

Impact of ice-shelf channels on ice sheet/shelf instability

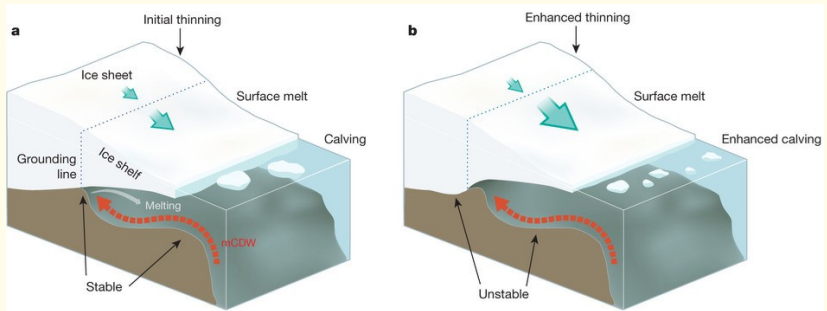
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Master Thesis

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Introduction

- ▶ Transition from grounded ice sheet to floating ice shelf → defined by grounding line
- ▶ Ice shelf mass balance and stability

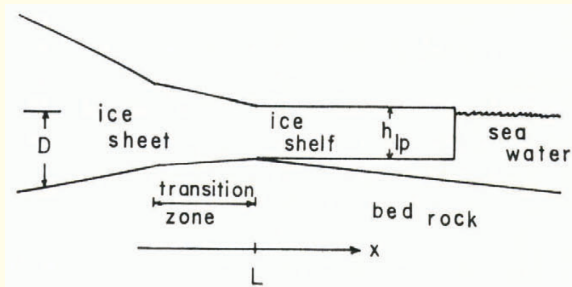


Edward Hanna, Francisco J. Navarro, et al. Ice-sheet mass balance and climate change. In: *Nature* 498 (June 5, 2013), pages.

Ice shelf instability

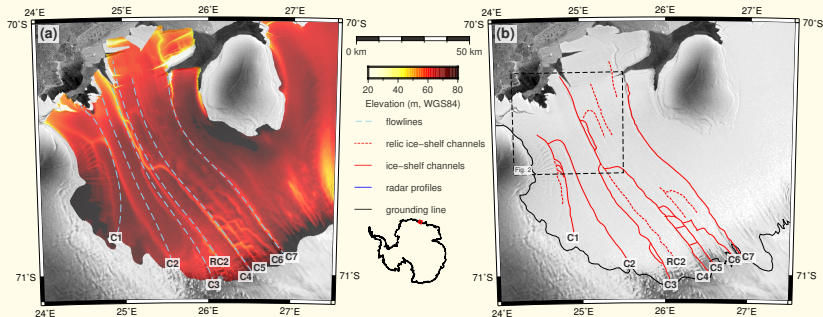
→ Flux is an increasing function of the ice thickness

$$q = f[h(L)]$$



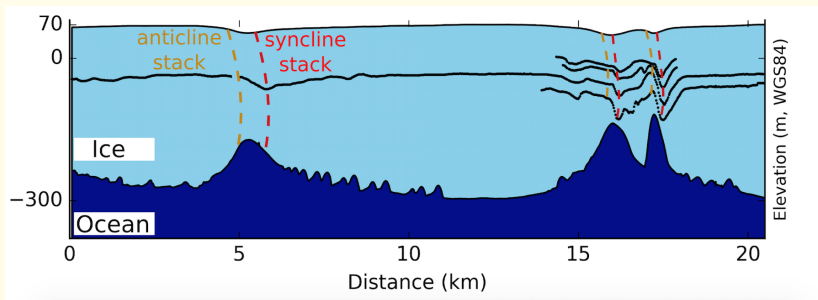
Ice shelf channels

- ▶ Longitudinal ice shelf channels, which often start near the grounding line
 - Thin ice sections where channels are located
- ▶ Buttressing of the continental ice flux through ice shelves



Ice shelf channels

- ▶ Longitudinal ice shelf channels, which often start near the grounding line
 - Thinner ice sections where channels are located
- ▶ Basal melting indicates channel creation



→ Numerical simulation using Elmer/Ice

- ▶ Full stokes, finite element, ice sheet / ice flow model
- ▶ Constructing a three dimensional synthetic model
 - Adjustment of parameter and model geometry
 - Implementing ice shelf channels

→ Scientific outline

- ▶ Ice channel propagation and preservation
- ▶ In general: Link to ice shelf disintegration and ice shelf instability

Thank you for your attention



References

J. Weertman. Stability of the junction of an ice sheet and an ice shelf. In: *Journal of Glaciology* 13.67 (1974), pp. 3–11

Reinhard Drews. Evolution of ice-shelf channels in Antarctic ice shelves. In: *The Cryosphere* 9 (June 2015), pp. 1169–

Edward Hanna, Francisco J. Navarro, et al. Ice-sheet mass balance and climate change. In: *Nature* 498 (June 5, 2013), pages