



The Effect of Basal Channels on Oceanic Ice-Shelf Melting

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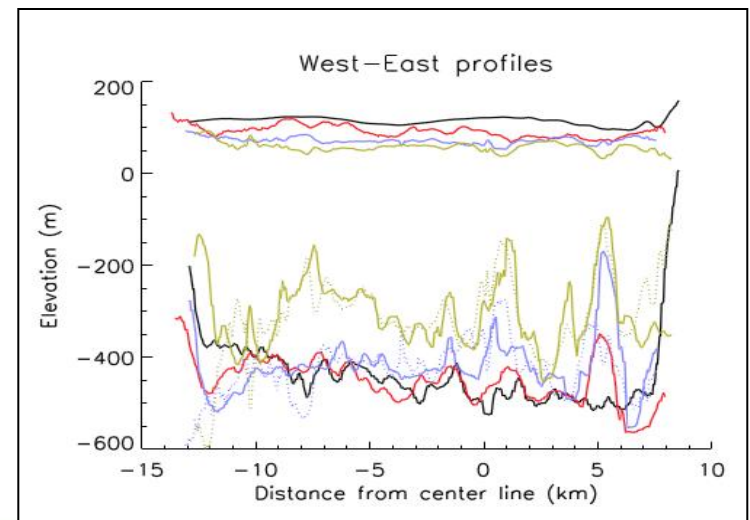
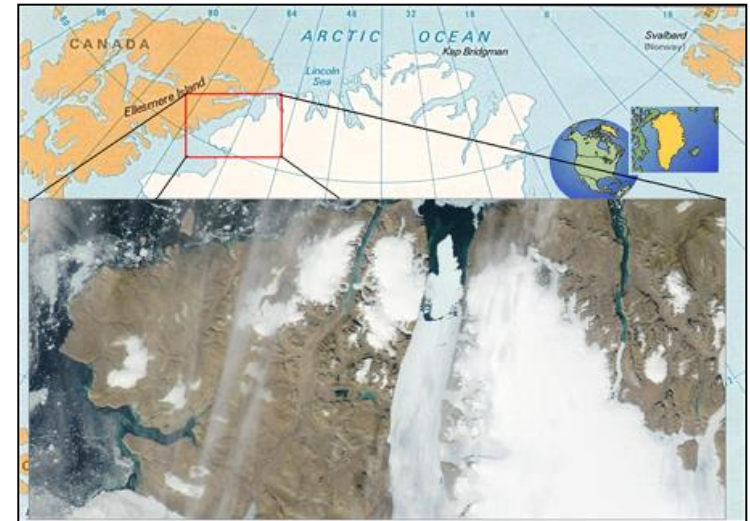
Introduction

Petermann Glacier in NW Greenland terminates in a long thin ice tongue. Rignot and Steffen (2008) found pronounced basal channels aligned in the direction of ice flow.

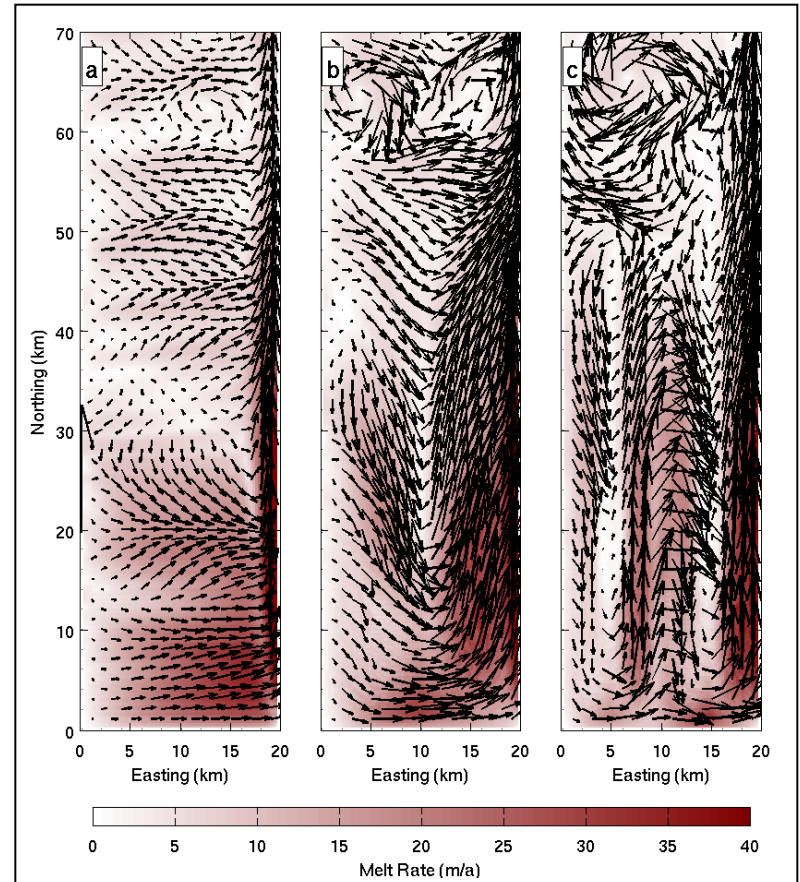
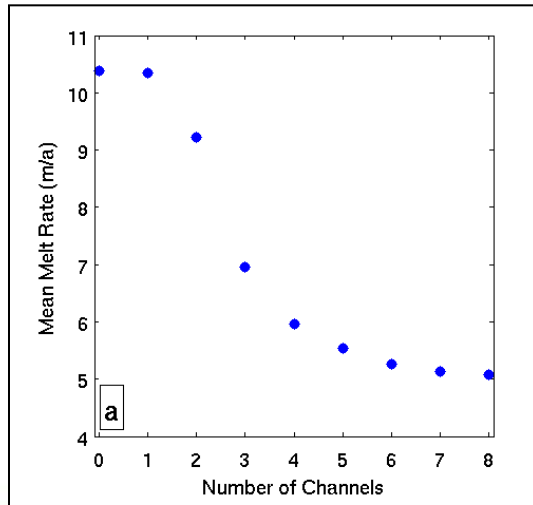
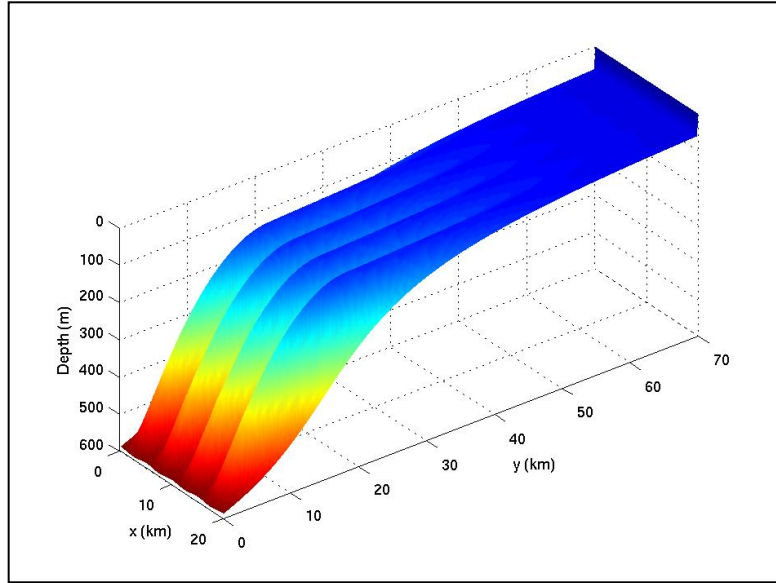
The question as to the importance of these channels remains open with one suggestion that they reduce the mechanical stability of the ice shelf (Rignot and Steffen, 2008) and another that they increased the stability by changing the location and magnitude of high melt regions (Gladish *et al.*, 2012).

We have investigated the impact of such basal channels on ice/ocean interactions beneath an Petermann-style idealised ice shelf.

Rignot, E., and K. Steffen (2008), Channelized bottom melting and stability of floating ice shelves, *Geophys. Res. Lett.*, 35, doi:10.1029/2007GL031765.
Gladish, CV, Holland, DM, Holland, PR, and Price, S (2012), Ice-shelf basal channels in a coupled ice/ocean model, *Journey of Glaciology* 58 (212), 1227-1244.



Methods / Results



Implications

- Channels cause the mixed layer flow to change which results in a change of location of strong melt.
- As the number of channels increases, the mean melt rate reduces. For a small number of wider channels this sensitivity is high, but for a larger number of smaller channels this sensitivity drops.
- This stabilising effect is a potential explanation as to why basal channels are observed in warm-water ice shelves around Greenland. If the channels stabilise ice shelves, ice shelves with channels are more likely to persist, and a 'survivor bias' makes them more likely to be observed.

