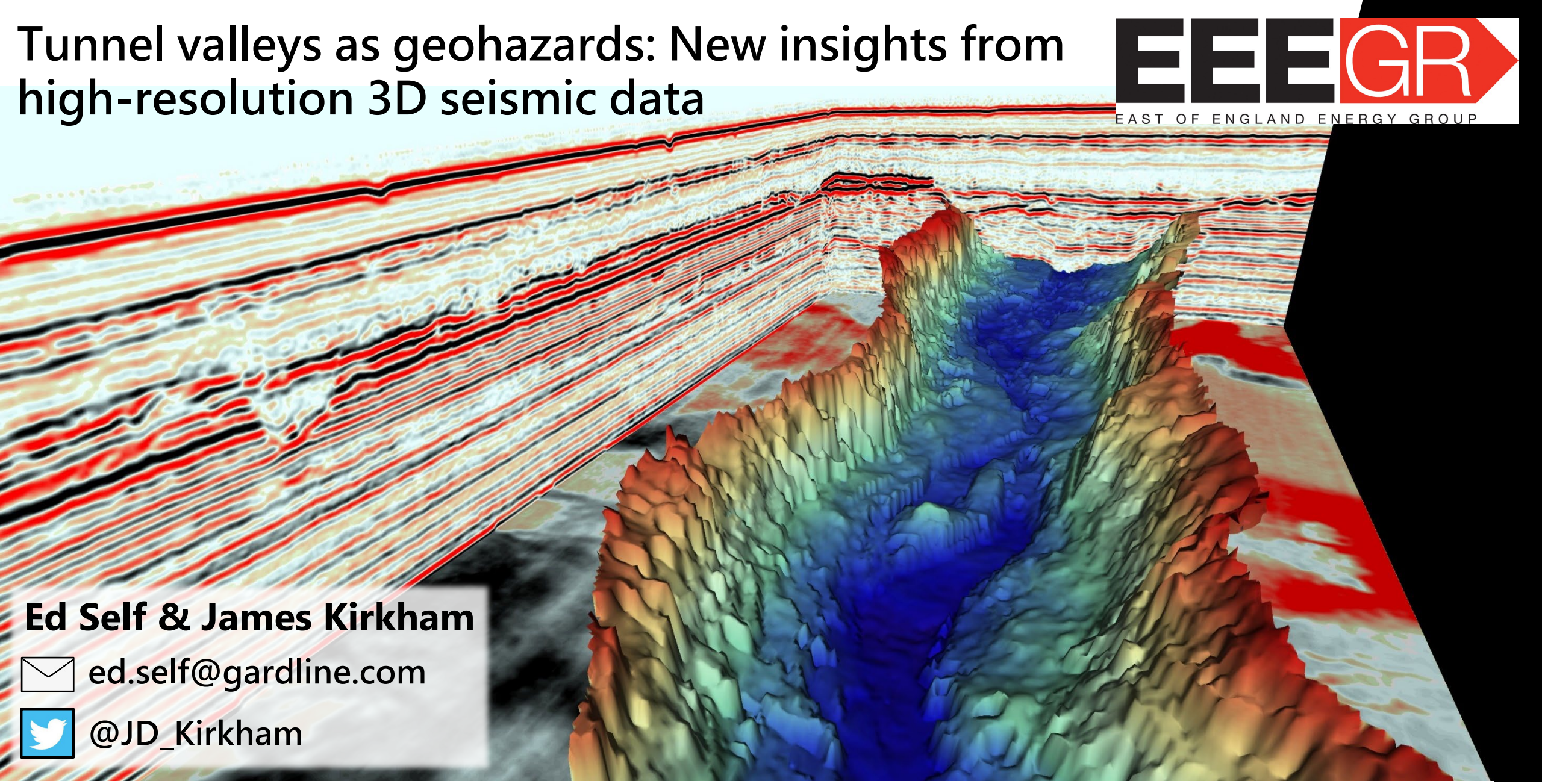
Tunnel valleys as geohazards: New insights from high-resolution 3D seismic data

EEEGR
EAST OF ENGLAND ENERGY GROUP



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BGS British Geological Survey

PGS

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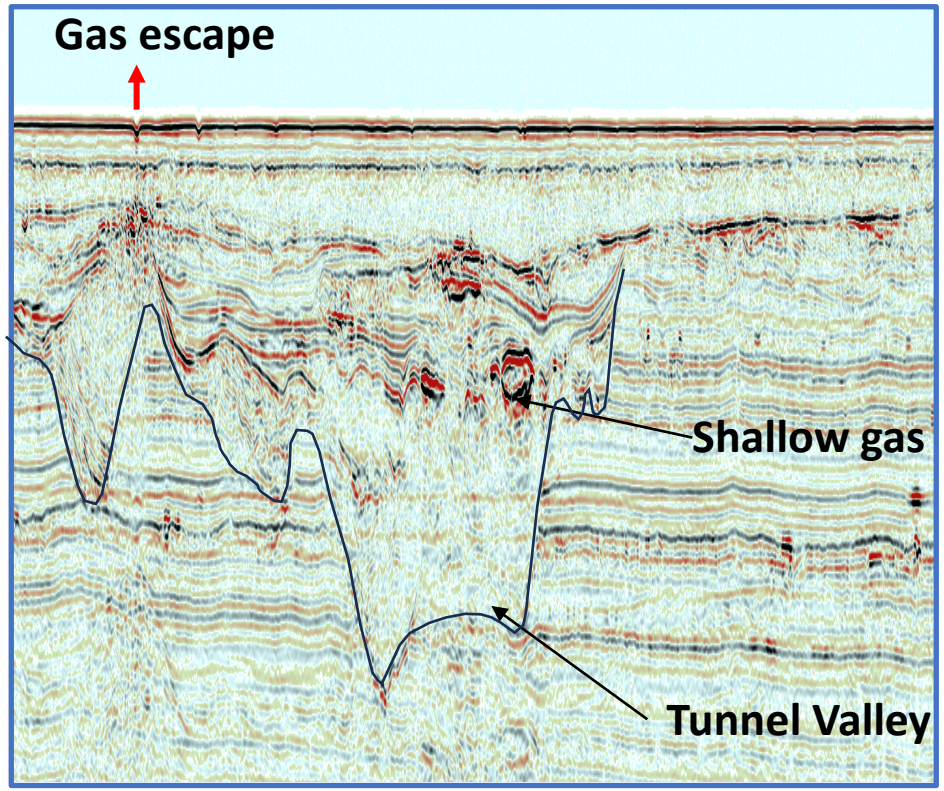
NERC SCIENCE OF THE ENVIRONMENT

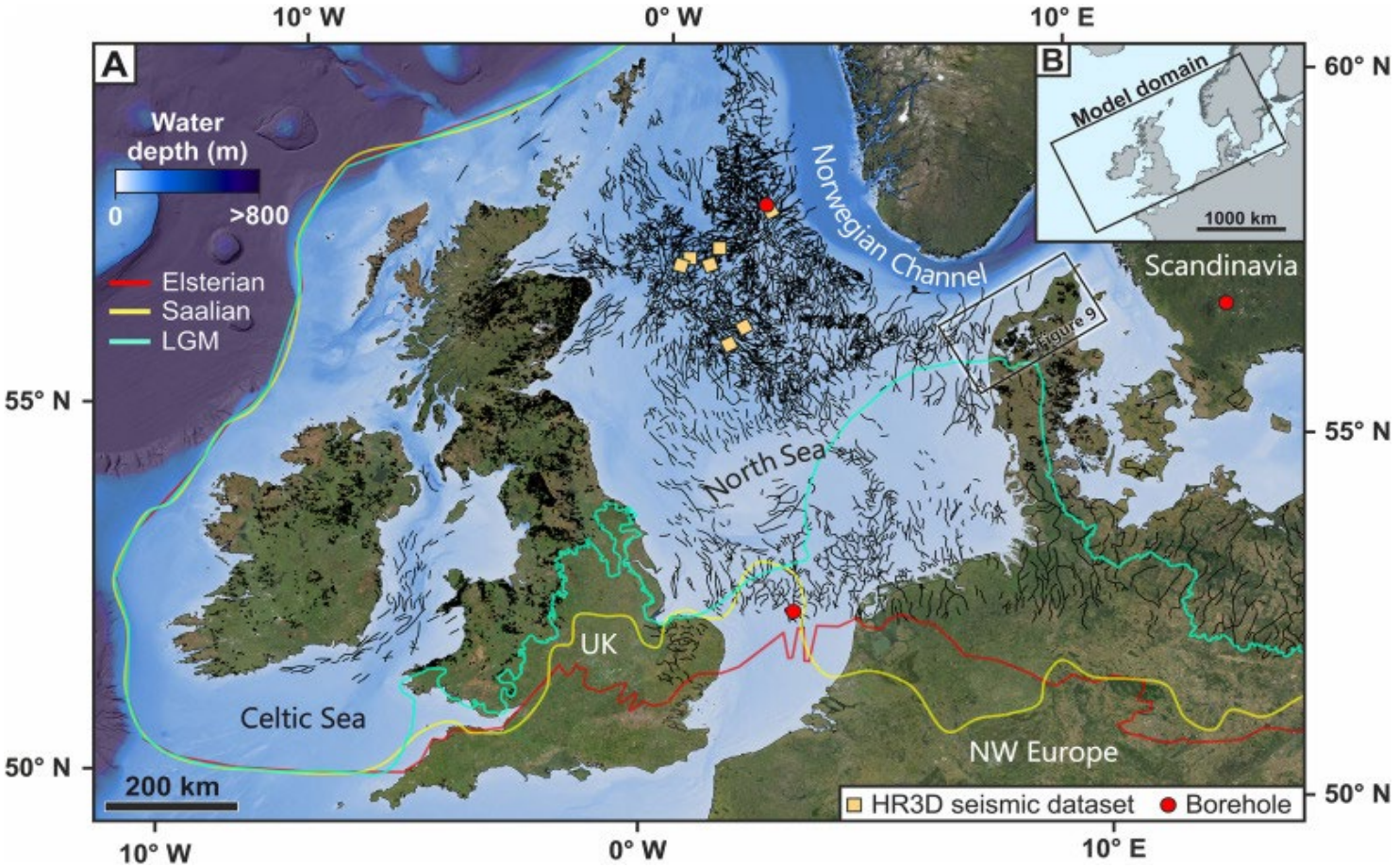
What are Tunnel Valleys?

Large valleys formed by subglacial erosion of sediments by meltwater

Several km's across and 100's metres deep

How did they get so large from meltwater erosion?





Very common as the figure (above) illustrates

Kirkham et al. (2021), *Quaternary Science Reviews*

Known geohazards; complex geo-body infill, shallow gas (left)

BGS name them Ling Bank, Coal Pit and Swarte Bank Formations + others

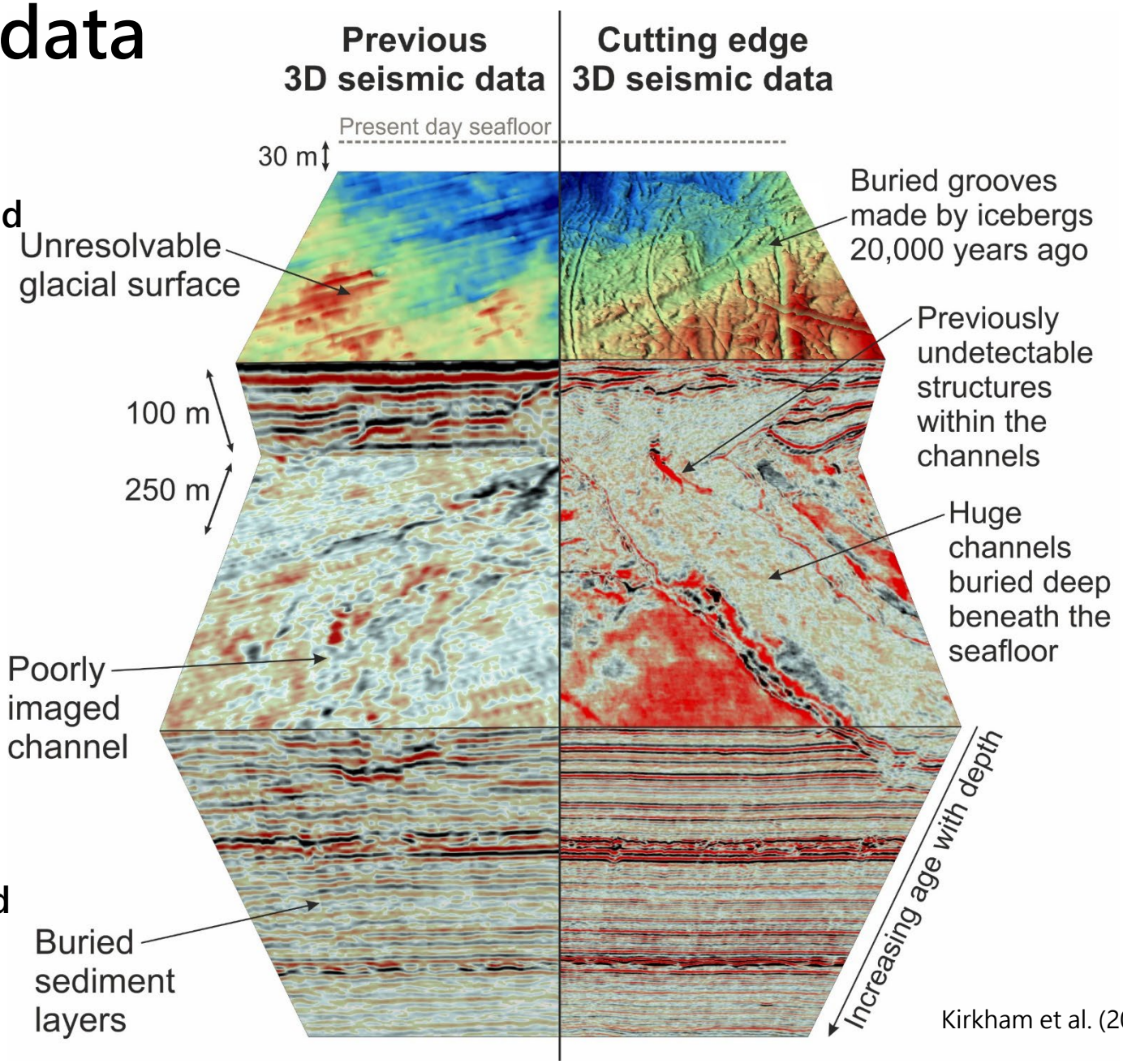
Revolutionary 3D data

Cutting edge data originally acquired for the oil and gas industry.

Using tried and tested technology, redesigned for 3D.

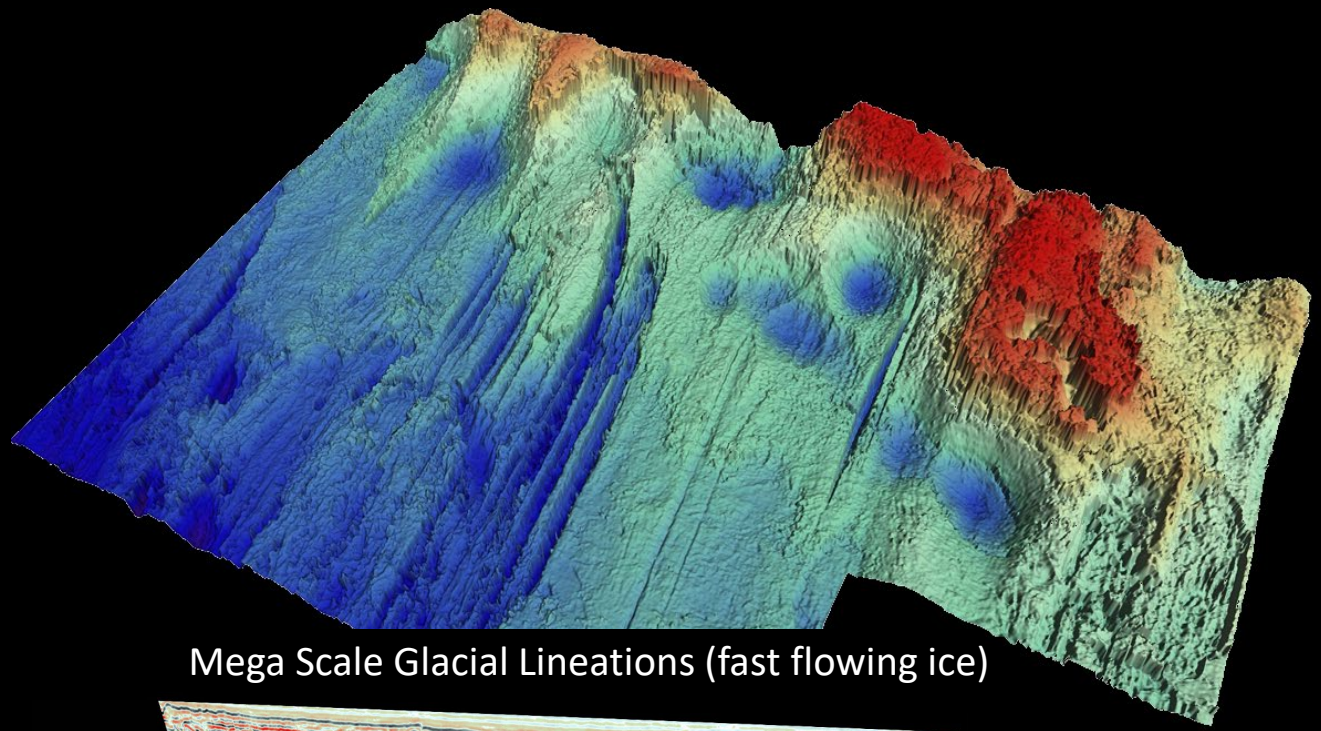
- Dual source + streamer
- 160cu in sleeve guns
- 1200m digital streamers
- True 6.25m x 6.25m bin.
- 1ms sample rate, up to 250Hz.
- Resolution of 2m-4m.

Primary purpose was Drilling Hazard Assessment, not academic research.

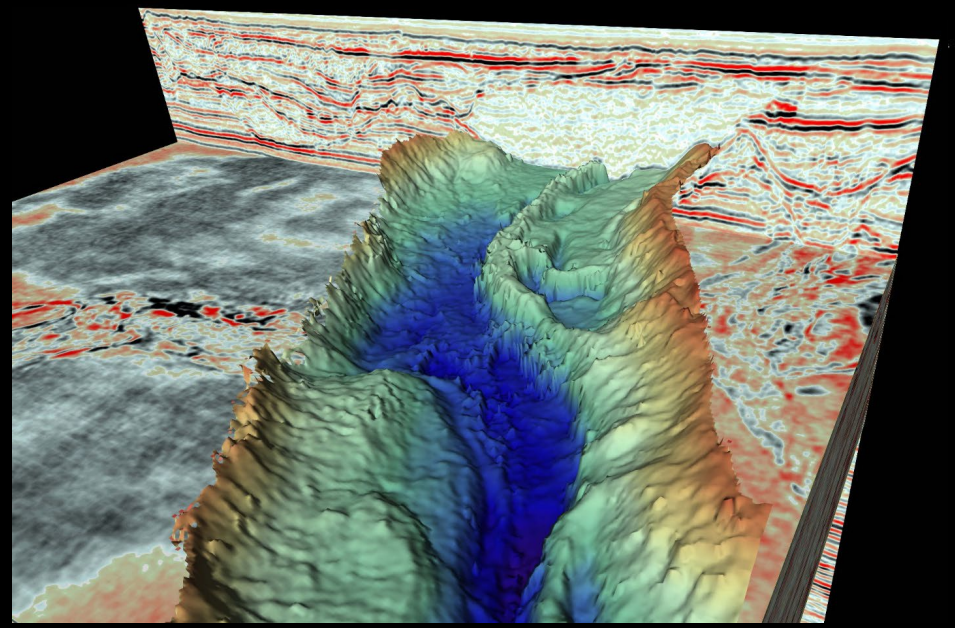


Scan for a link to the paper!

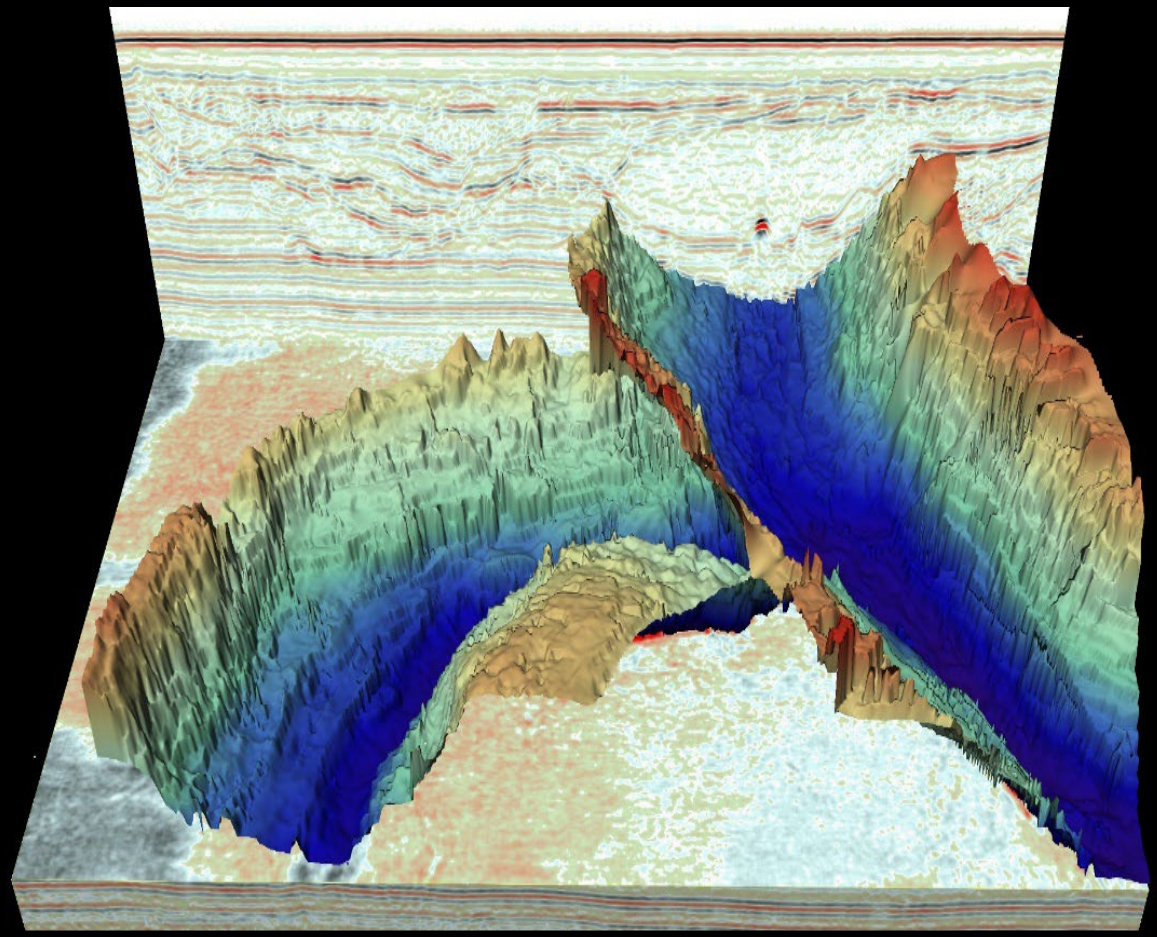
Kirkham et al. (2021), *Geology*



Mega Scale Glacial Lineations (fast flowing ice)

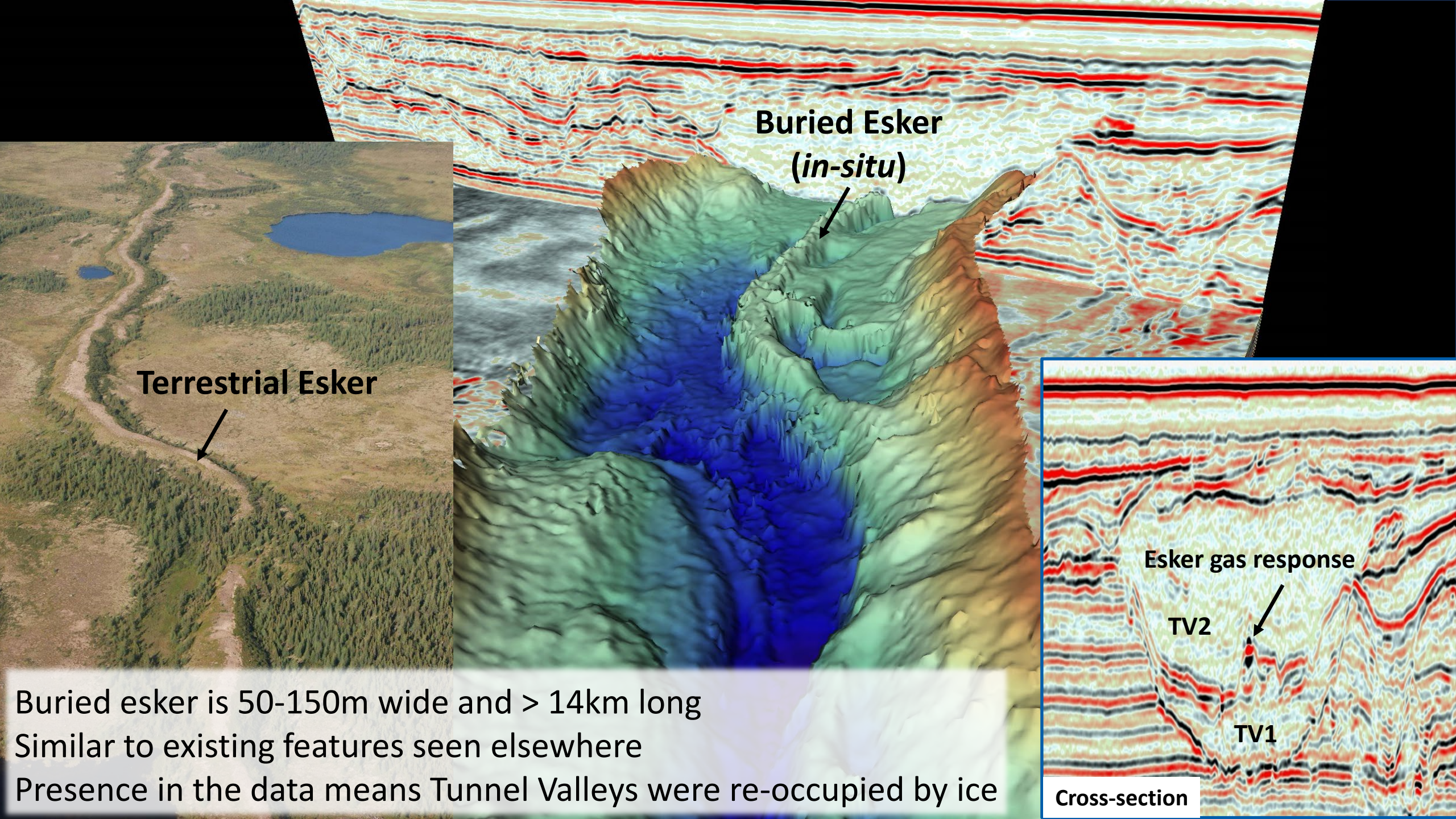


Large scale esker feature (TV reoccupied by ice)

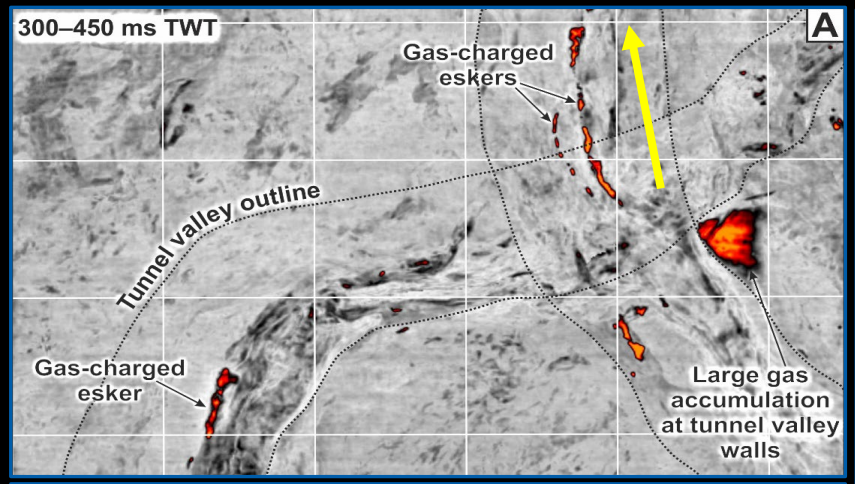


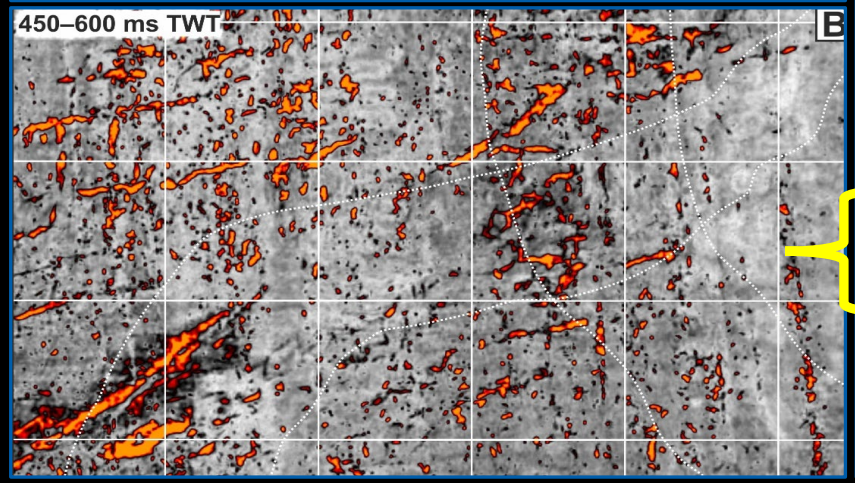
Multi-generational tunnel valleys

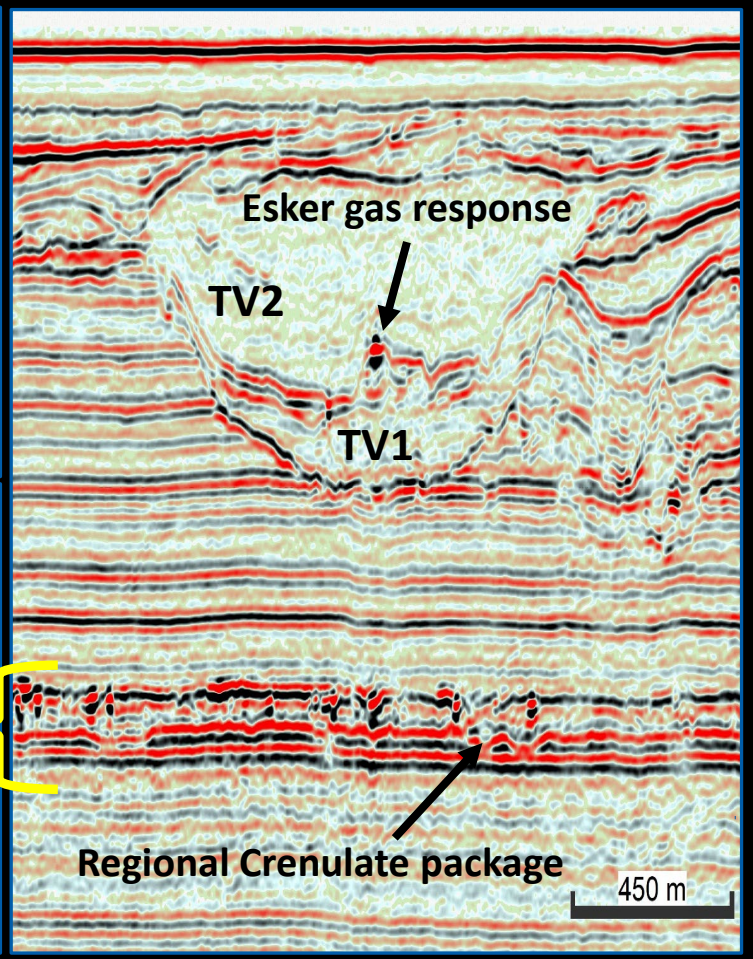
Features are preserved *in-situ*.
Required 1000's hours of work, revealing intricate subglacial landforms ➡ both stable ice and dynamic flow behaviour.

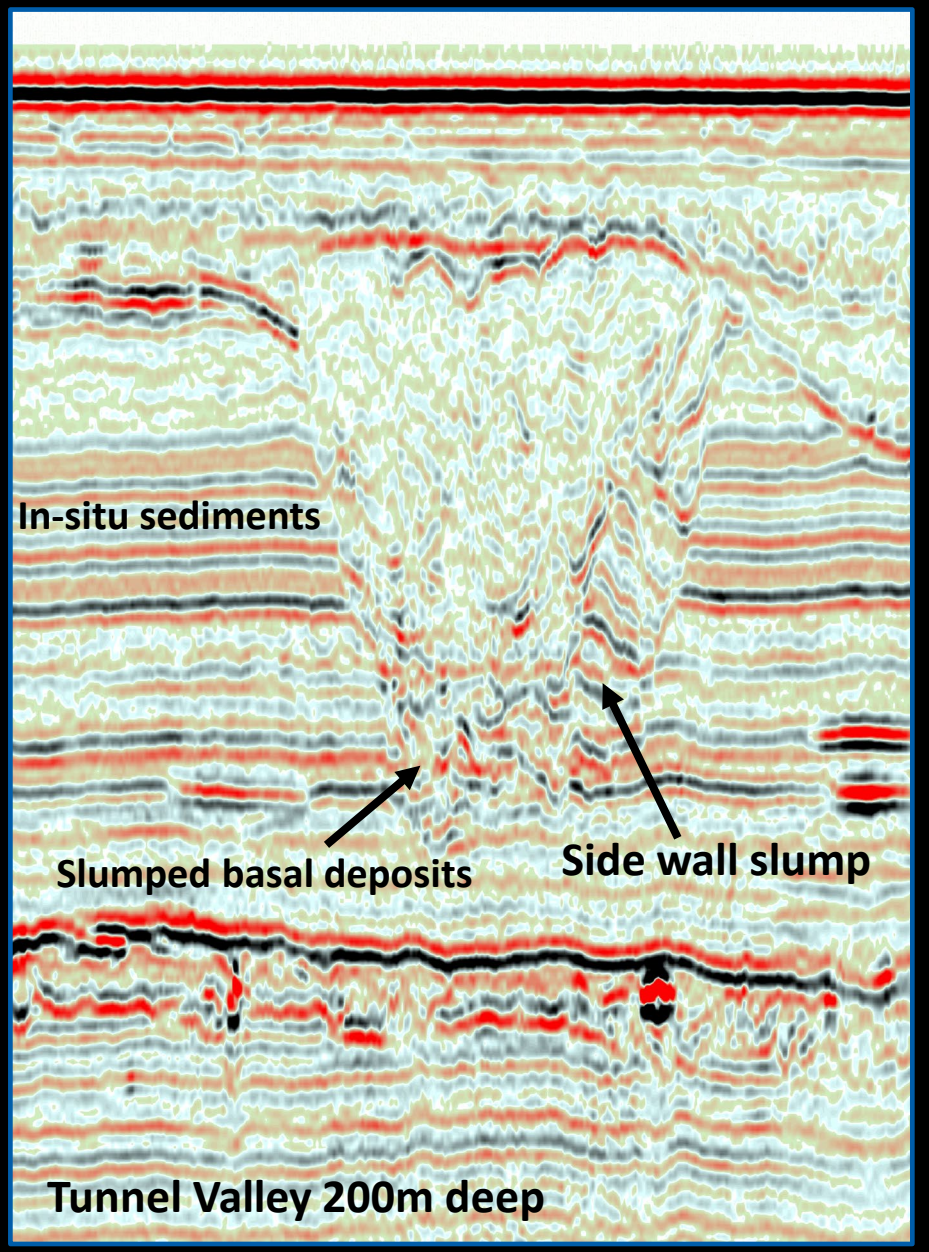


Buried esker is 50-150m wide and > 14km long
Similar to existing features seen elsewhere
Presence in the data means Tunnel Valleys were re-occupied by ice









Potential Geohazard?

Eskers - long sand bodies capable of being gas-charged

Side wall slumps - Potential pathway for fluid migration?

Gas escape to seabed is known from TVs

Potential for significant lateral migration of gas? Unknown

equinor
petoro
Lundin Energy
AkerBP
TOTAL E&P
CHRYSAOR
bp

Acknowledgements

What's next?

Try sharing data with academia

British Antarctic Survey
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