IRH

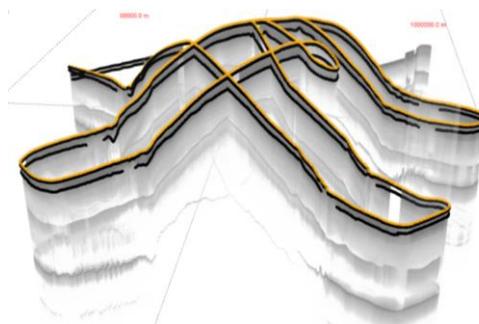
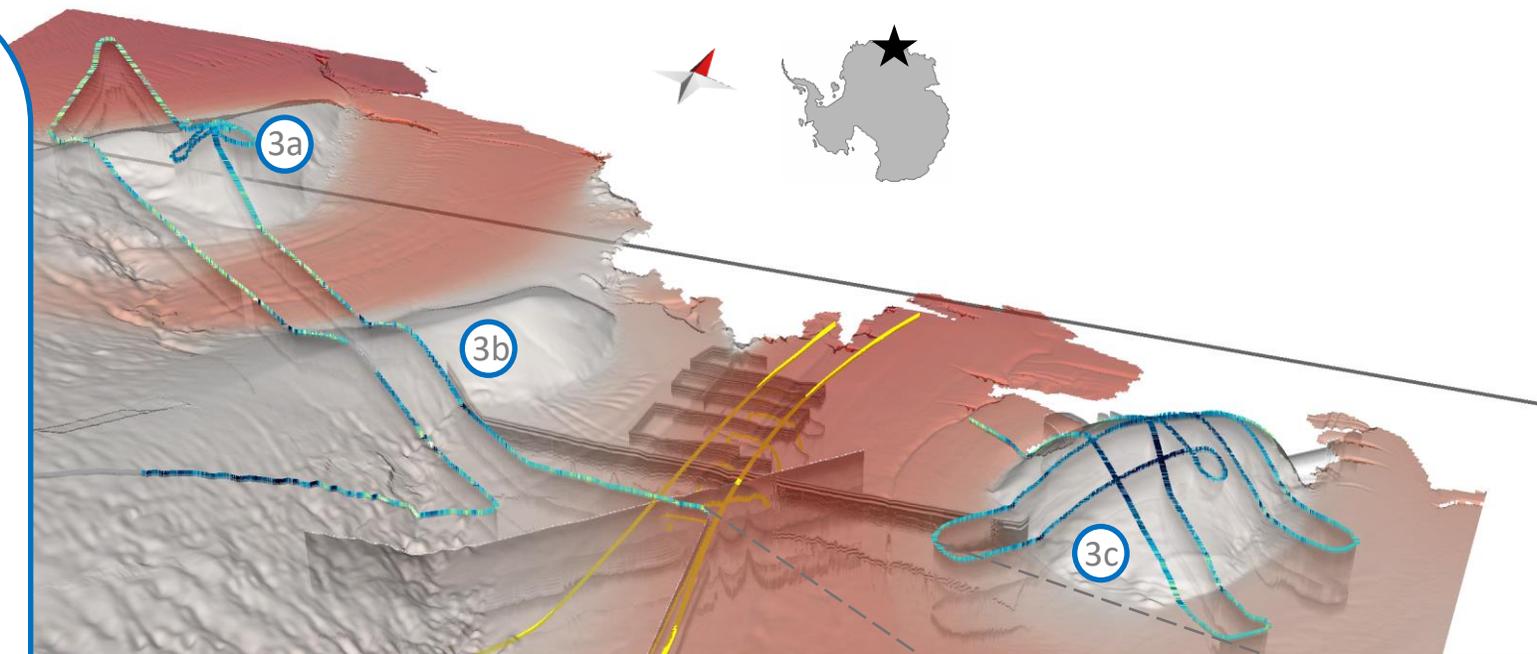
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③ Accumulation patterns across 3 ice rises



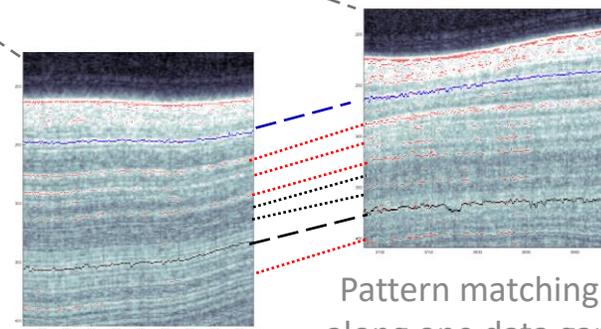
Main takeaways

- Depth of internal reflection horizons increases to the east of individual ice rises and also from 3a to 3c.
- Continuous near surface IRH are useful for cross-checking locally derived age-depth scales (e.g. through ice cores) providing new constraints for ice-rise evolution in this sector



Methods

Tracing of IRH using wavelets and local maxima (Xiong et al., 2017). Validation through crossing of traced layers at same depth.



Pattern matching along one data gap