Buried geomorphic features in the North-western Irish Sea: markers of the last glaciation and deglaciation episodes

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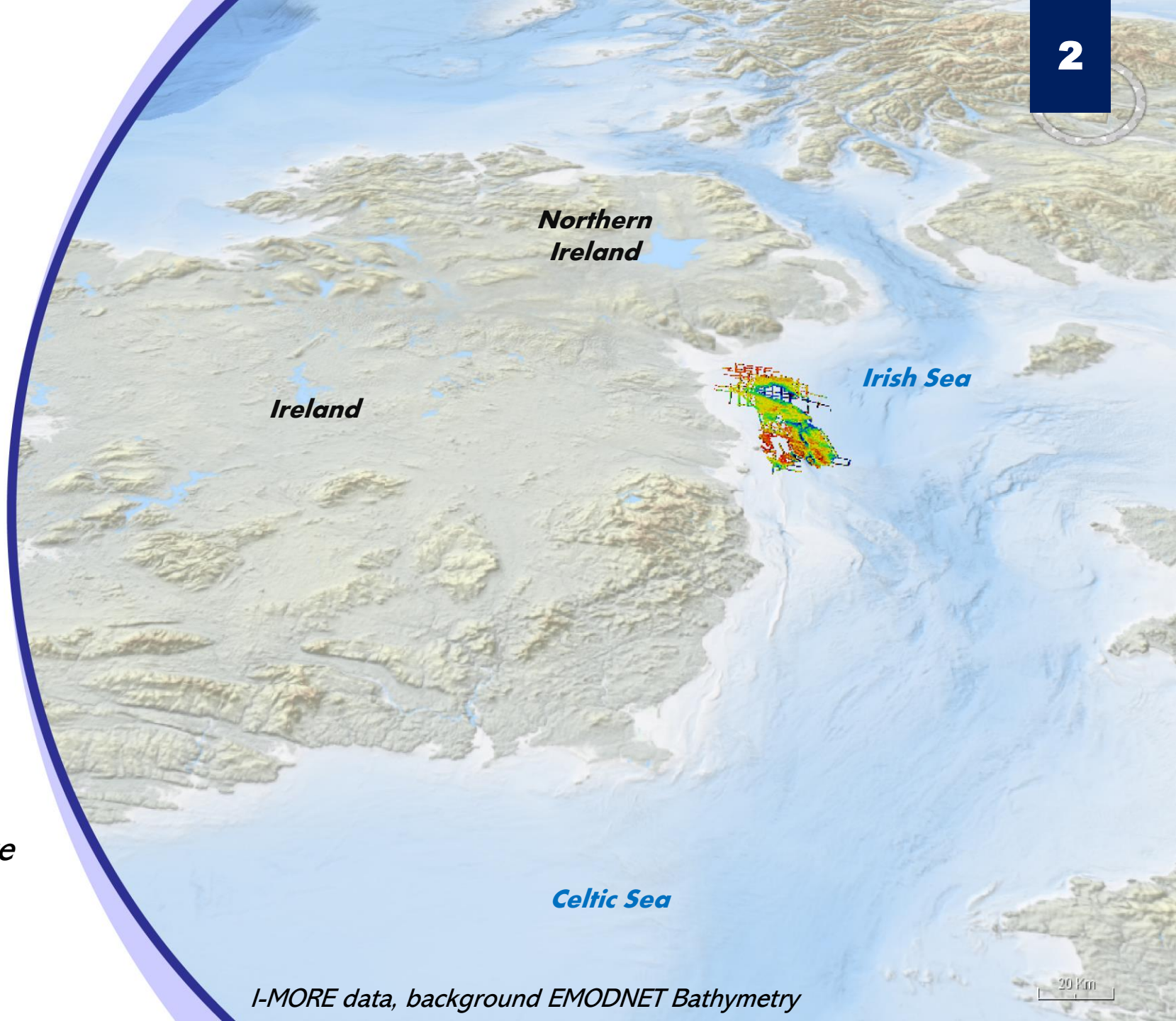
SUSTAINABLE ENERGY AUTHORITY OF IRELAND

I-MORE project

Informing and Mapping Offshore Renewable Energy

Optimizing methods and datasets in order to efficiently reduce the **Levelized Cost of Energy**.

Present study as part of:
I-MORE Work Package 2 – Pilot Site Identification



I-MORE data, background EMODNET Bathymetry

How do we do it? And why?

INFOMAR

Foras na Mara
Marine Institute

Geological Survey
Suirbhéireacht Gheolaíochta
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INFOMAR and academic datasets

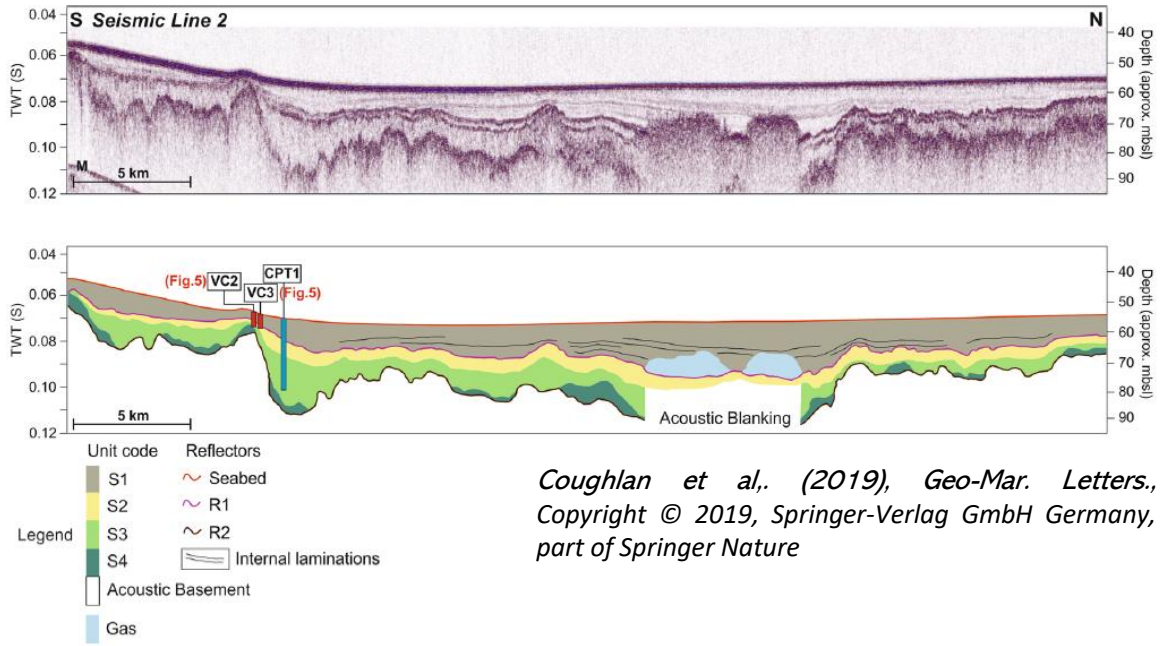
Extensive seismic dataset interpretation based on published stratigraphic model (Coughlan et al., 2019).

Key seismic units:

- *Holocene marine sediments on top of an unconformity*
- *Glaciomarine / Glacio-lacustrine sediments*
- *Till and basement*

Integration of CPT data (2014 dataset, Coughlan et al., 2019) and newly acquired dataset (early 2022).

Why? To improve geotechnical and geological constrains and then de-risk offshore windfarm development.



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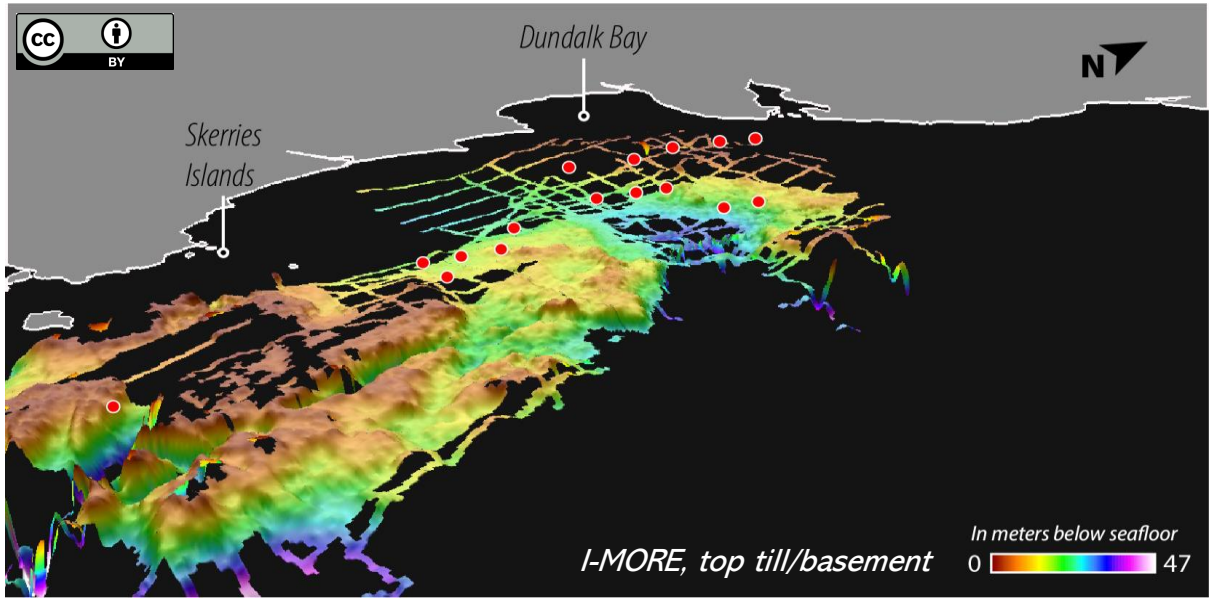


Study dataset

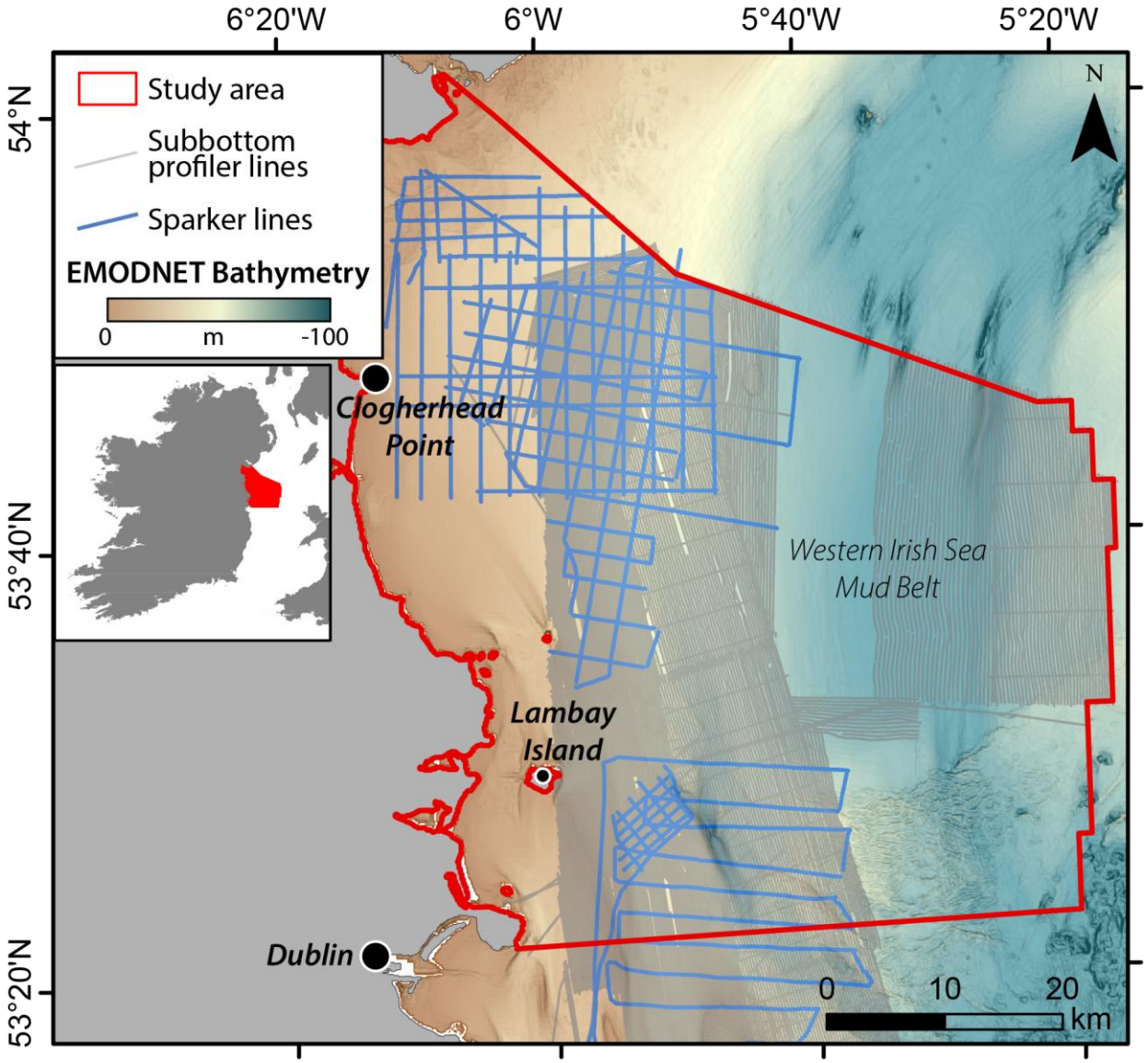
Focus on the North Irish Sea

From Dundalk Bay (north of Clogherhead Point) to south of Lambay Island, covering a large section of the Western Irish Sea Mud Belt.

Sparker and sub-bottom profiler seismic data:
- *9 surveys from 2008 to 2019*
- *451 seismic line interpreted*

Application of corrections within Kingdom software :
- *Navigation*
- *Bandpass filter*
- *Gain control*

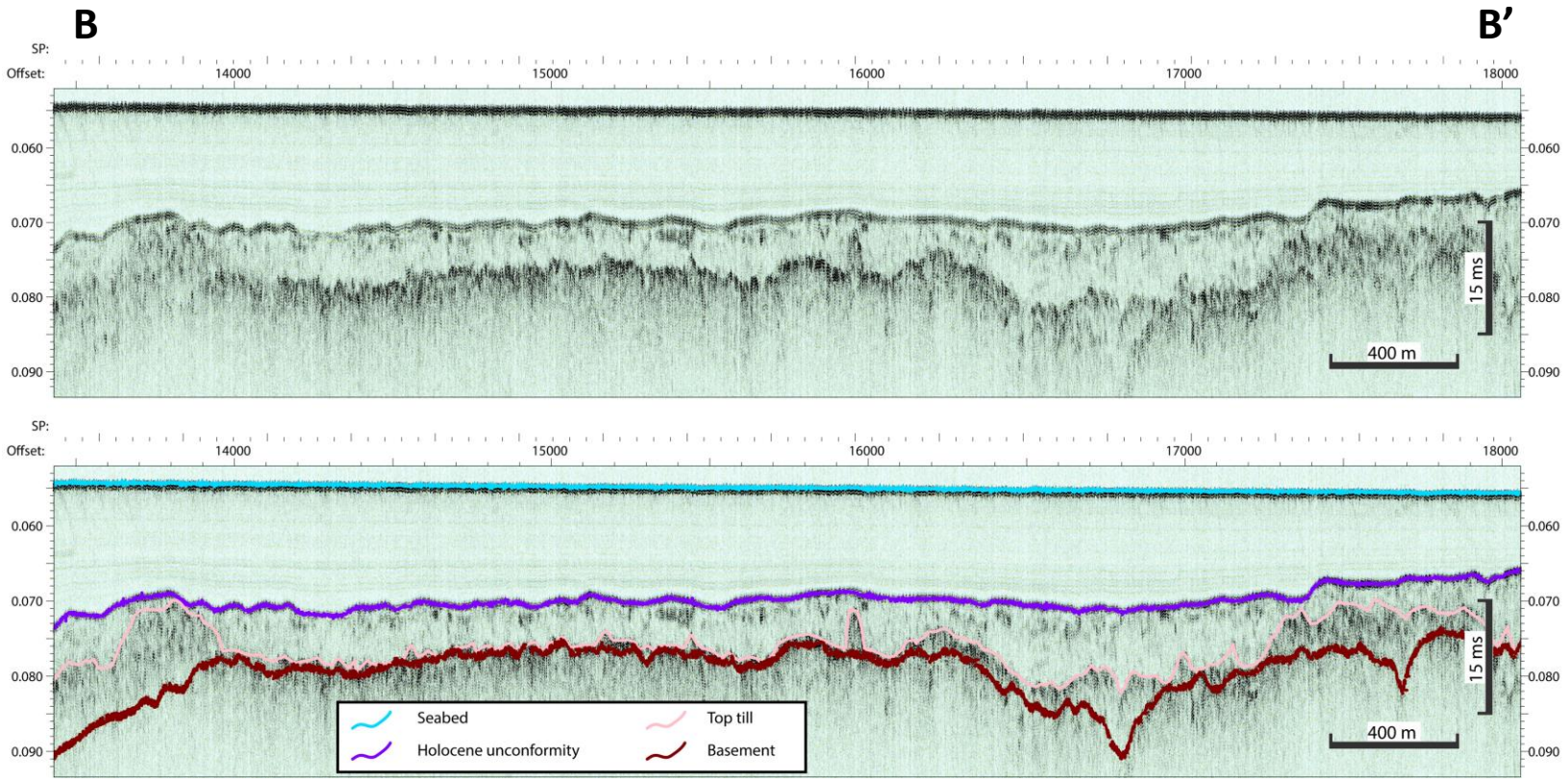
Generation of regional seismic surfaces and production of synthetic-3D seismic models.

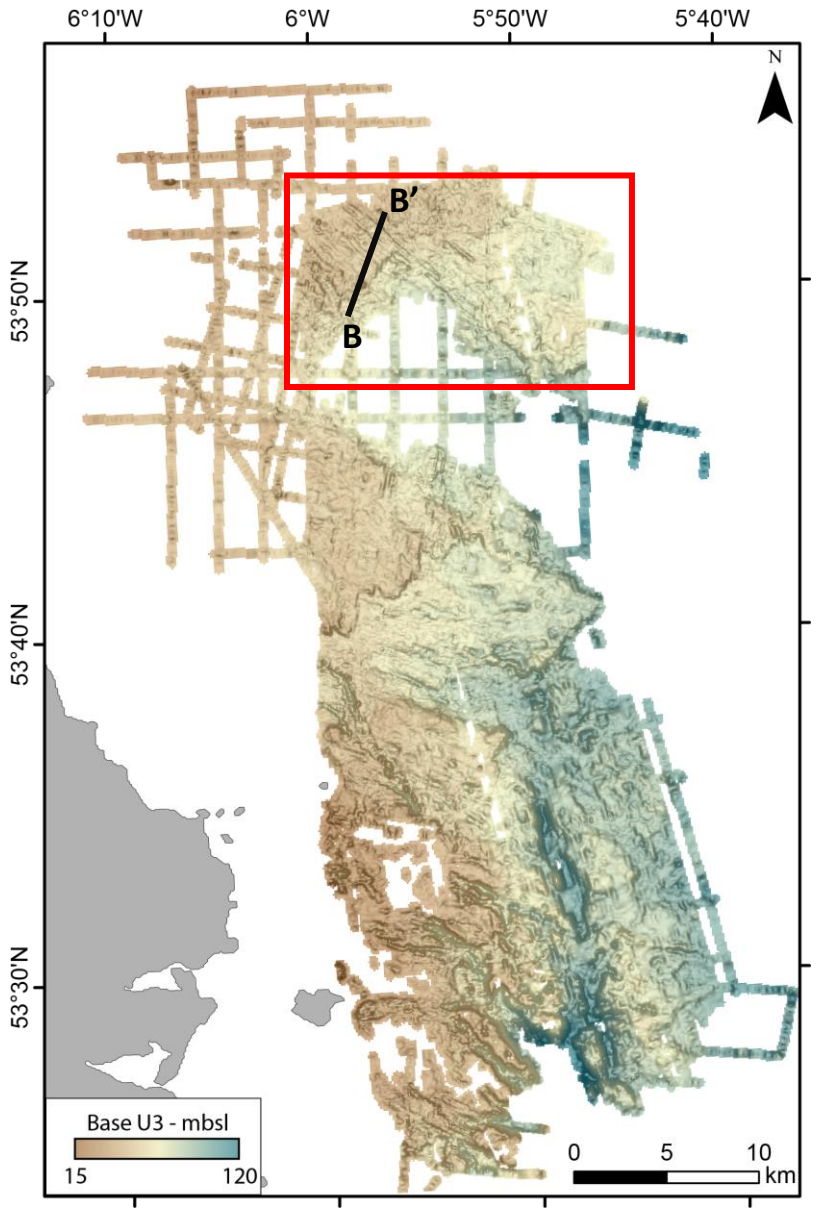


Localized till deposits

Base of U3 unit (glacio-marine sediments) and top of till/basement.

North of the study area:
Regional evidences of a thin layer of till on top of basement, with localized thicker till deposit units.

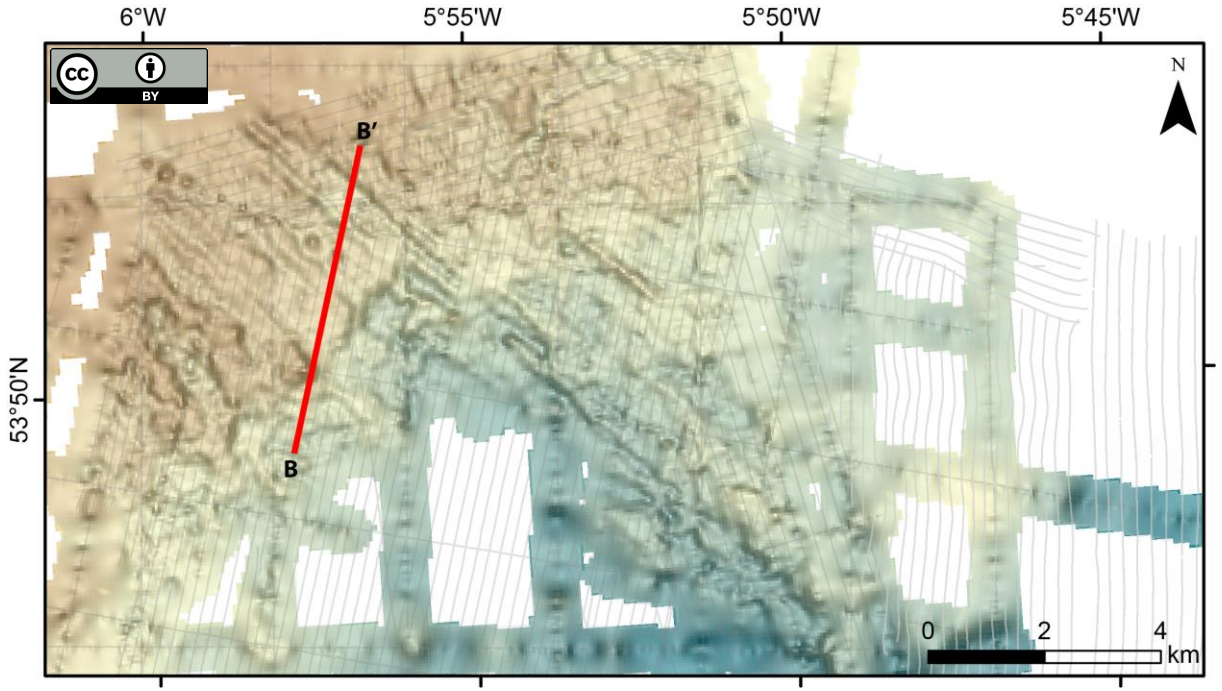




Large glacial lineations

Spatial repartition of these localized till units as lineations.

- Several kilometres long (up to 5km)
- Width 150 – 350m,
- Differential height (between trough and crests) of about 3-5 m.

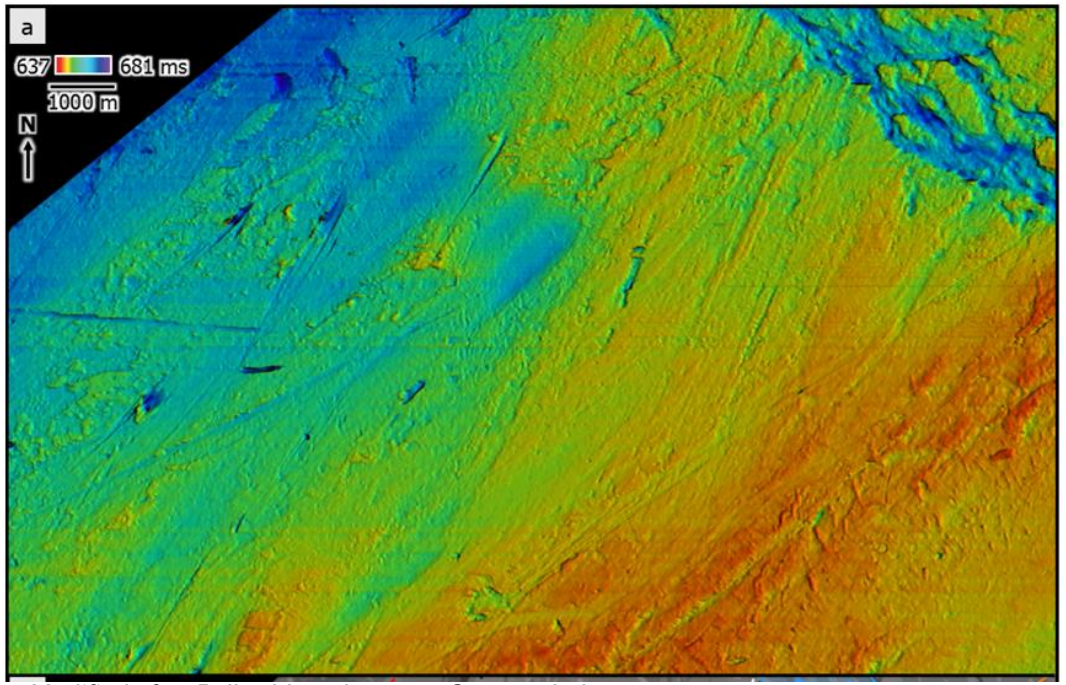


- *Mega-scale features.*

- *Consistent orientation with onshore glacial morphologies (Brit-Ice Chrono project and GSI Quaternary features).*

- *Comparison to literature (e.g. Bellwald et al., 2019)*

Interpretation as glacial lineations, markers of a fast ice-flow paleo ice-stream.



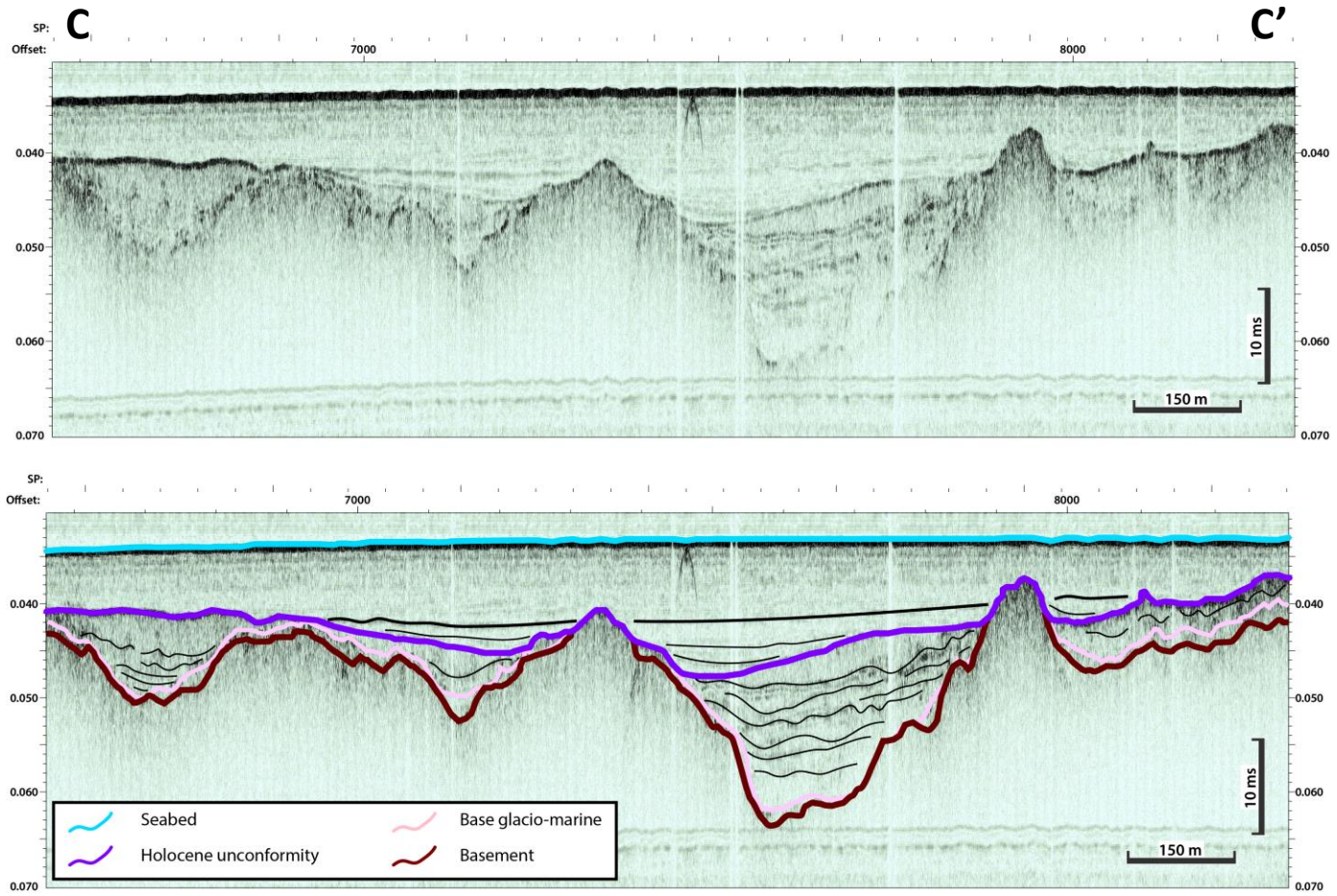
Modified after Bellwald et al., 2019, Geomorphology,

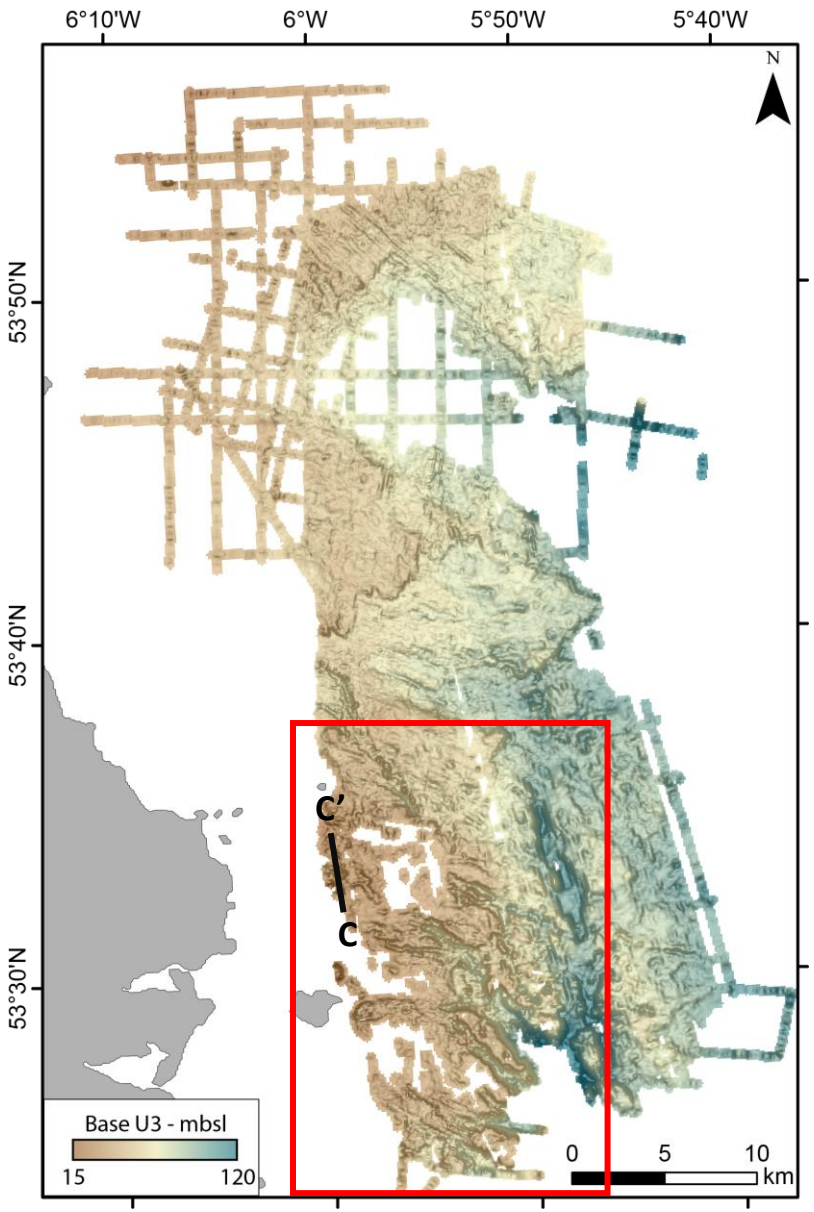
Glacial incisions

Base of U3 unit (glacio-marine sediments) and top of till/basement.

SW of the study area:

Deep incisions within the basement with complex episodes of sediment infilling and possible re-incisions.





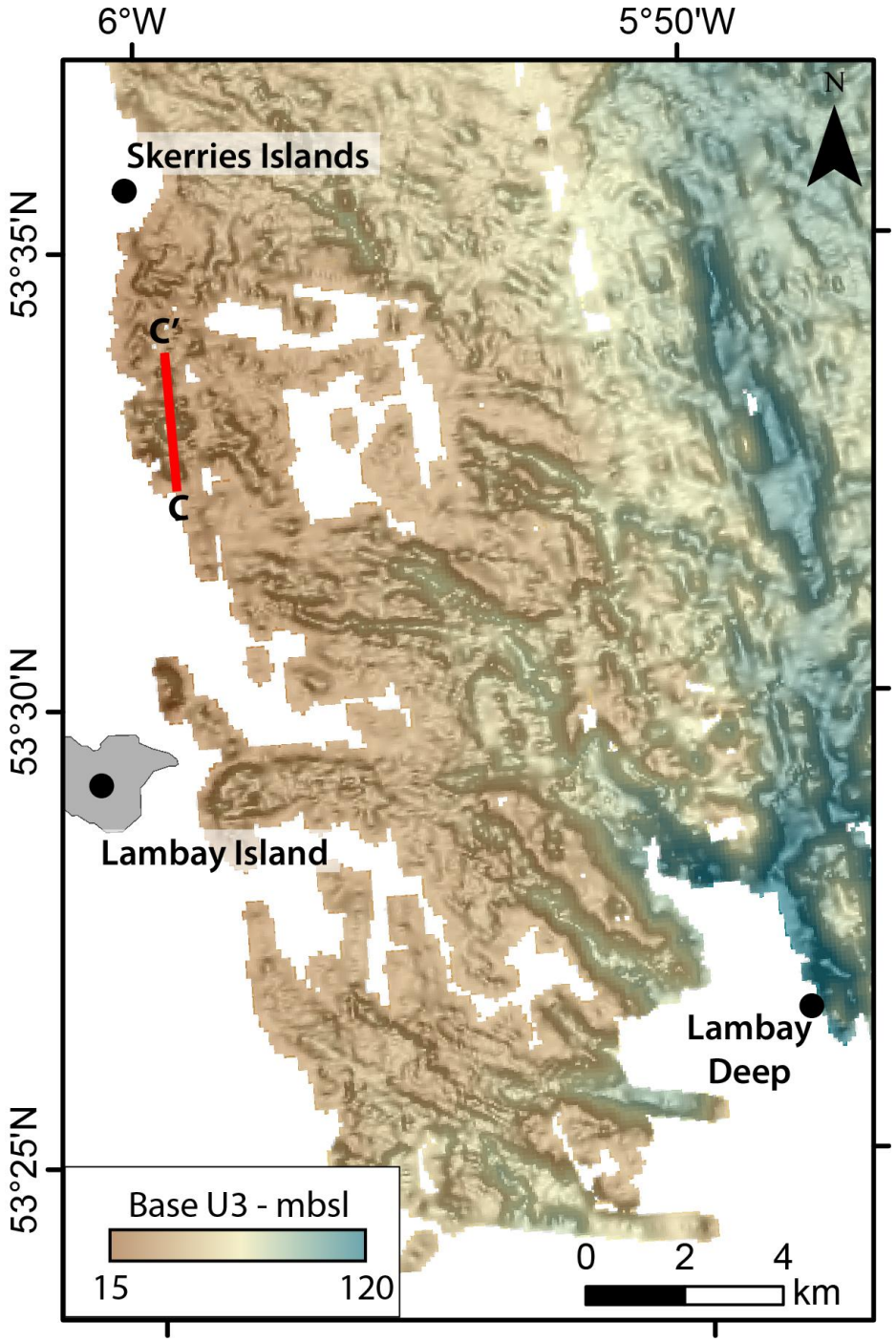
Meltwater channels

Dense network of several kilometres-long incisions within the till formations and basement.

Evolution from narrow (250 – 400m) to large incisions (750 – 1800m) with increase of internal depths (from 4-6m to 20-30m) towards Lambay Deep.

- *Dense network of medium-scale incisions connecting into large-scale incisions.*
- *Consistent with onshore network of meltwater channels (Brit-Ice Chrono project).*
- *Complex infilling is indicative of multiple generation of meltwater channels.*

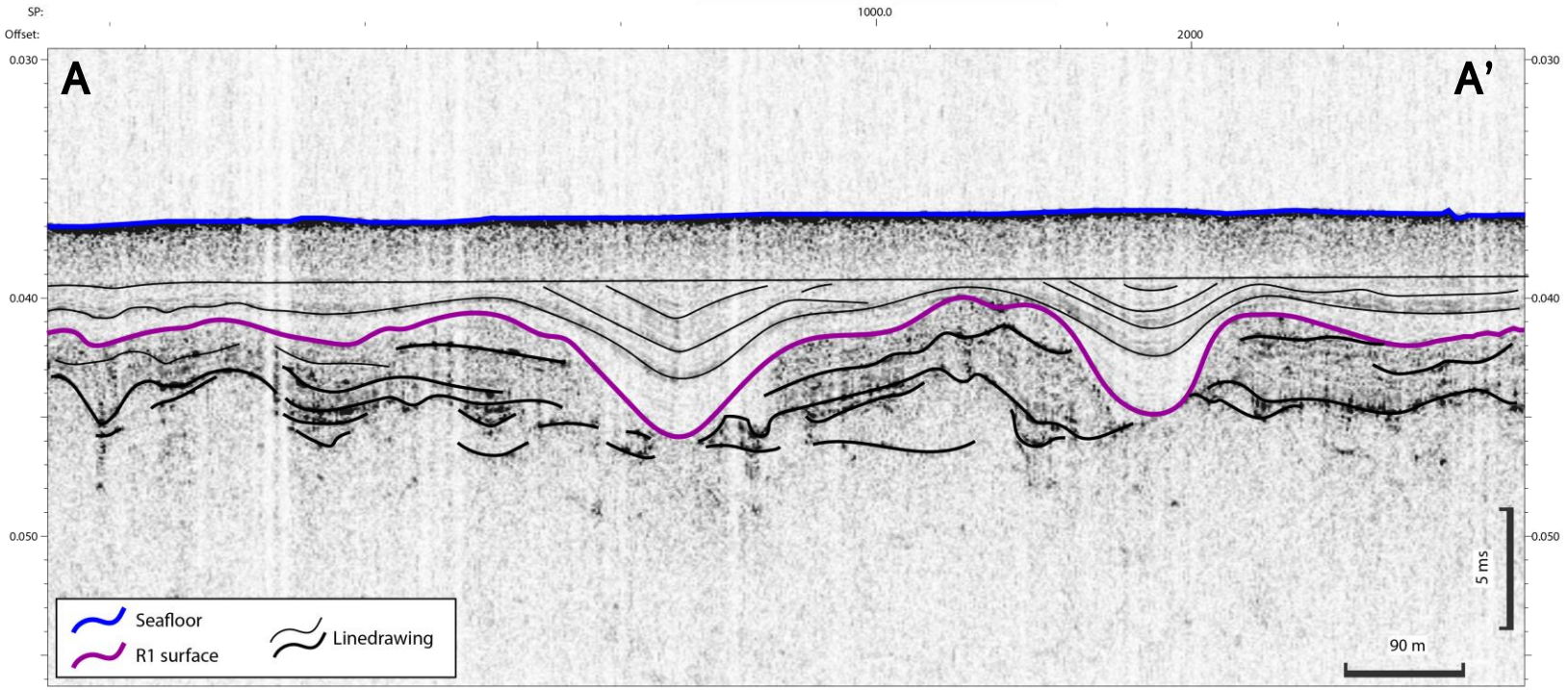
Interpretation as subglacial meltwater channels connecting into tunnel valleys.

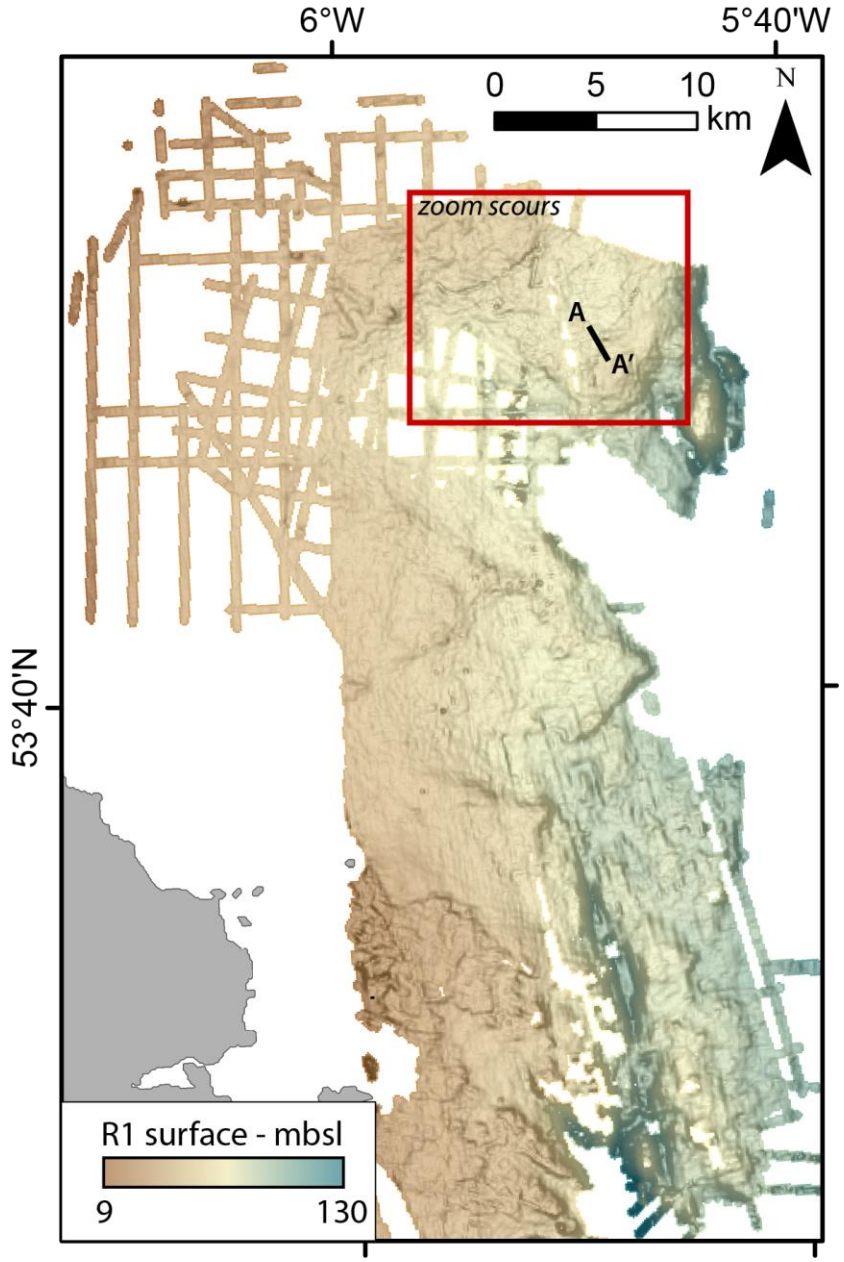


Late glacial incisions

R1 surface on top of glacial sediments, corresponds to an unconformity topped by Holocene marine sediments.

NE of the study area:
Incisions with 'infilling' units different from typical channel morphologies.
Instead, well layered low amplitude infilling with apparent iso-thickness.





Iceberg scours

Dimensions of the incisions:
- 1-4 m deep
- 75-250 m wide
- 2,5 – 6,25 km long.

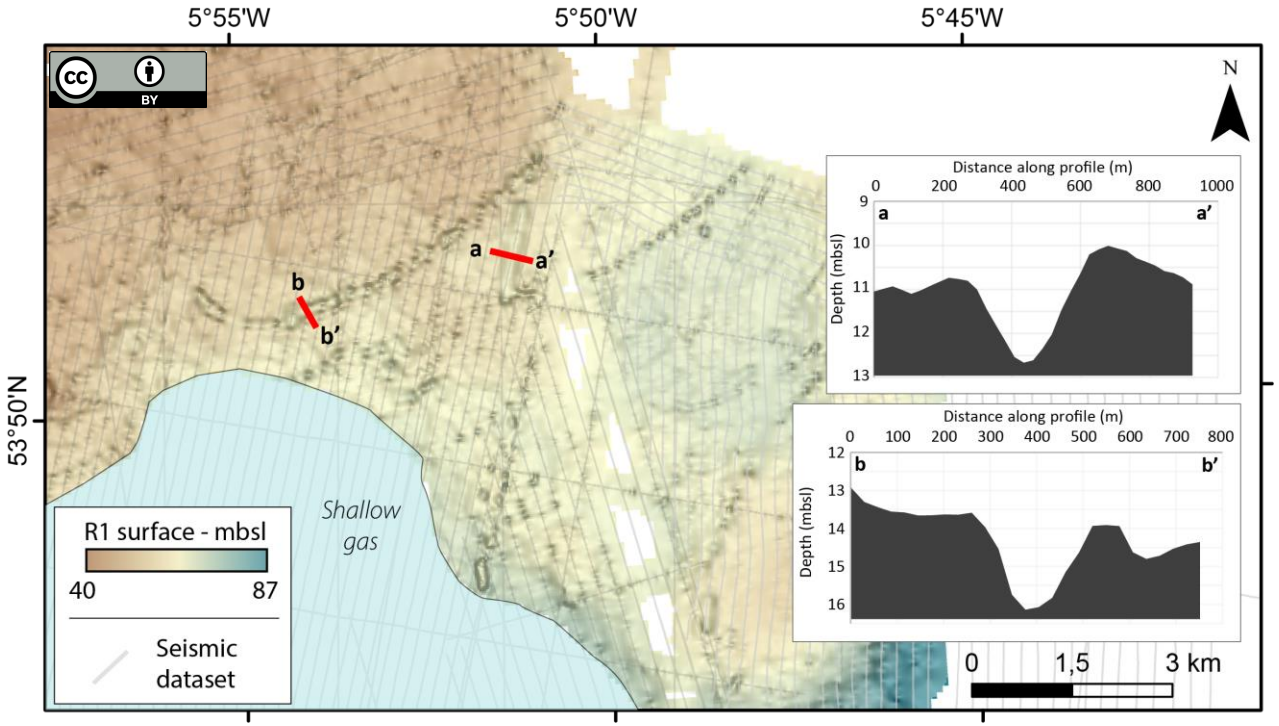
- *Bulges on top of each flank of the incisions.*

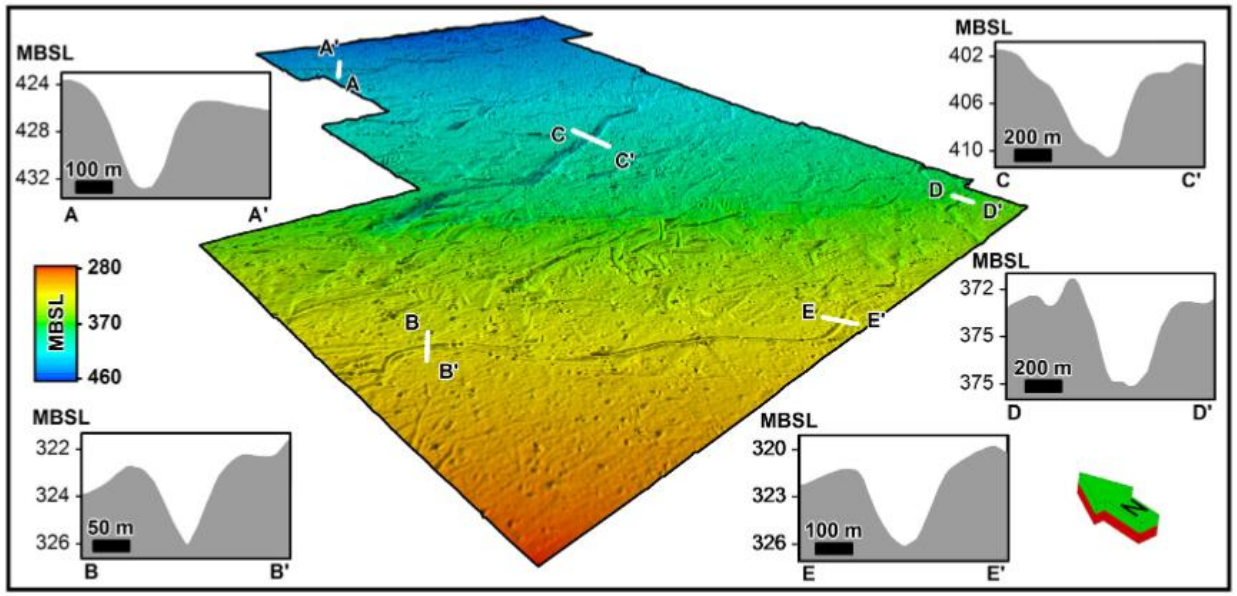
- *No evidence of pits but evidence of direction changes.*

- *Comparison to literature (e.g. Brown et al., 2017)*

Interpretation as iceberg scours.

Most likely formed during late glacial episode and buried by Holocene marine sediments.





Synthesis

Occurrence of:

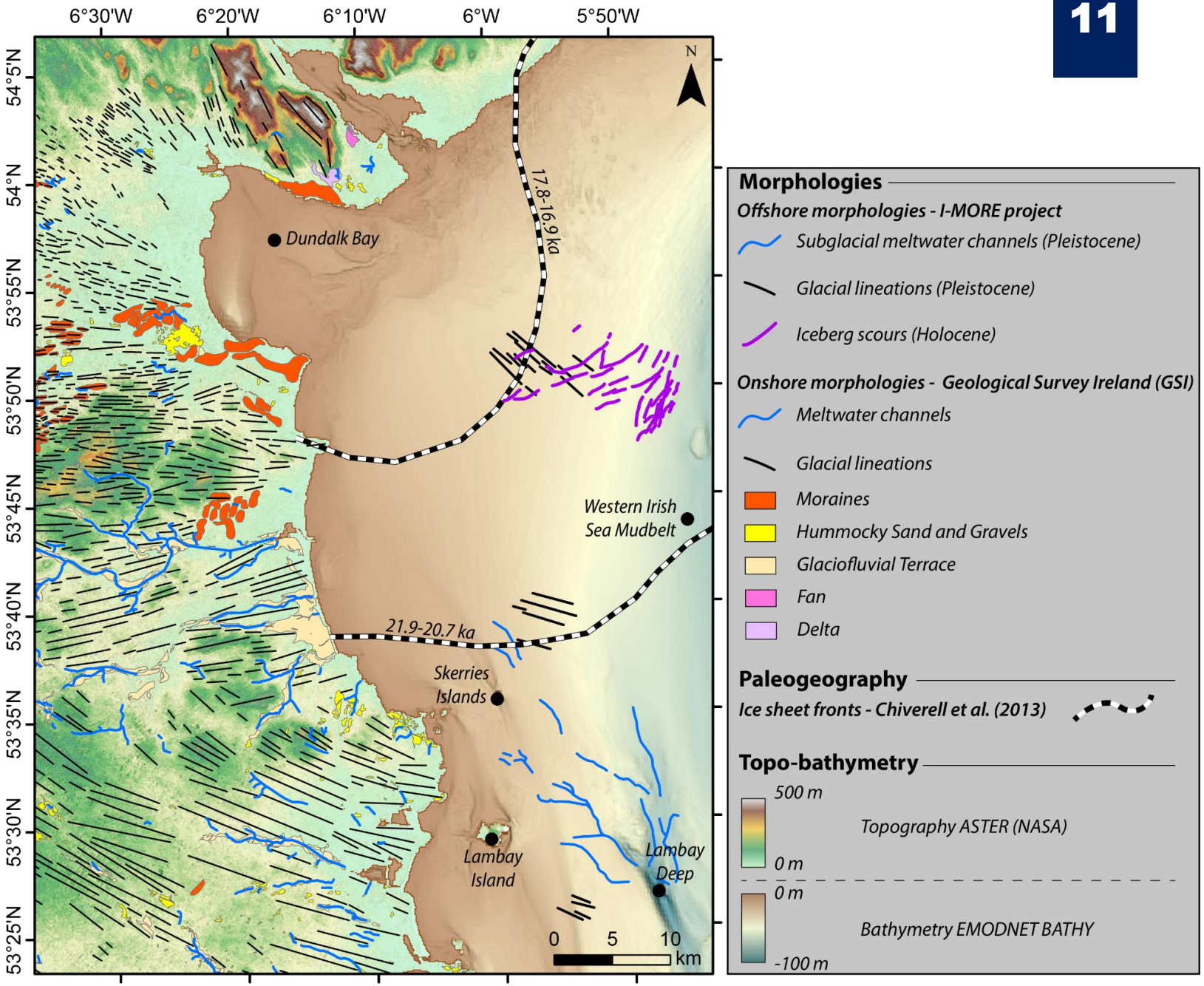
- Glacial lineations made of till units.
- Subglacial meltwater channels incised into till units and bedrock.

Markers of ice sheet progression, highlighting different lobe and also different ice sheet dynamic patterns.

- Iceberg scours prior to Holocene marine sediments.

Markers of late glacial episode and transition towards a fully marine setting

Next steps: comparison with the paleo Ice-sheet fronts modelised by Chiverell et al., 2013



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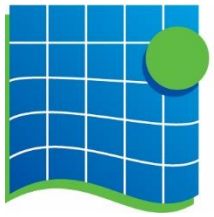
Acknowledgments



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NETWORKING AND MARINE RESEARCH COMMUNICATION AWARDS

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