

NEGIS

North East Greenland Ice Stream

Ice-ocean coupled modelling for Nioghalvfjærdsbræ (79NG), Greenland

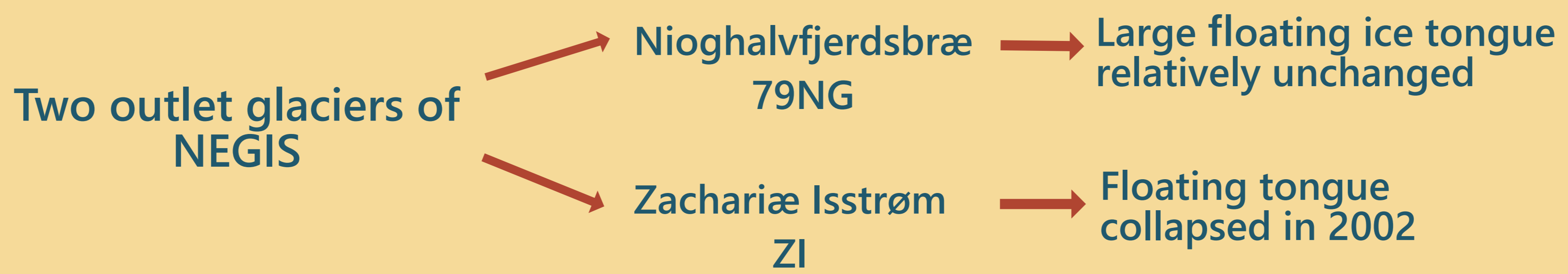
Joanna Zanker & Jan De Rydt - The Future of Ice of Earth, Northumbria University UK

Assessing the importance of feedbacks between ice-sheet geometry, surface mass balance and ocean-driven melt with a mutually evolving dynamical ice sheet and 3D ocean circulation model for the future sea-level contribution of the Greenland Ice Sheet

1. Current knowledge

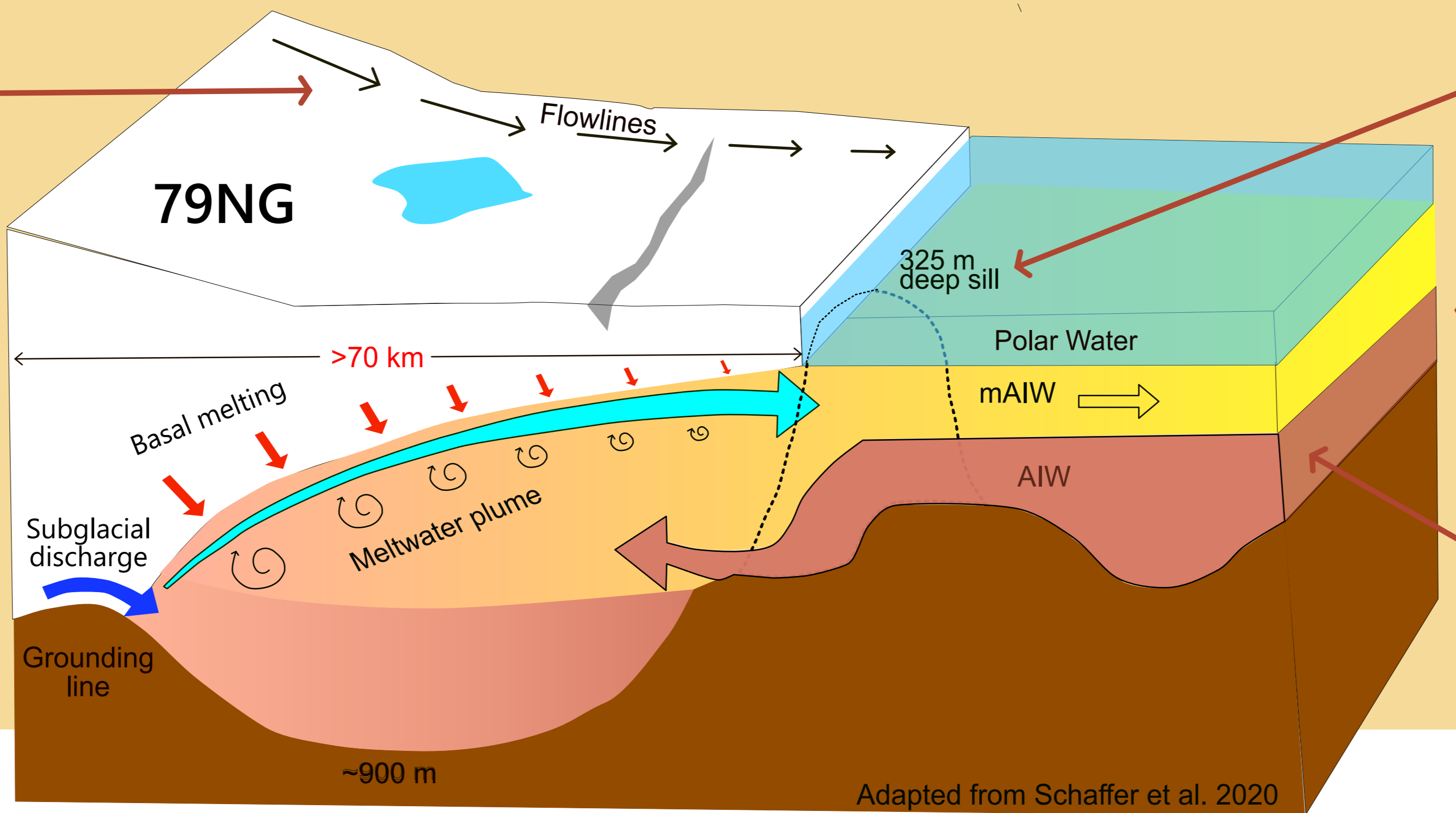


NEGIS drains ~12% of the Greenland Ice Sheet → 1.1 m sea level equivalent



Ice tongue thinning and speeding up in recent decades
Khan et al. 2022

Buoyancy driven circulation alters submarine melt which feeds back on cavity circulation and geometry
Zeising et al. 2023



Sills control oceanic heat supply to cavity and pin the calving front
Schaffer et al. 2020

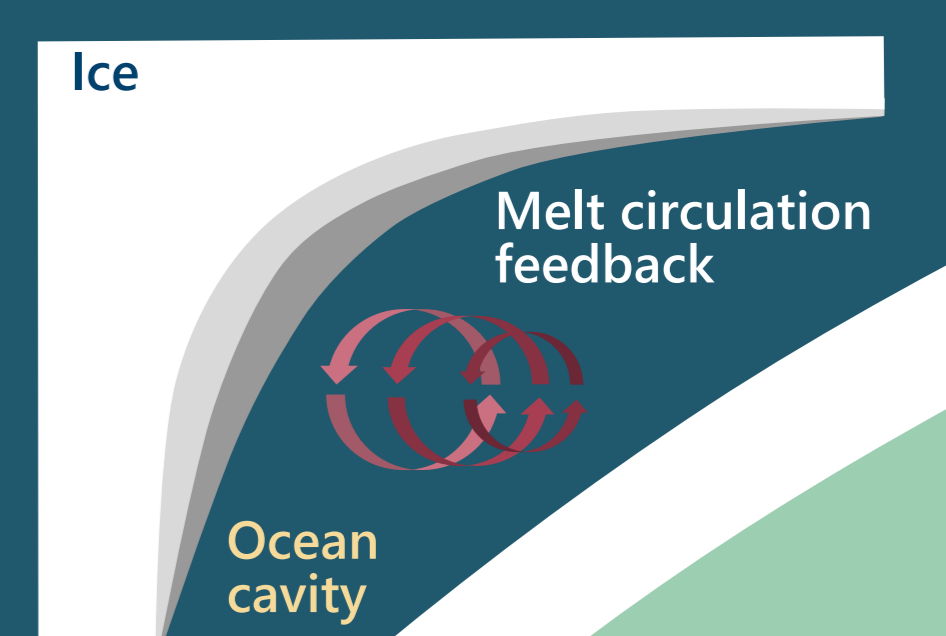
Considerably variable circulation and exchange with the adjacent continental shelf
von Albedyll et al. 2021

Warm (>1°C) Atlantic Intermediate Water (AIW) flows into cavity and modified (m)AIW flows out
Lindeman et al. 2020

2. Motivation

Coupled ice-ocean model not done before in Greenland - floating ice tongue is similar to Antarctic ice shelf environments

Importance of cavity melt-geometry feedbacks on mass loss projections has not yet been investigated



Coupled approach required to test fidelity of the ISMIP6 projections of ice sheet mass loss
(Goelzer et al. 2018)

ISMIP

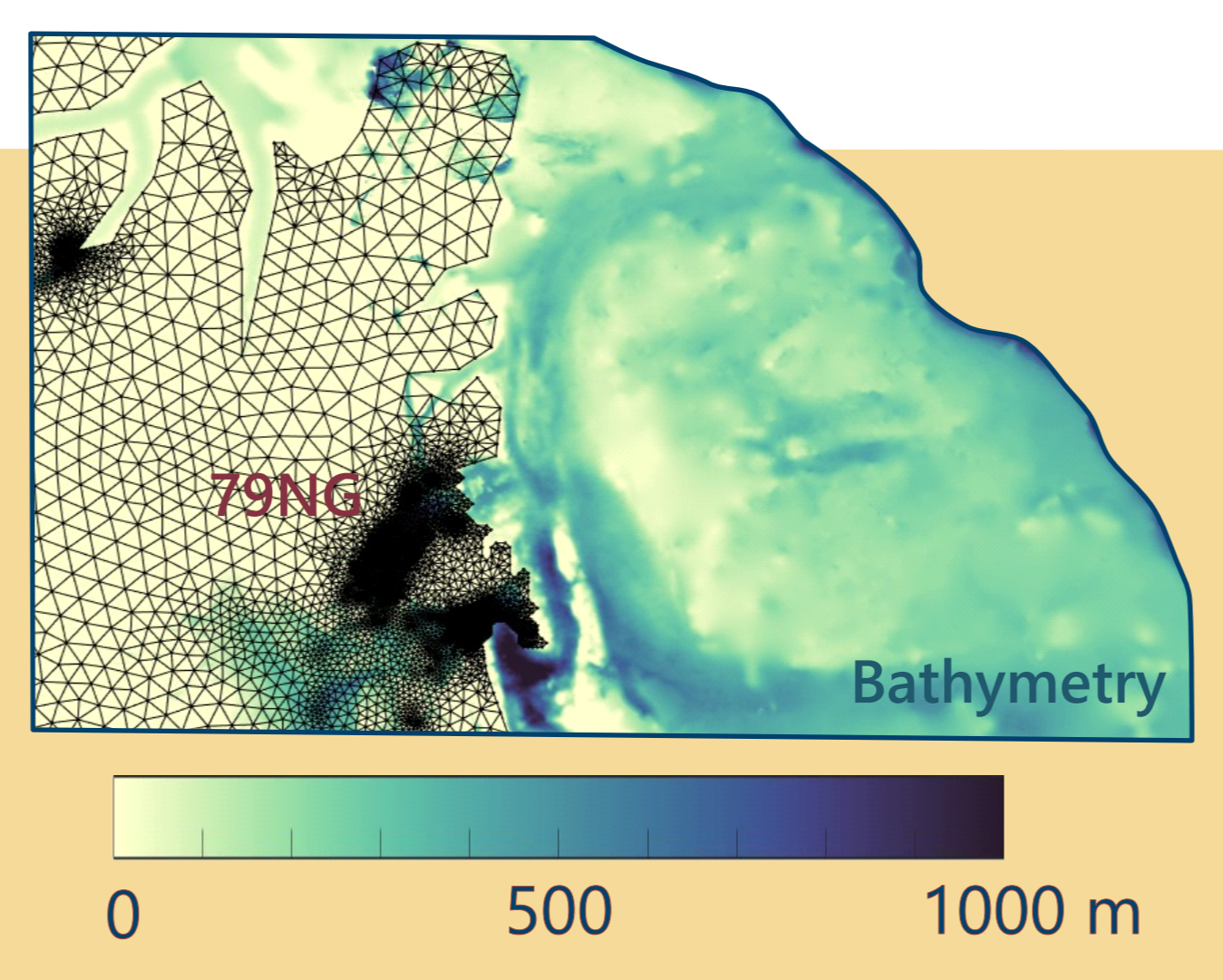
Ice Sheet Model Inter-comparison Project

3. Research plans

High resolution dynamical ice model with moving ice fronts

- Sensitivity to surface mass balance
- Sensitivity to ocean forcing
- NEGIS regional domain - starting from present day ice sheet configuration obtained from model inversions
- Perform idealised perturbation scenarios with different ice fronts including removing the ice tongue altogether

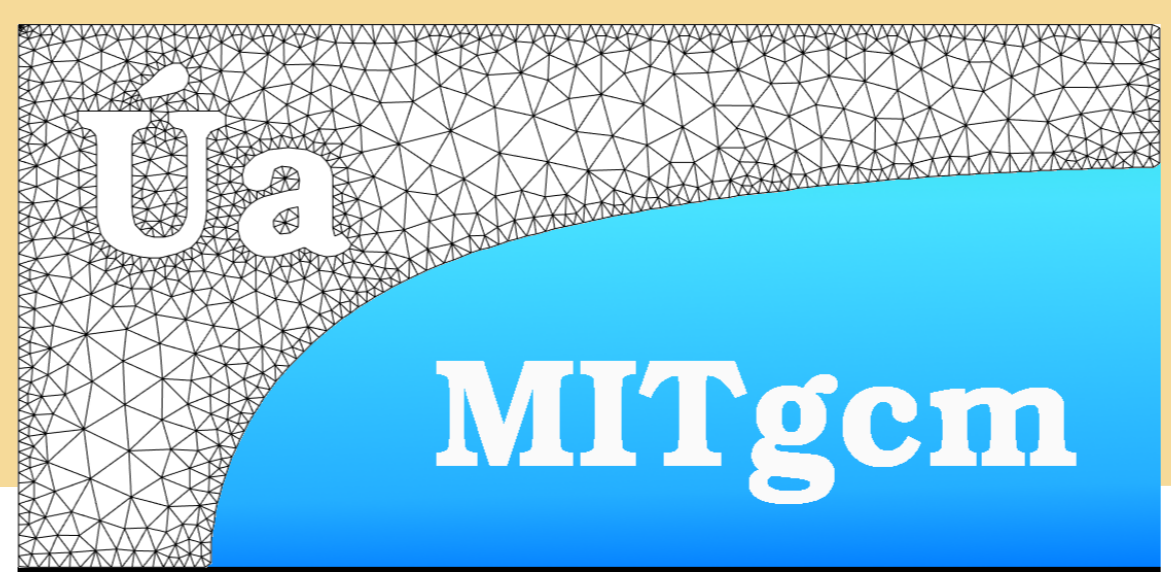
→ Is the floating extension key to ice loss?



Couple with ocean model with complex bathymetry to see how these changes might occur.

Mutually evolving dynamical ice sheet and 3D ocean circulation model

Fully operational publicly available code: <https://github.com/knaughten/UaMITgcm>



Running ISMIP6 experiments with Ua - projecting the future sea-level contribution of the Greenland Ice Sheet
Goelzer et al. 2018

