

Recent Scientific Discoveries from Seafloor Mapping in the Polar Regions



Martin Jakobsson

Department of Geological Sciences, Stockholm University

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Evidence of marine ice-cliff instability in Pine Island Bay from iceberg-keel plough marks (Nature, 26 October, 2017)

Matthew G. Wise¹, Julian A. Dowdeswell¹, Martin Jakobsson² & Robert D. Larter³

¹Scott Polar Research Institute, ²Stockholm University, ³British Antarctic Survey



The leapfrogging Petermann Glacier, northern Greenland (In prep)

Martin Jakobsson, Larry Mayer, Kelly Hogan, Alan Mix *et al*

¹Stockholm University, ²University of New Hampshire, ³British Antarctic Survey,

⁴Oregon State University

Youtube clip: Calving and rotating iceberg in Greenland: <https://youtu.be/3V2UACo1qEY>

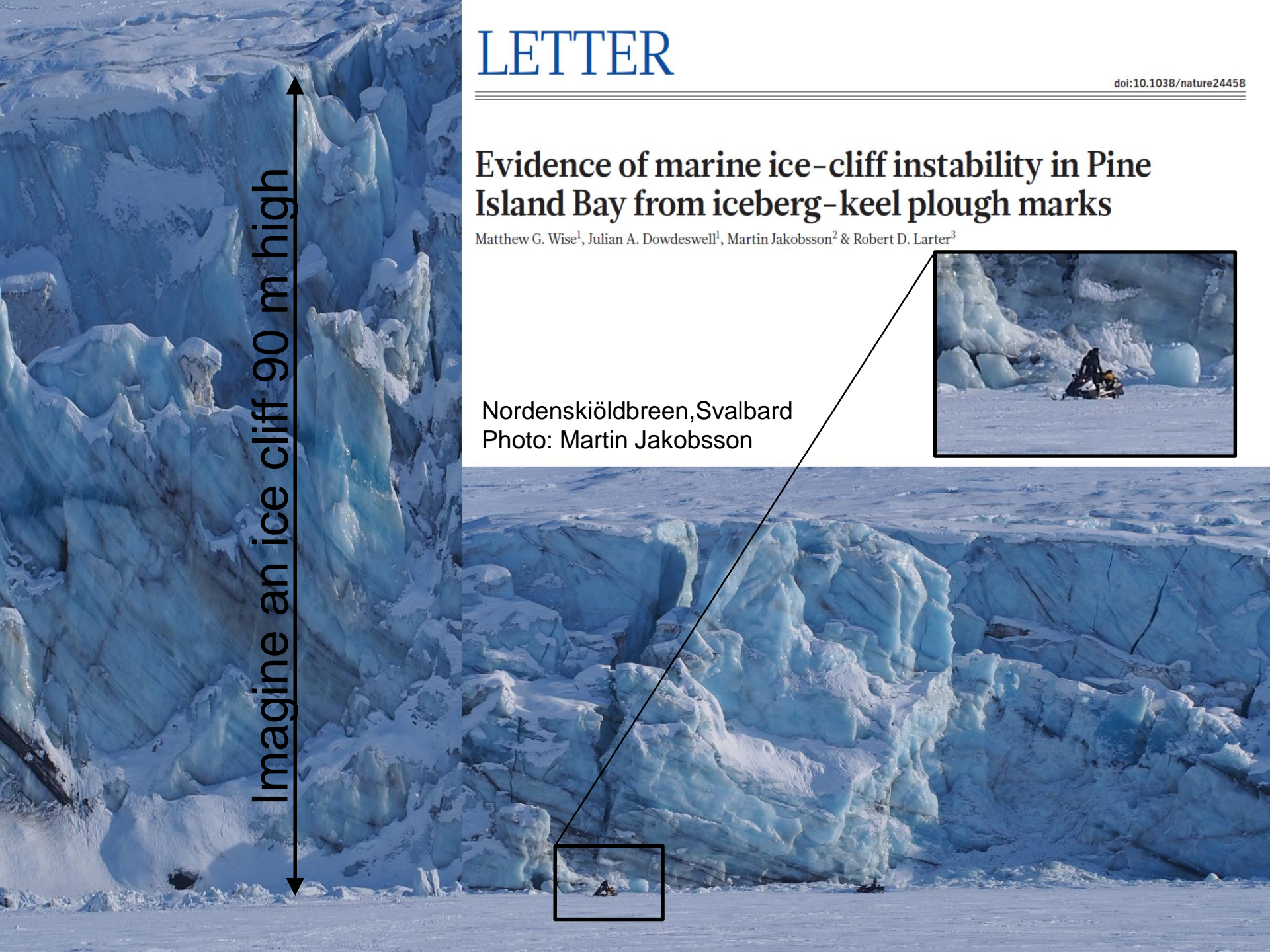


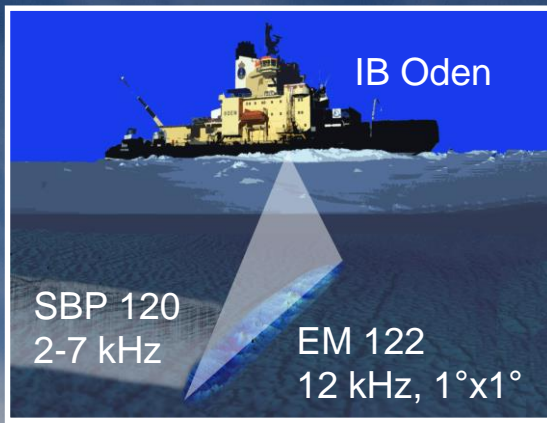
Evidence of marine ice-cliff instability in Pine Island Bay from iceberg-keel plough marks

Matthew G. Wise¹, Julian A. Dowdeswell¹, Martin Jakobsson² & Robert D. Larter³

Imagine an ice cliff 90 m high

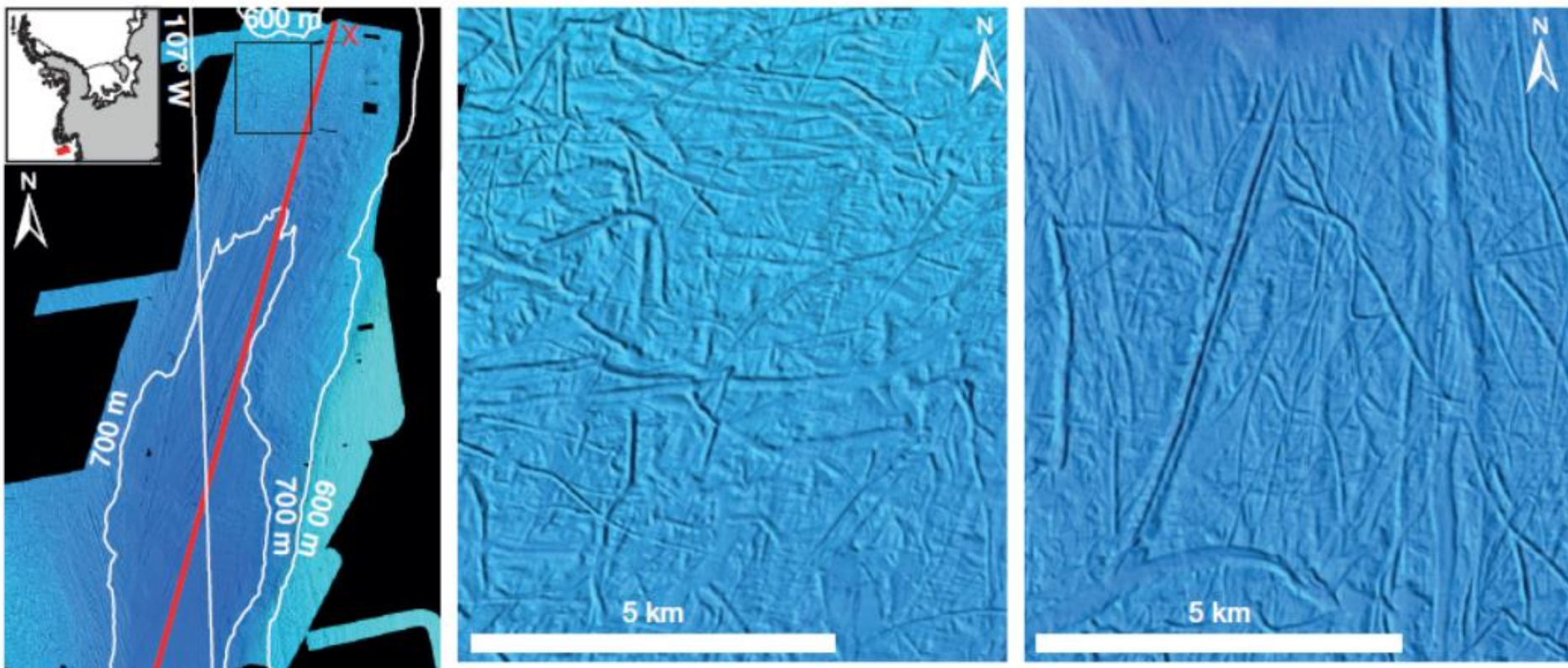
Nordenskiöldbreen, Svalbard
Photo: Martin Jakobsson





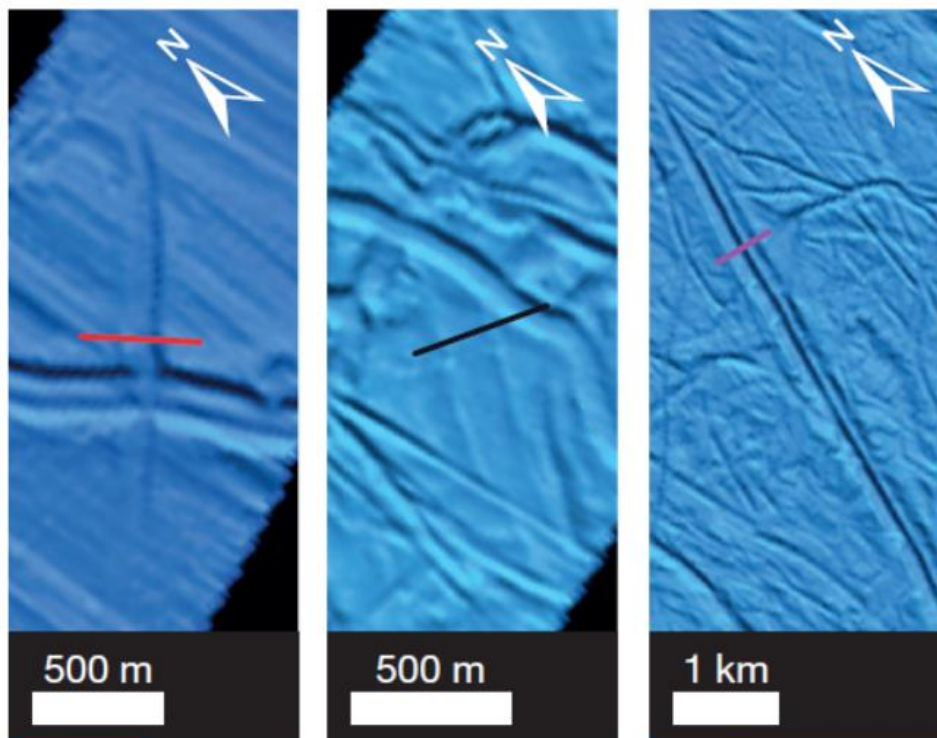
Iceberg calving during the most recent deglaciation was not characterized by small numbers of large, tabular icebergs as is observed today, which would produce wide, flat-based plough marks or toothcomb-like multi-keeled plough marks.

Iceberg plowmarks from Pine Island Trough

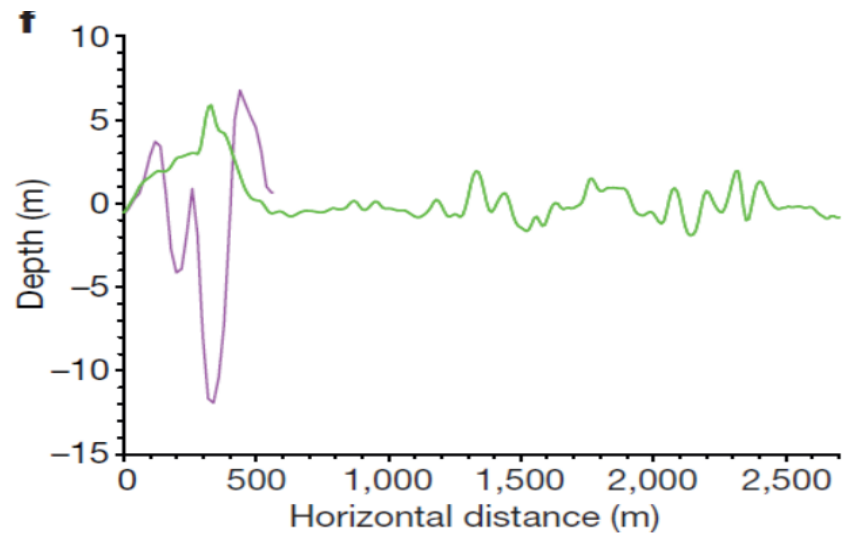
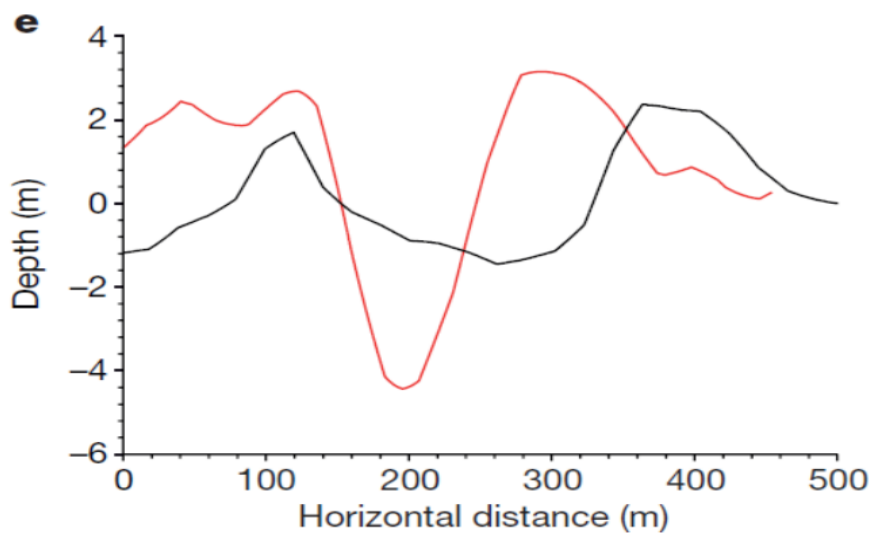
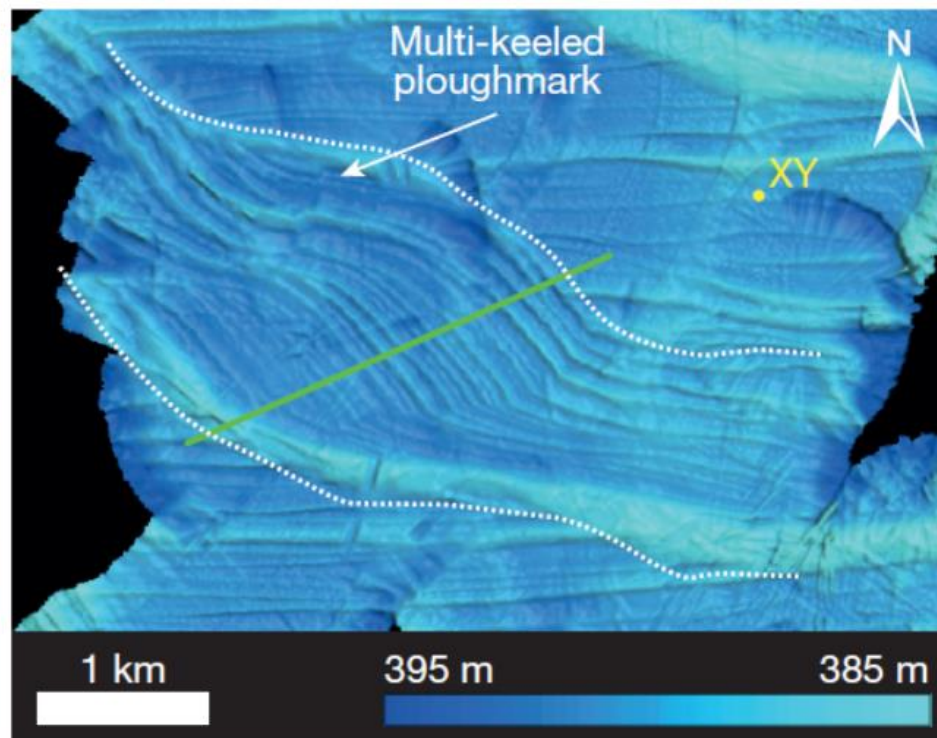


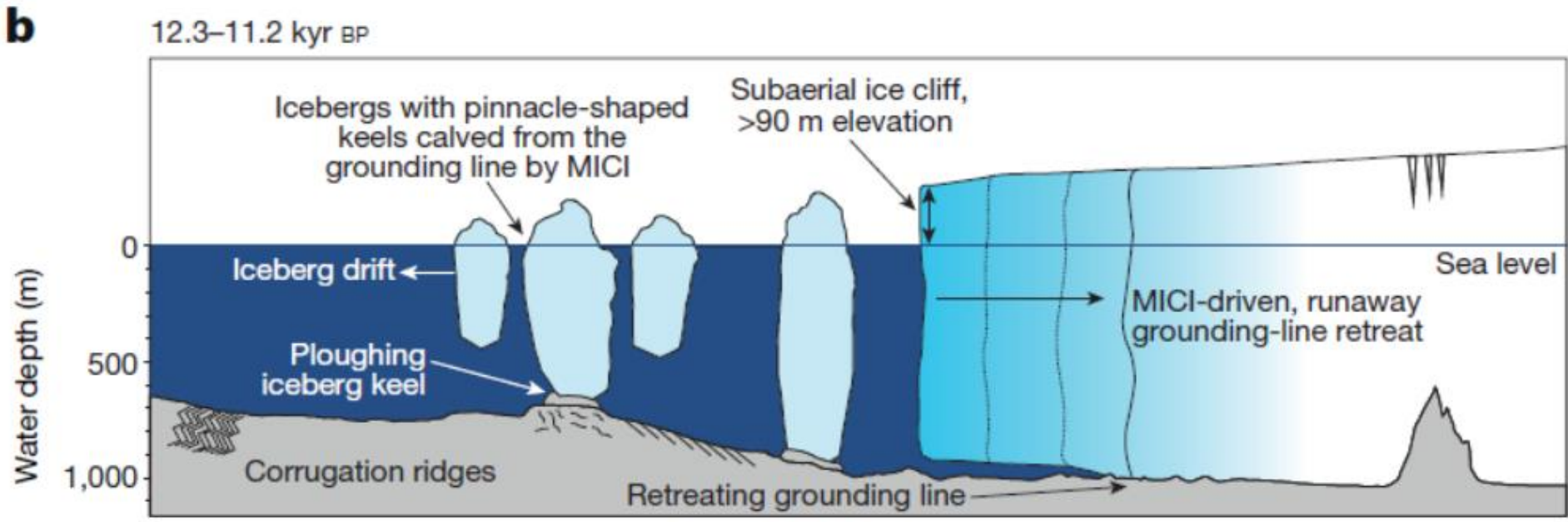
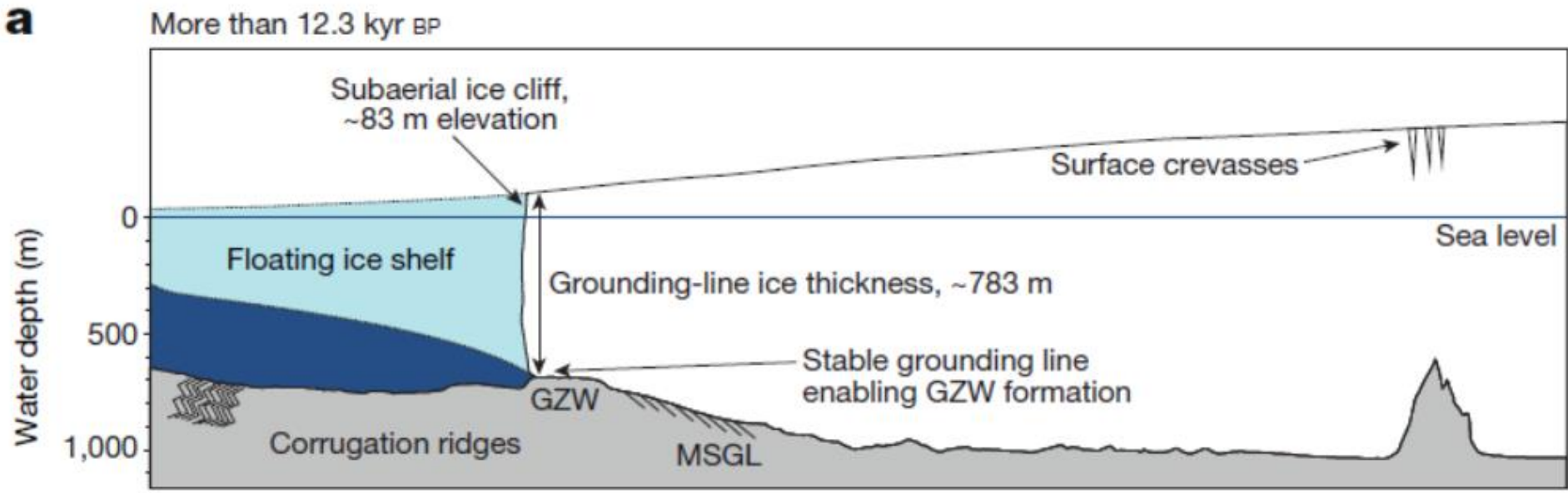
Wise, M. G., Dowdeswell, J. A., Jakobsson, M., and Larter, R. D., 2017, Evidence of marine ice-cliff instability in Pine Island Bay from iceberg-keel plough marks: *Nature*, v. 550, no. 7677, p. 506-510.

Pine Island Trough



McClure Strait, Arctic





Wise, M. G., Dowdeswell, J. A., Jakobsson, M., and Larter, R. D., 2017, Evidence of marine ice-cliff instability in Pine Island Bay from iceberg-keel plough marks: *Nature*, v. 550, no. 7677, p. 506-510.



Conditions for and implications of MICI

- An ice cliff becomes unstable when it is >90 m implying grounding at >800 m below sea level
- An ice stream grounded on a retrograde slope will become increasingly unstable following each iceberg calving event: “runaway retreat”
- Buttressing ice shelves of ice tongues have stabilizing effects
- Adding the process of MICI in predicted West Antarctic Ice Sheet retreat results in an order of magnitude faster retreat (up to 3 m contribution to global sea-level rise in 100 years)

The leapfrogging Petermann Glacier, northern Greenland (In prep)

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Platform: Swedish *Icebreaker Oden*

Based on: NSF project *Petermann Gletscher, Greenland - Paleooceanography and Paleoclimatology*, Lead PIs Alan Mix, Oregon State Univ; Larry Mayer, UNH; Anne Jennings, INSTAAR

Logistical Organizers: Swedish Polar Research Secretariat; NSF; Swedish Maritime Organization

Co-Chief Scientists: Alan Mix, Oregon State University; Martin Jakobsson, Stockholm University

Captain: Mattias Petterson

Project Coordinator: Ulf Hedman



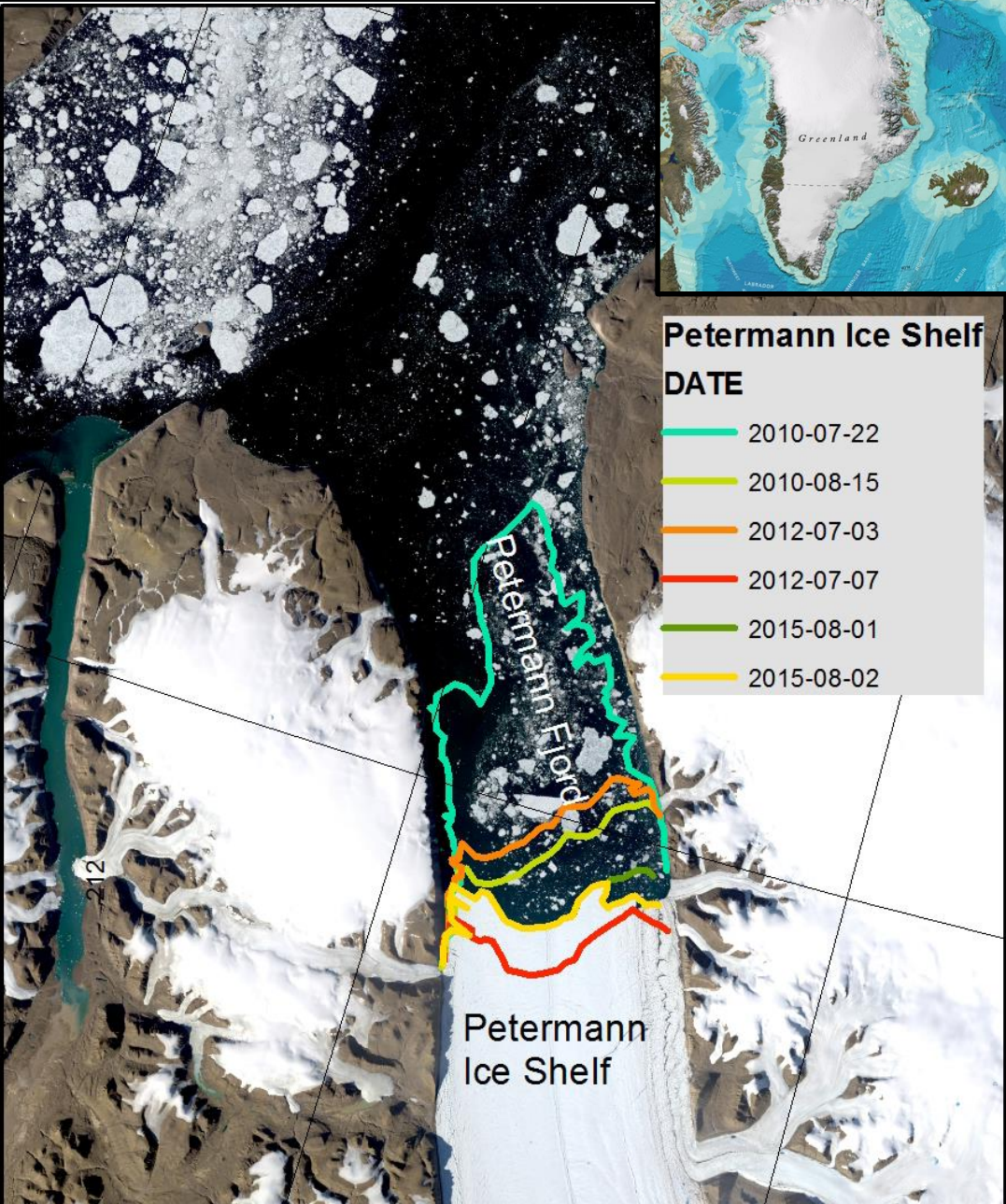
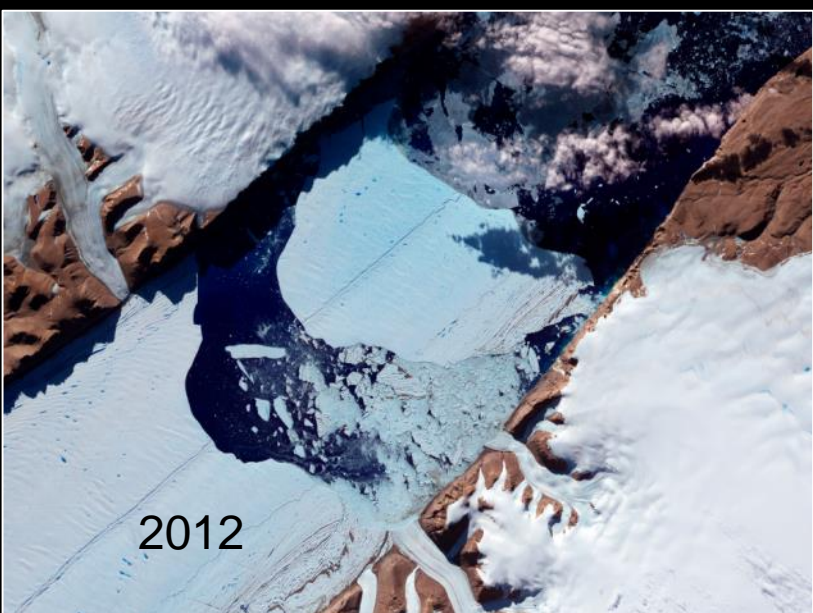
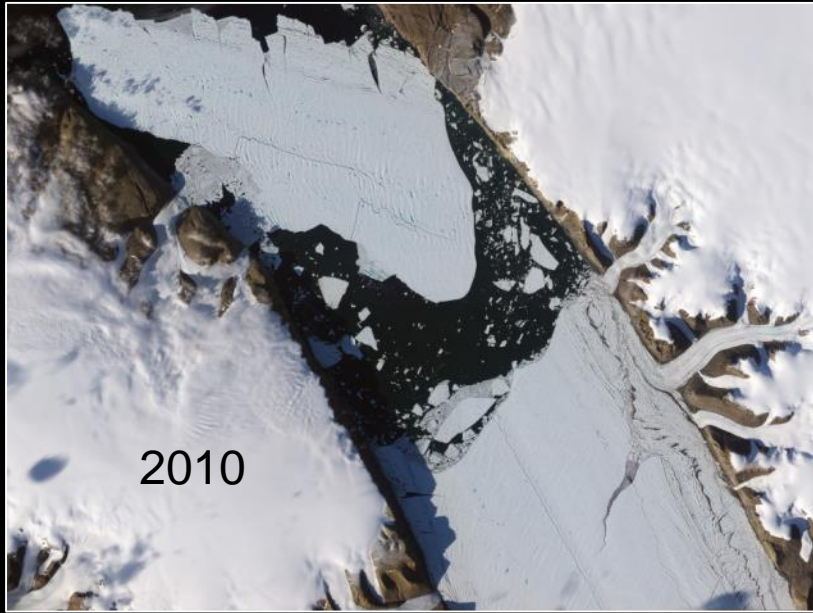
British Antarctic Survey



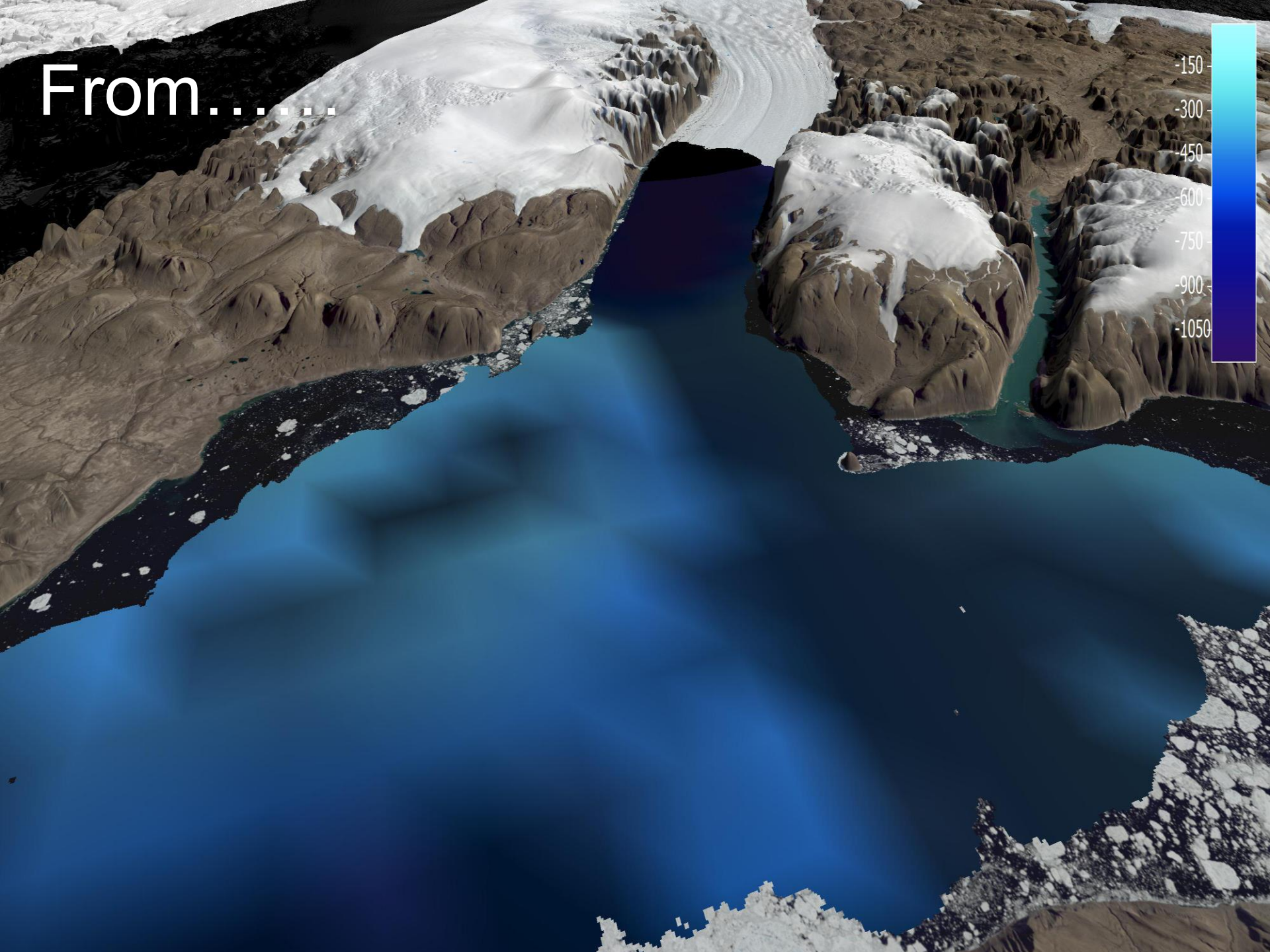
POLARFORSKNINGSSEKRETARIATET
SWEDISH POLAR RESEARCH SECRETARIAT



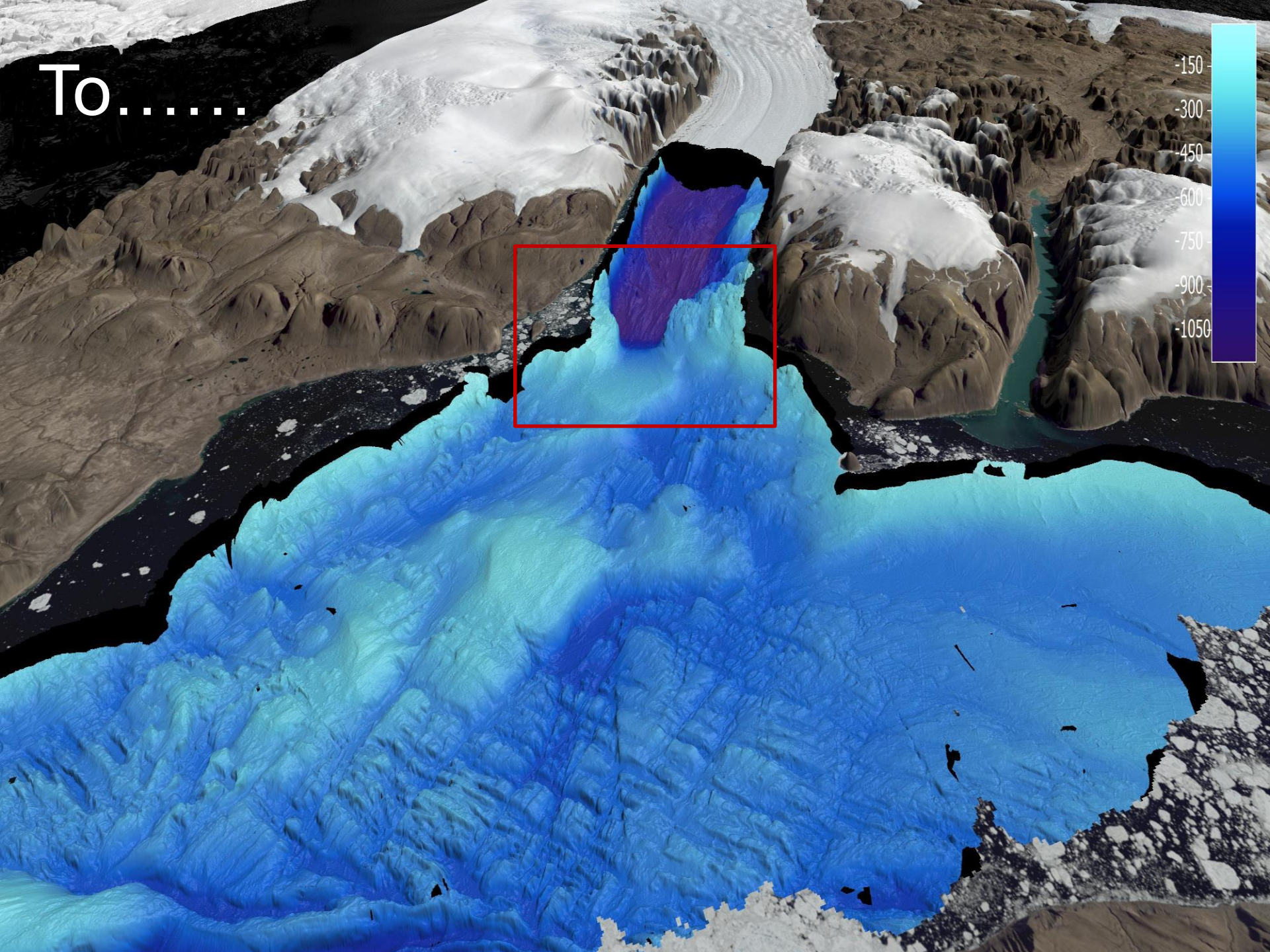
Petermann ice tongue lost 30-40% of its extent in 2010 and 2012

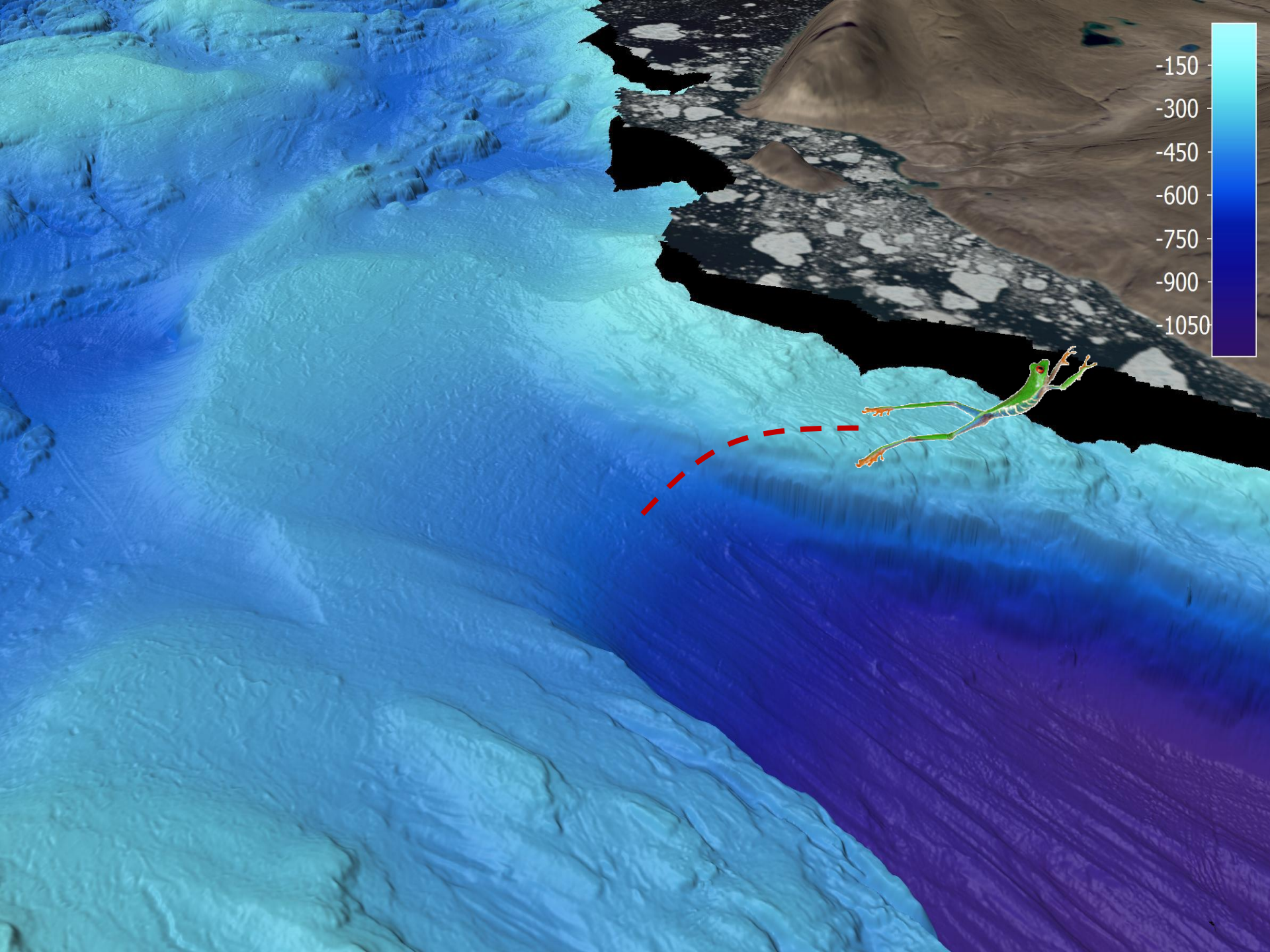


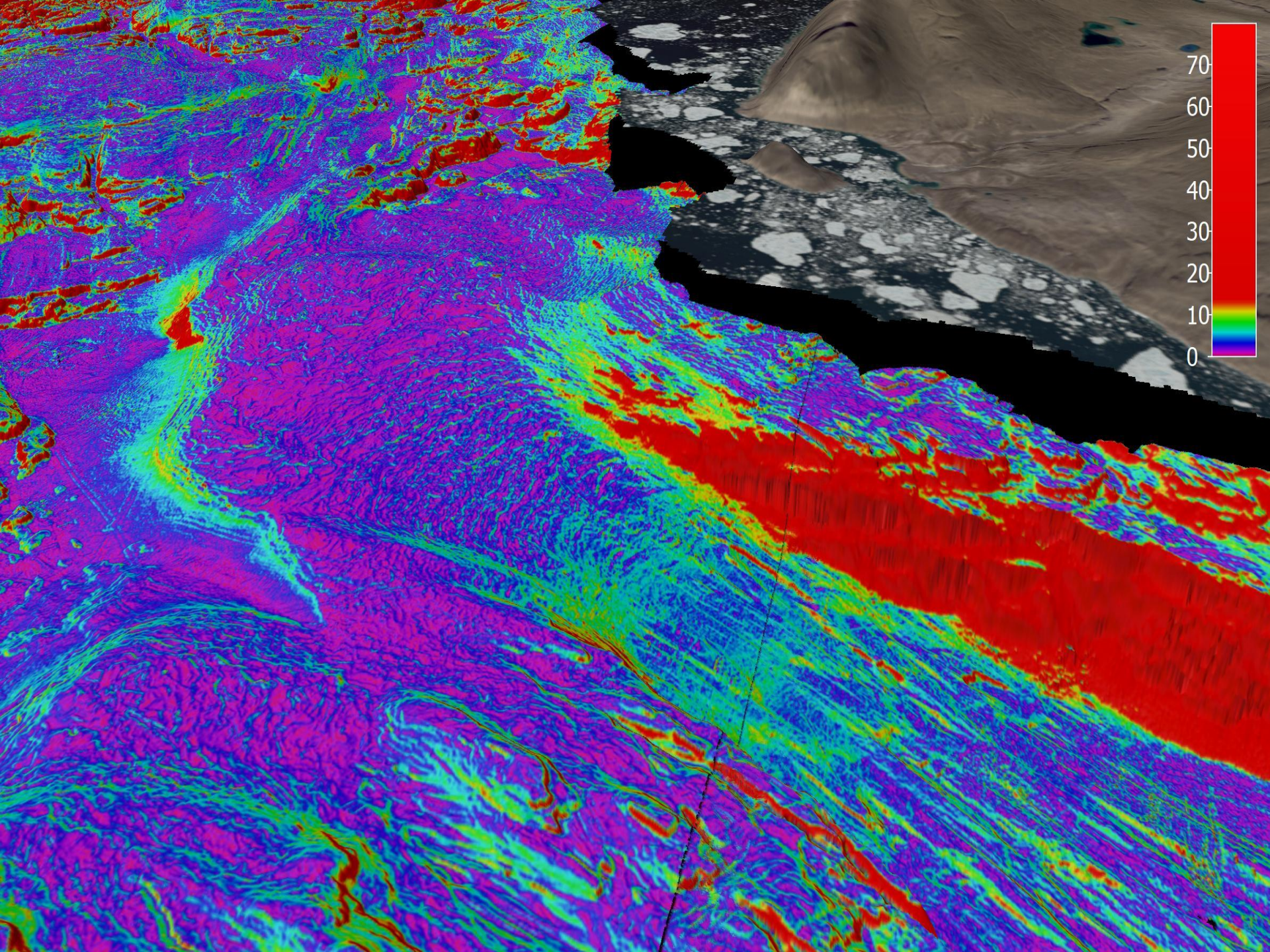
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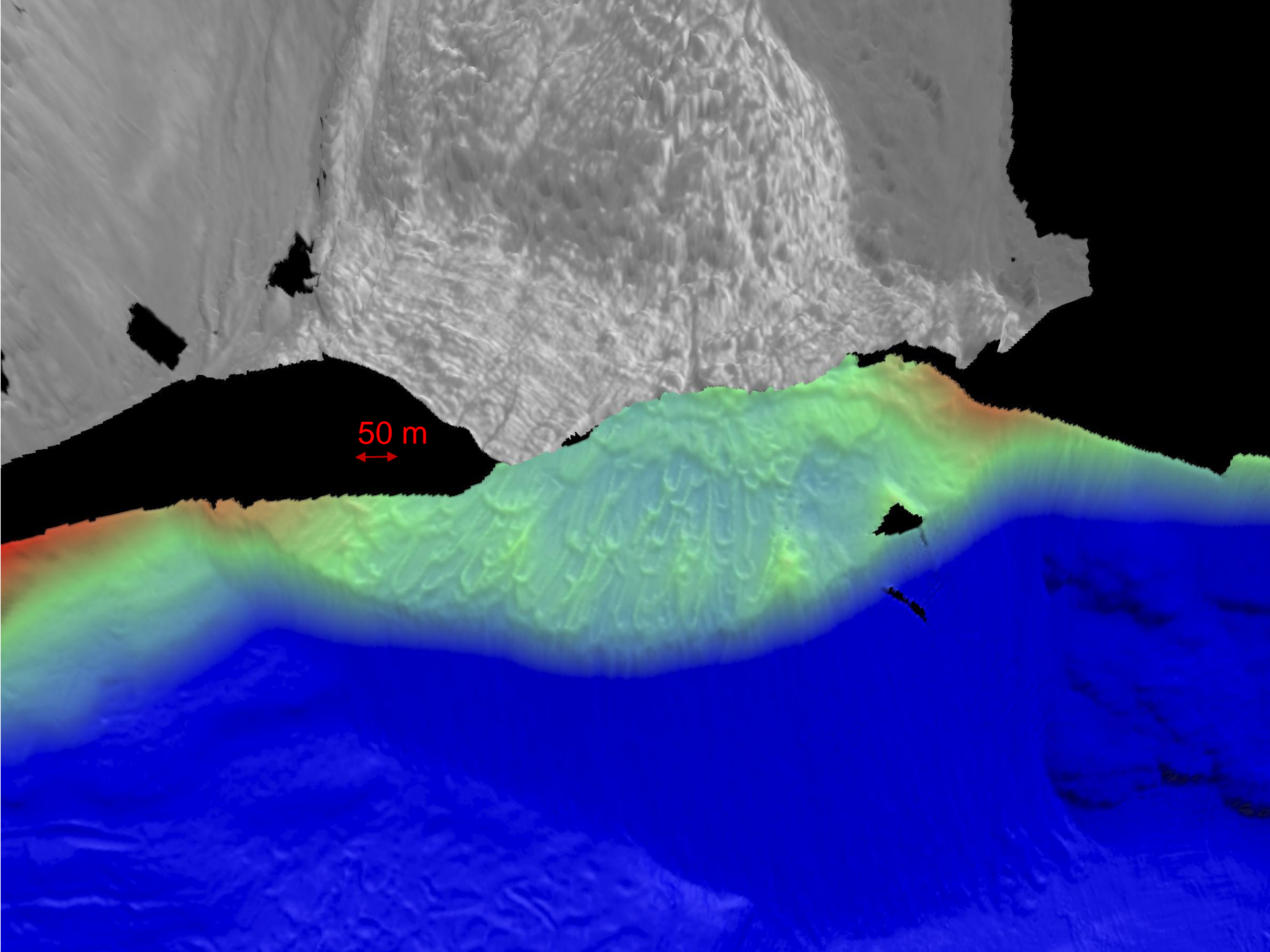
To.....











50 m

67°0'W 66°0'W 65°0'W 64°0'W 63°0'W 62°0'W 61°0'W



Stockholm University

Bolin Centre for Climate Research

