

Mixed sedimentation of the North Sea Fan – insights on volumes of contourites, plumites and downslope deposits during a full glacial-interglacial cycle

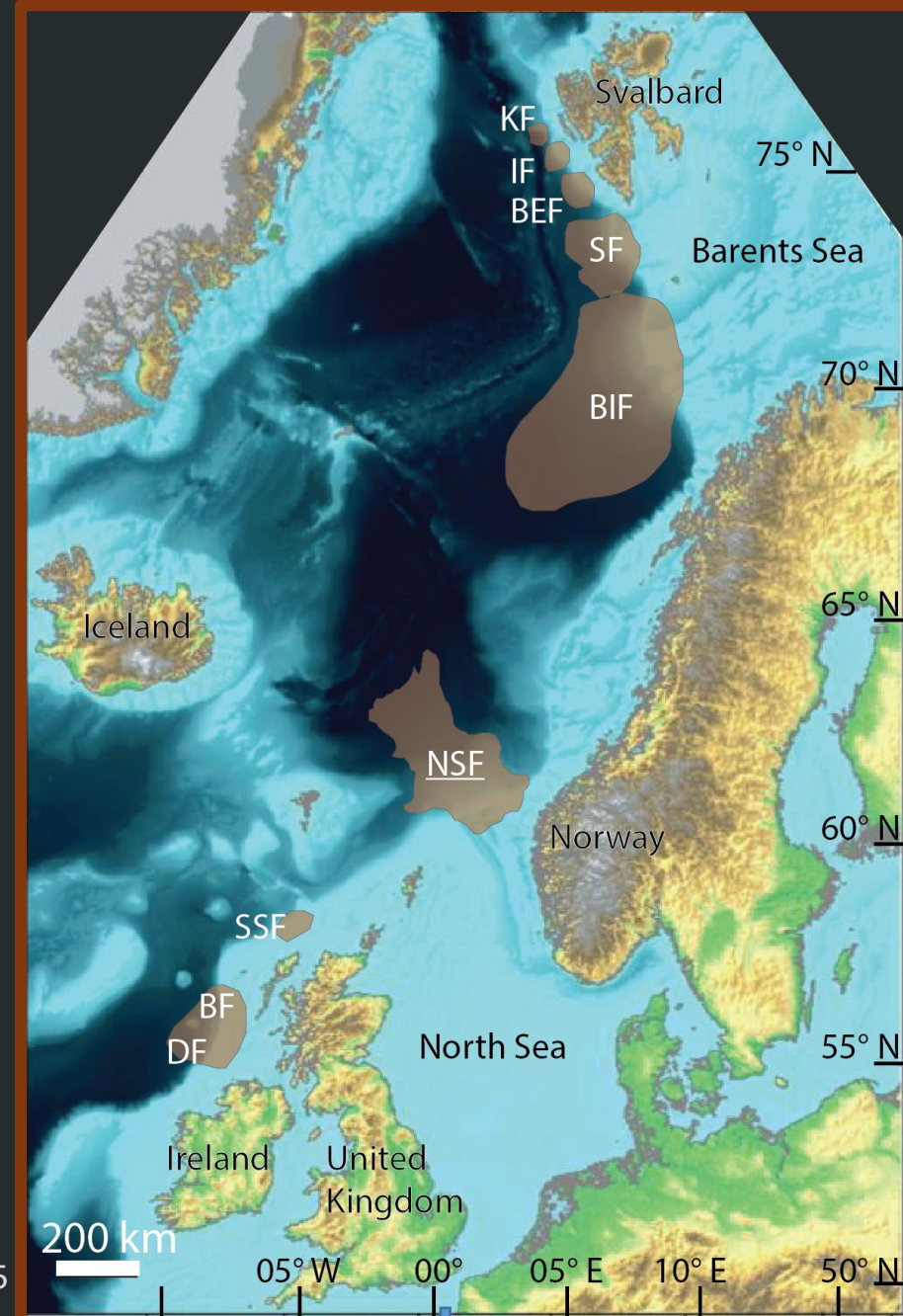
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Introduction

- Source-to-sink systems in glaciated margins
 - High-frequency, high-intensity perturbations of surface mass redistribution
 - Complete disruption of landscape dynamics and sediment routing
- Trough mouth fans as archives of past glaciations
- North Sea Fan – 2nd largest in the world (110,000km²) - Nygård et al. 2005

Modified from Dahlgren et al. 2005



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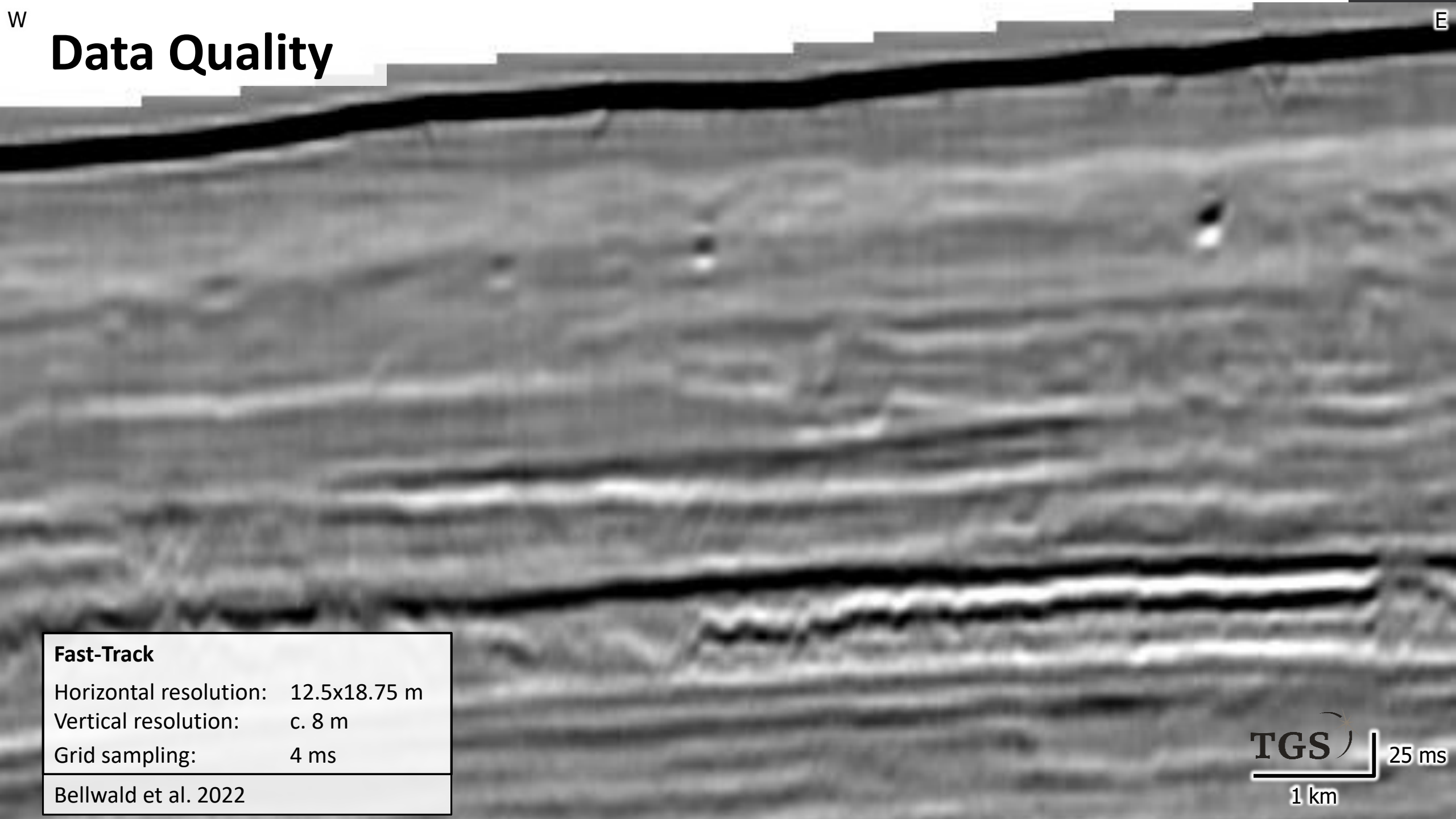
Modified from Dahlgren et al. 2005



W

E

Data Quality



Fast-Track

Horizontal resolution: 12.5x18.75 m

Vertical resolution: c. 8 m

Grid sampling: 4 ms

Bellwald et al. 2022

TGS 25 ms
1 km

W

Data Quality

Seabed

E

HighRes

Horizontal resolution: 6.25x18.75 m

Vertical resolution: c. 2 m

Grid sampling: 2 ms

Bellwald et al. 2022

Tampen Slide

TGS 25 ms
1 km

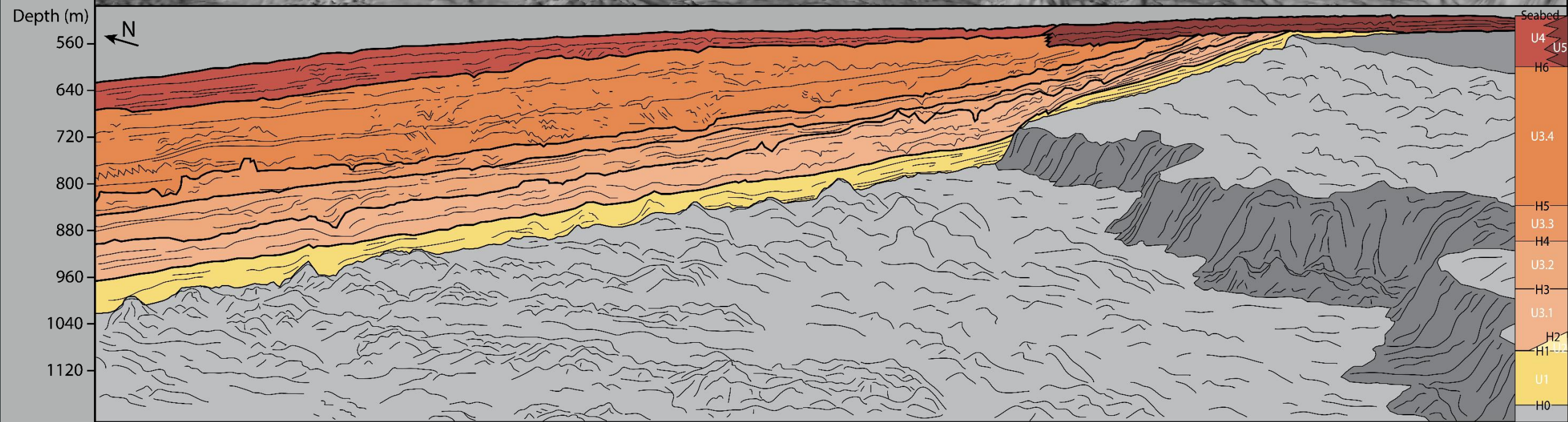
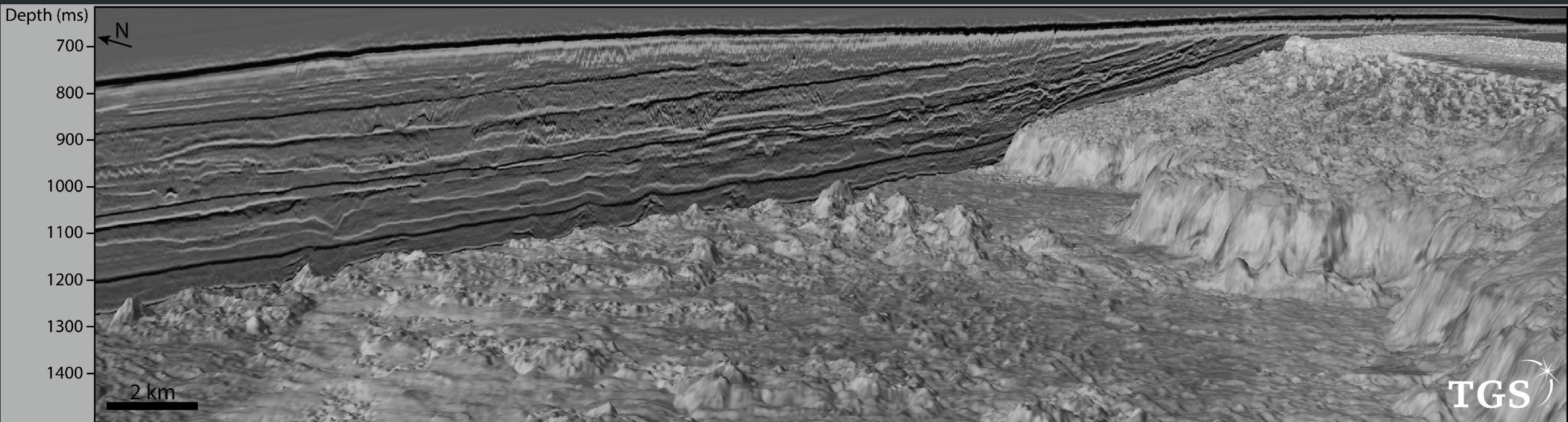
Results

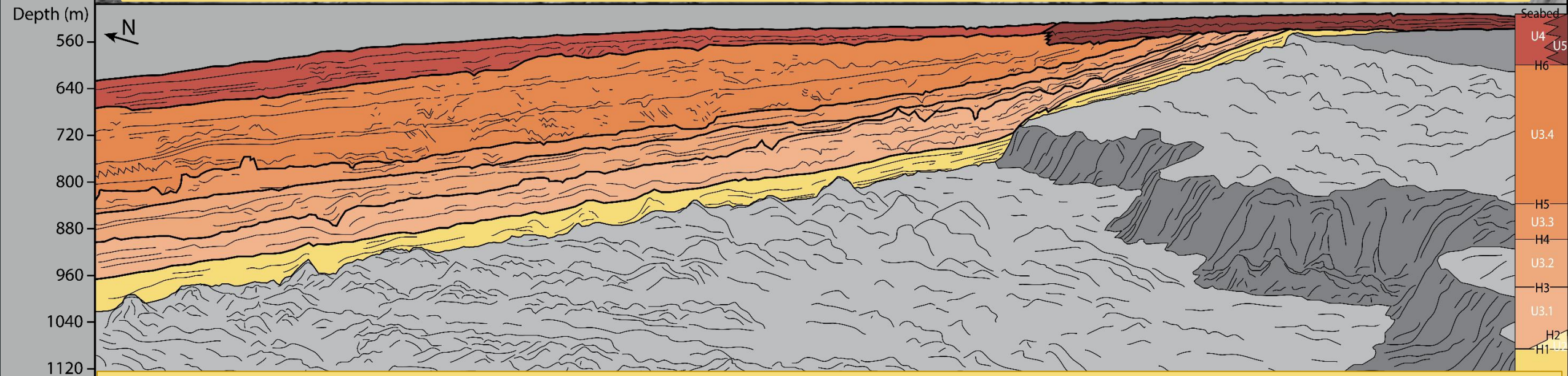
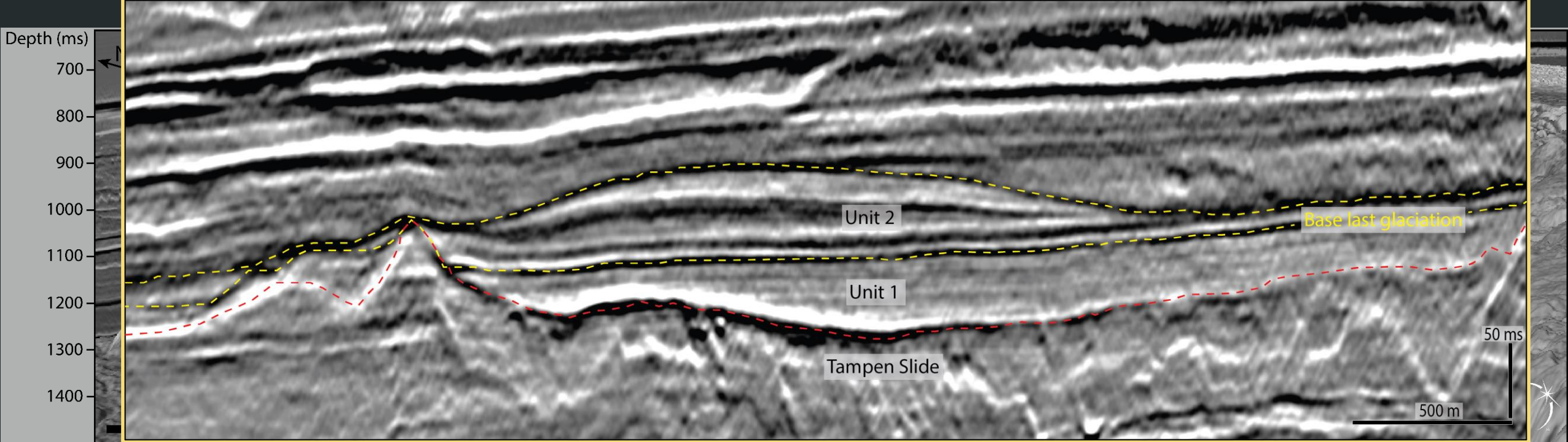
- Seismic facies – depositional processes
 - Interglacial: contourites
 - Glacial: meltwater turbidites, glacigenic debris flows and tills
 - Deglacial: plumites

Total volume: $\sim 7200 \text{ km}^3$

- Measured area: $\sim 15000 \text{ km}^2$

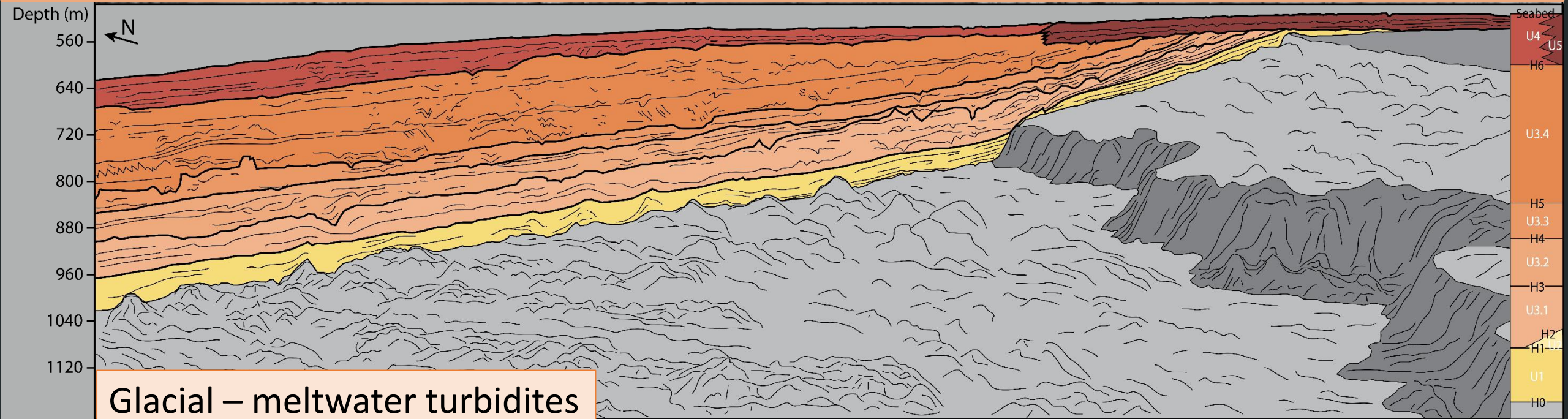
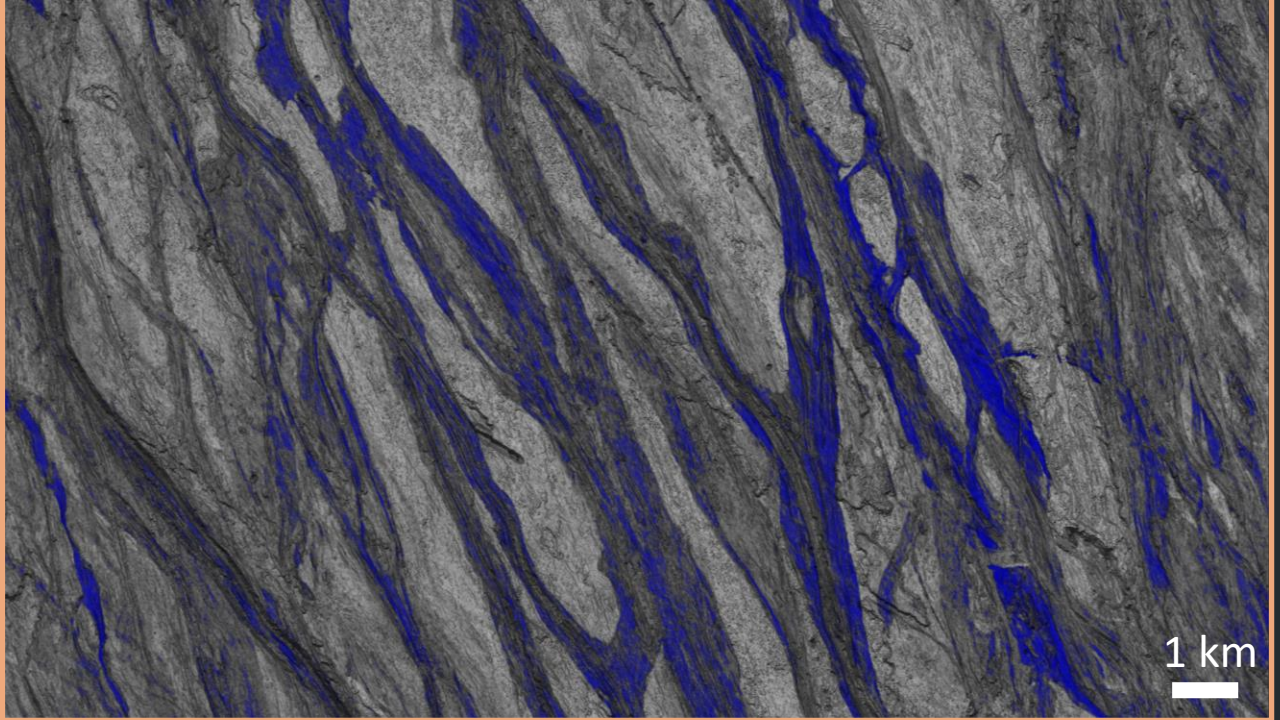
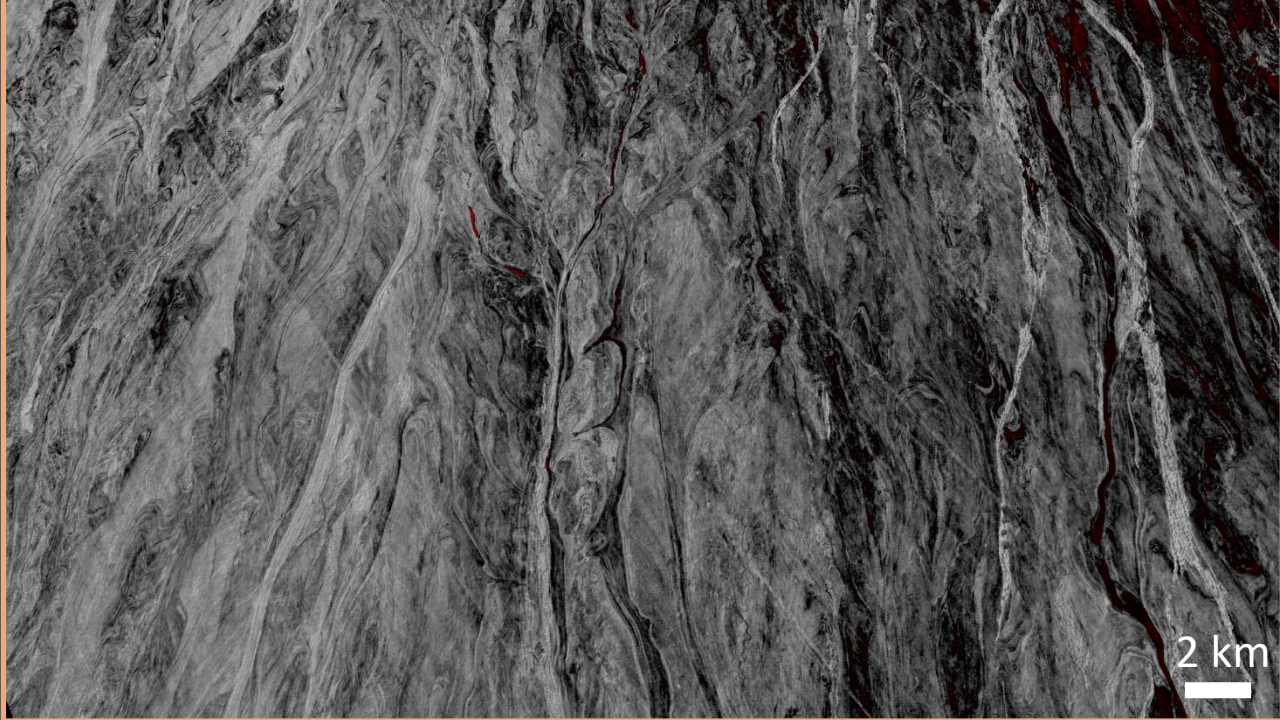
- Seven types of linear erosive features
 - Five types of channel-like structures
 - MSGs and ploughmarks
- Different types of channels were classified based on their morphology
 - Width
 - Depth
 - Sinuosity
 - Profile in 2D
 - Branching

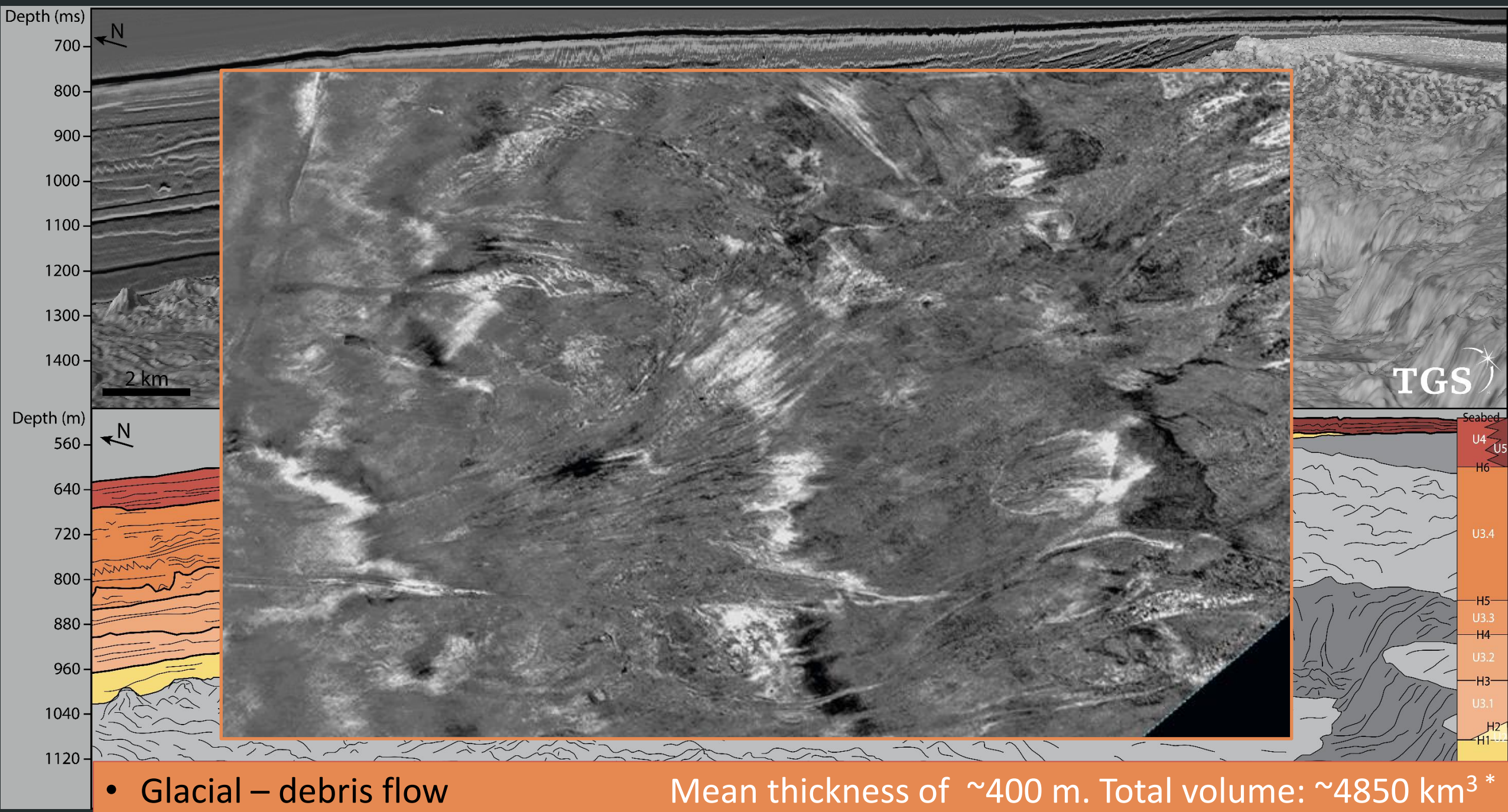


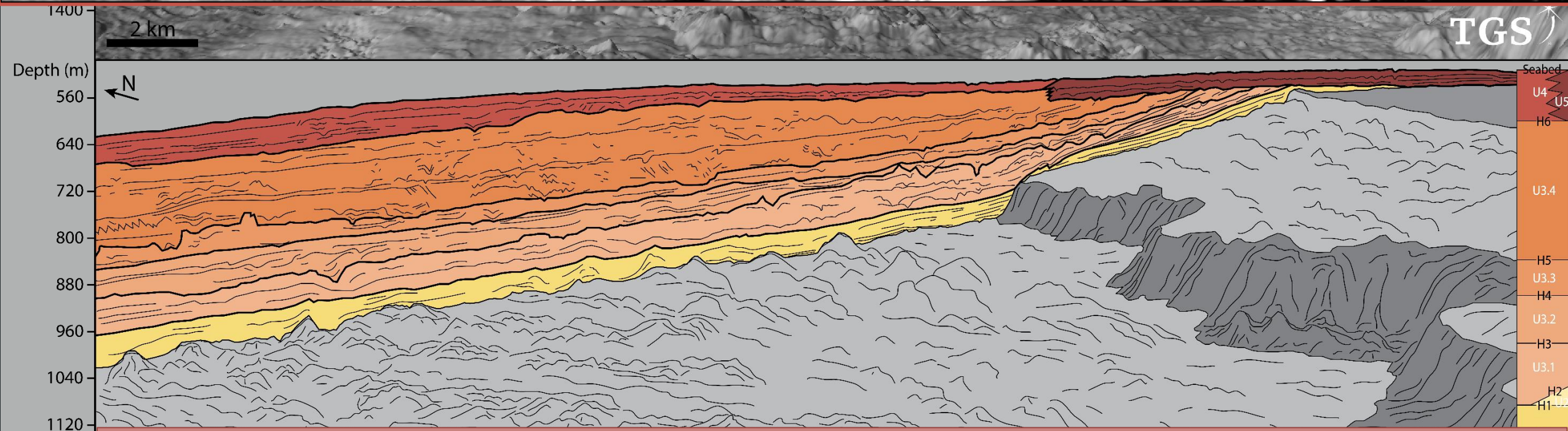
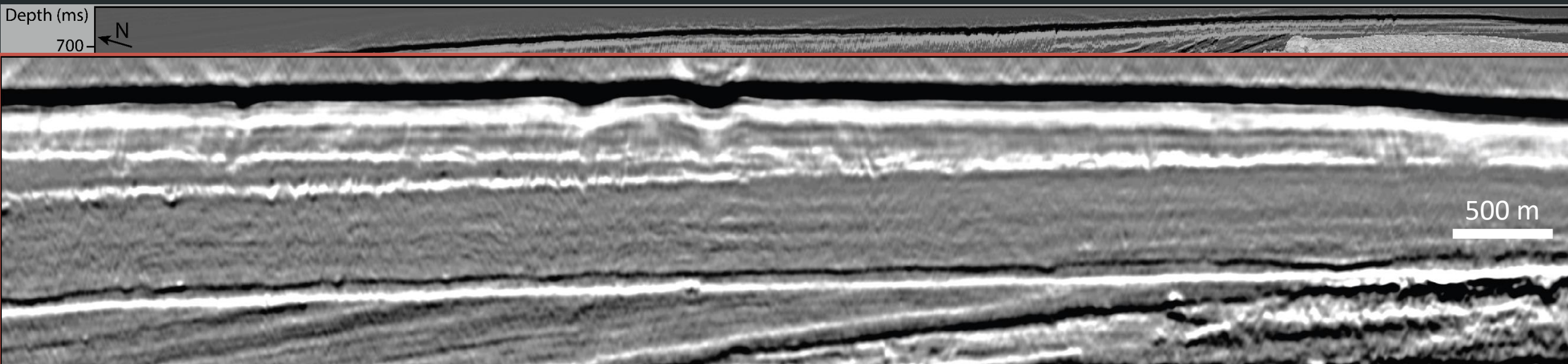


Interglacial – contourite

Mean thickness ~ 80 m. Volume ~1200 km³

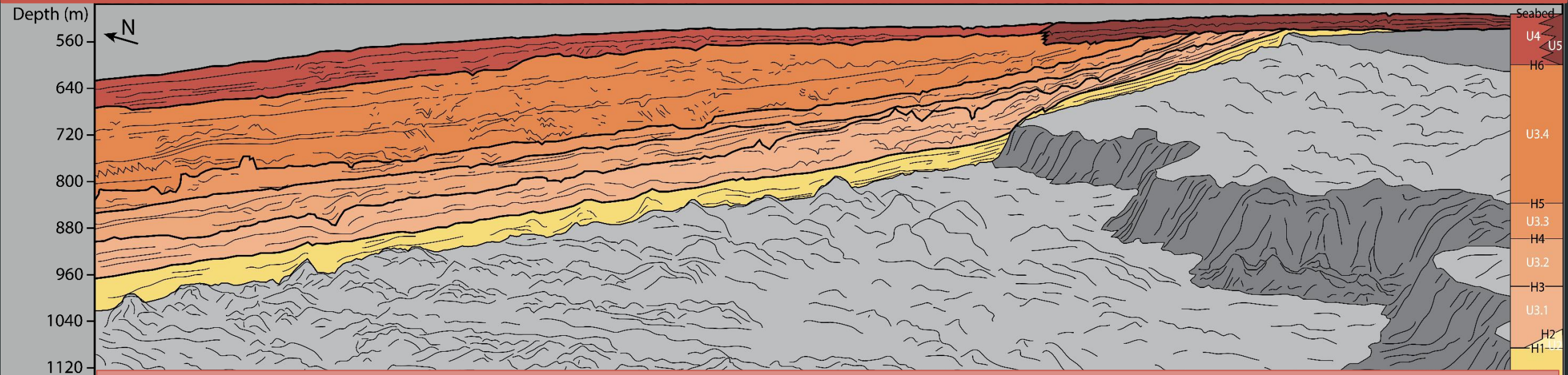
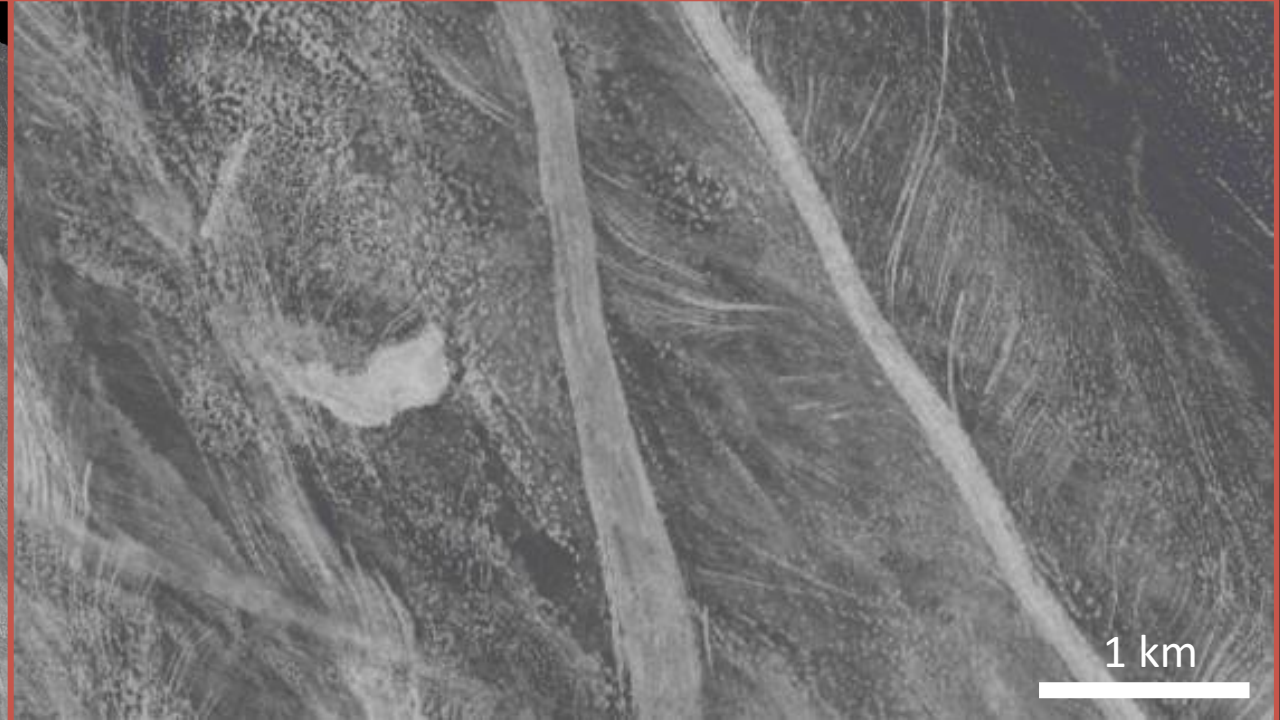






Glacial – till

Maximum thickness ~ 60 m.

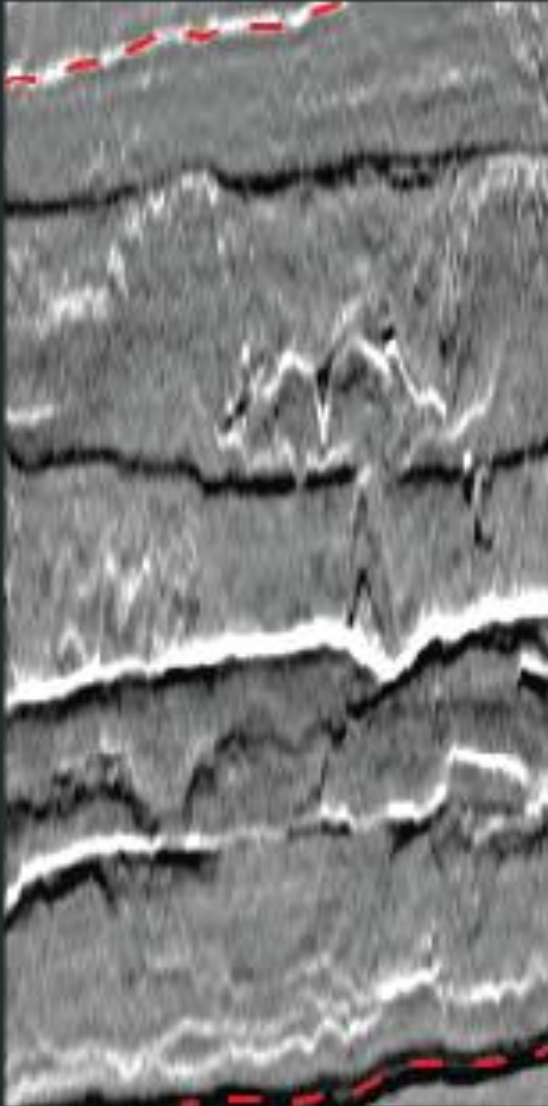


Deglacial –plumites

Mean thickness ~ 70 m. Volume $\sim 1100 \text{ km}^3$

Accumulation rates

400 ms



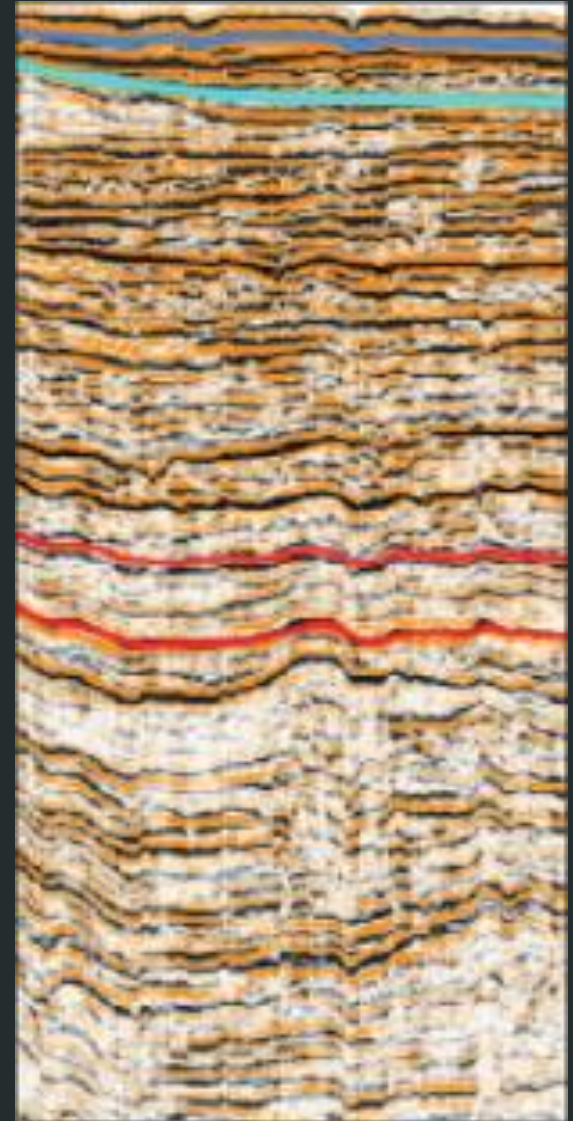
North Sea Fan

Alexandropoulou et al. 2021



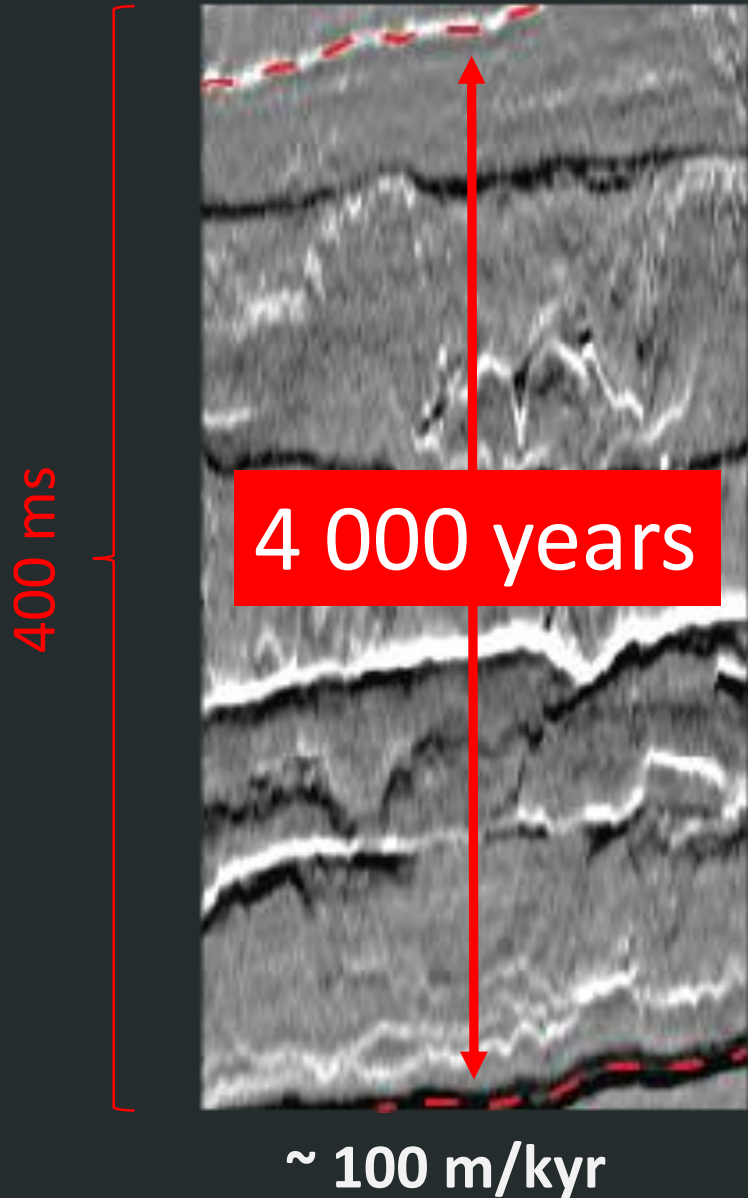
Bear Island Fan

Bergmann et al. 2020

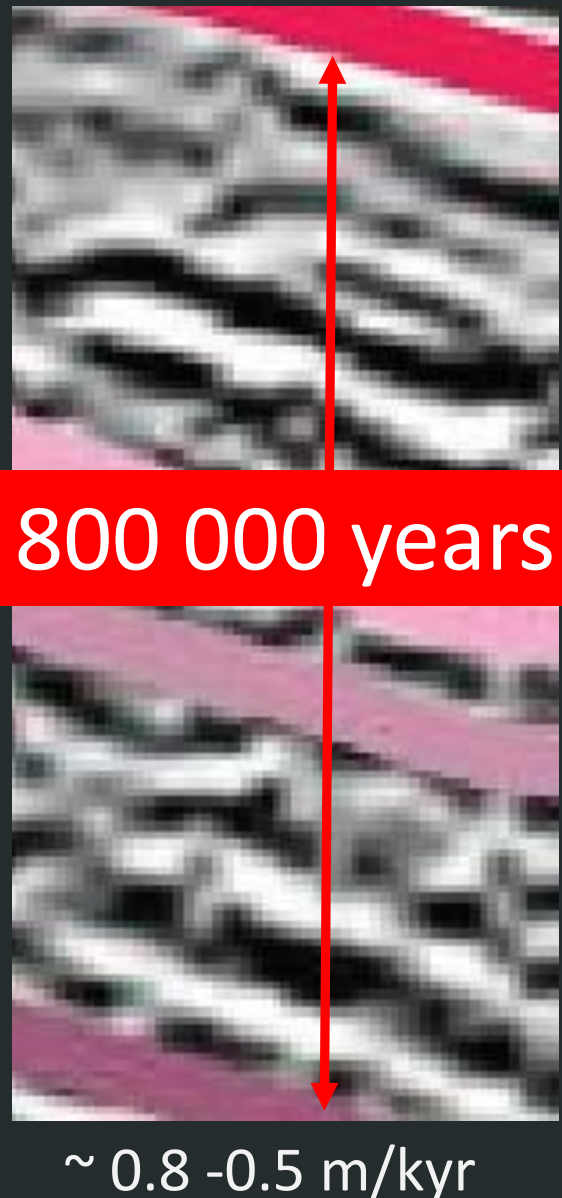


Bengal Fan

Accumulation rates



Alexandropoulou et al. 2021

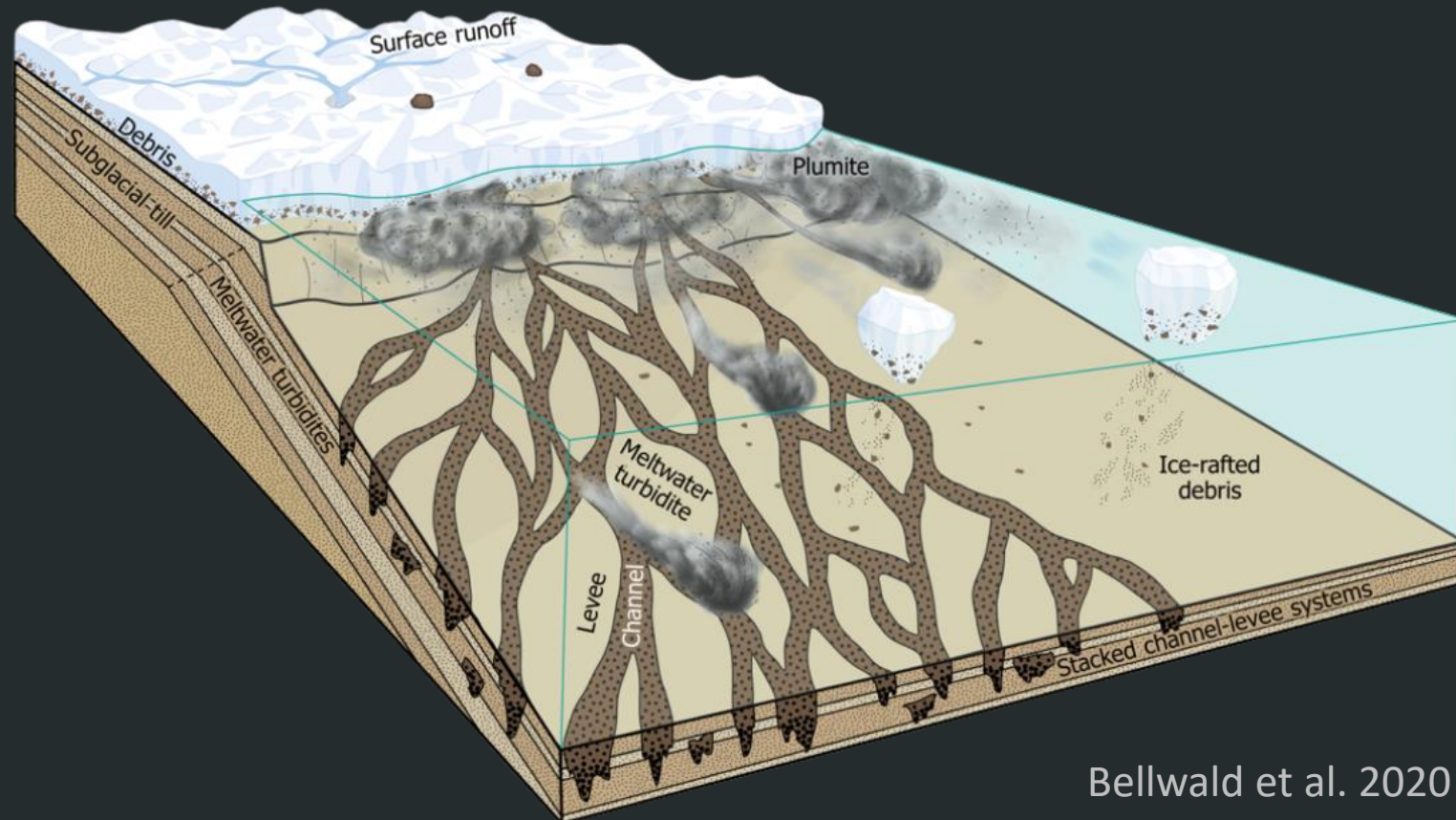


Reilly et al. 2020; Bergmann et al. 2020



Take home messages

- The LGM at the North Sea Fan is dominated by meltwater turbidites (Bellwald et al. 2020)
- The >500 m thick sequence in the slope correlates to only ~50 m on the shelf (Norwegian Channel – Morén et al. 2017)
- Sedimentation rates are up to 100x higher during glacial periods than compared to interglacials, also when compared to other submarine fans



Thank you!

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Access the abstract here



Questions?

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