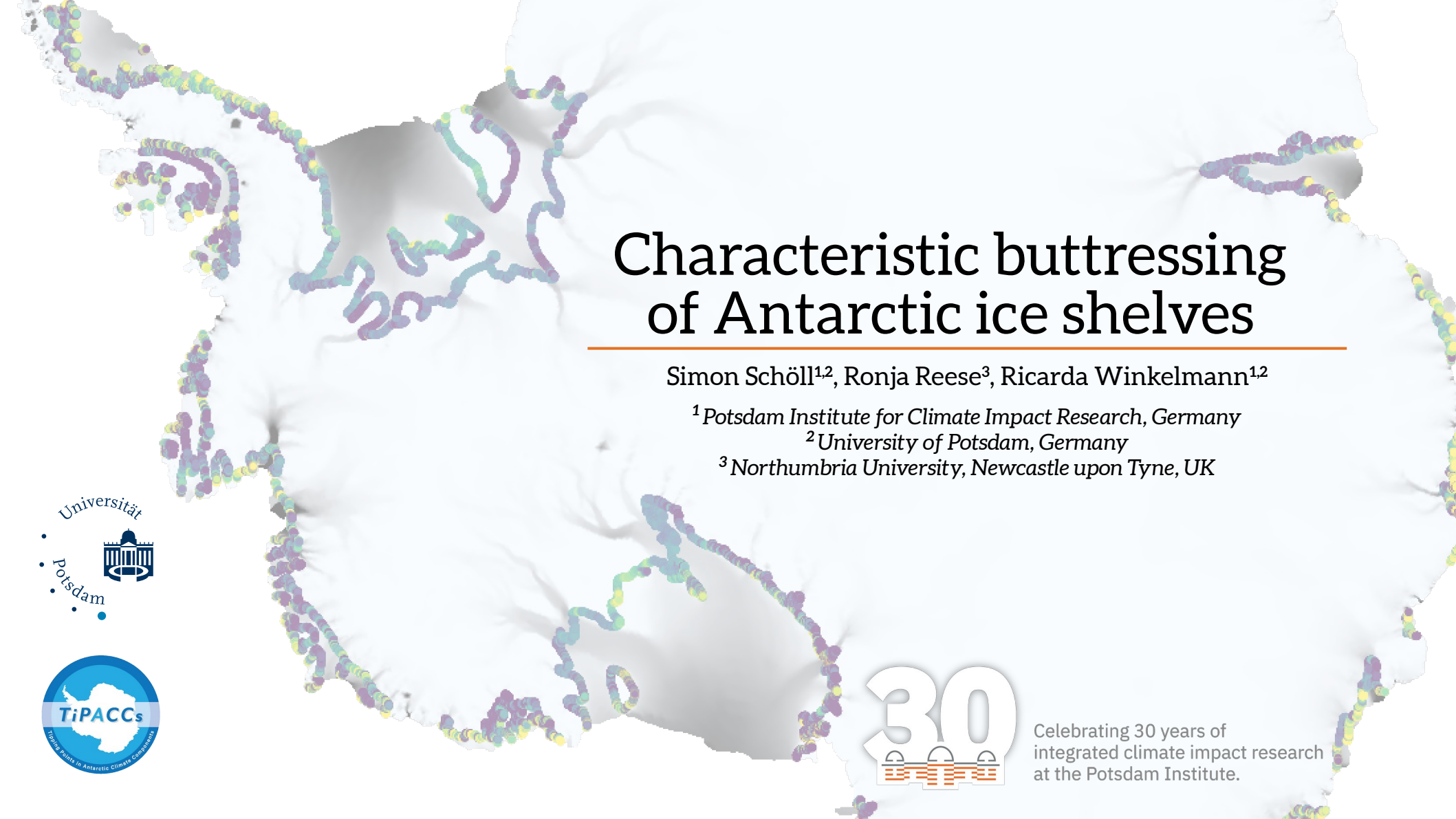

Characteristic buttressing of Antarctic ice shelves

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Universität Potsdam

TiPACCs
Tipping Points in Antarctic Climate Components

30

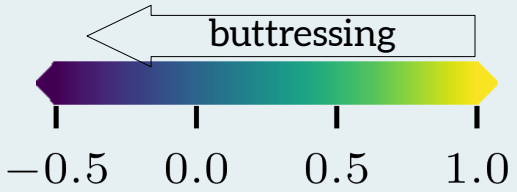
Celebrating 30 years of integrated climate impact research at the Potsdam Institute.

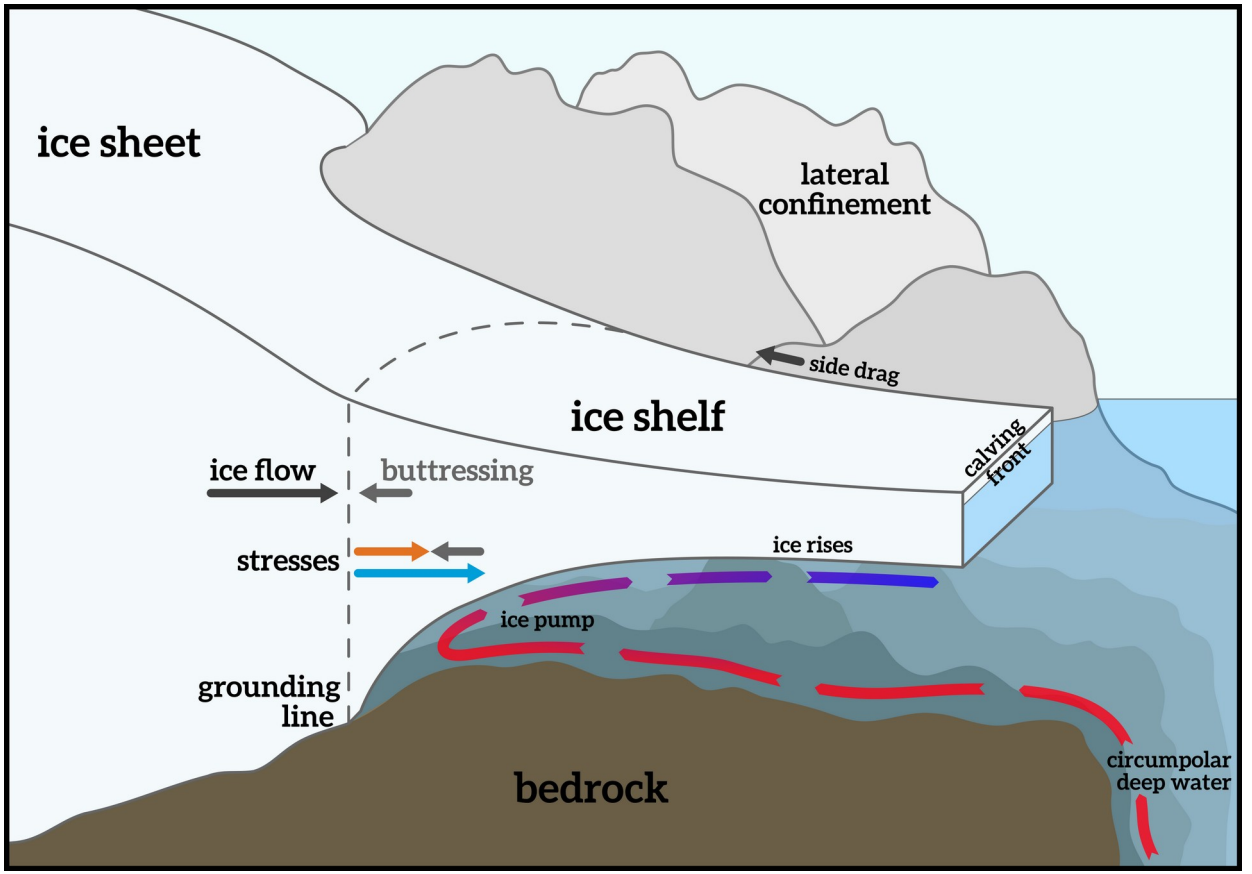
Why buttressing of ice shelves?

- Weaker ice shelves lead to **decreased longitudal back-stress** and increased flux accross the grounding line

- Buttressing ratio at GL

$$\Theta_N = \frac{\text{stresses with ice shelf}}{\text{stresses without ice shelf}}$$

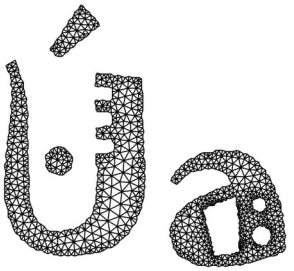




Methods

PISM
PARALLEL ICE SHEET MODEL

- transient simulations
- 8km resolution
- Spin-up: equilibrium close to present-day observations

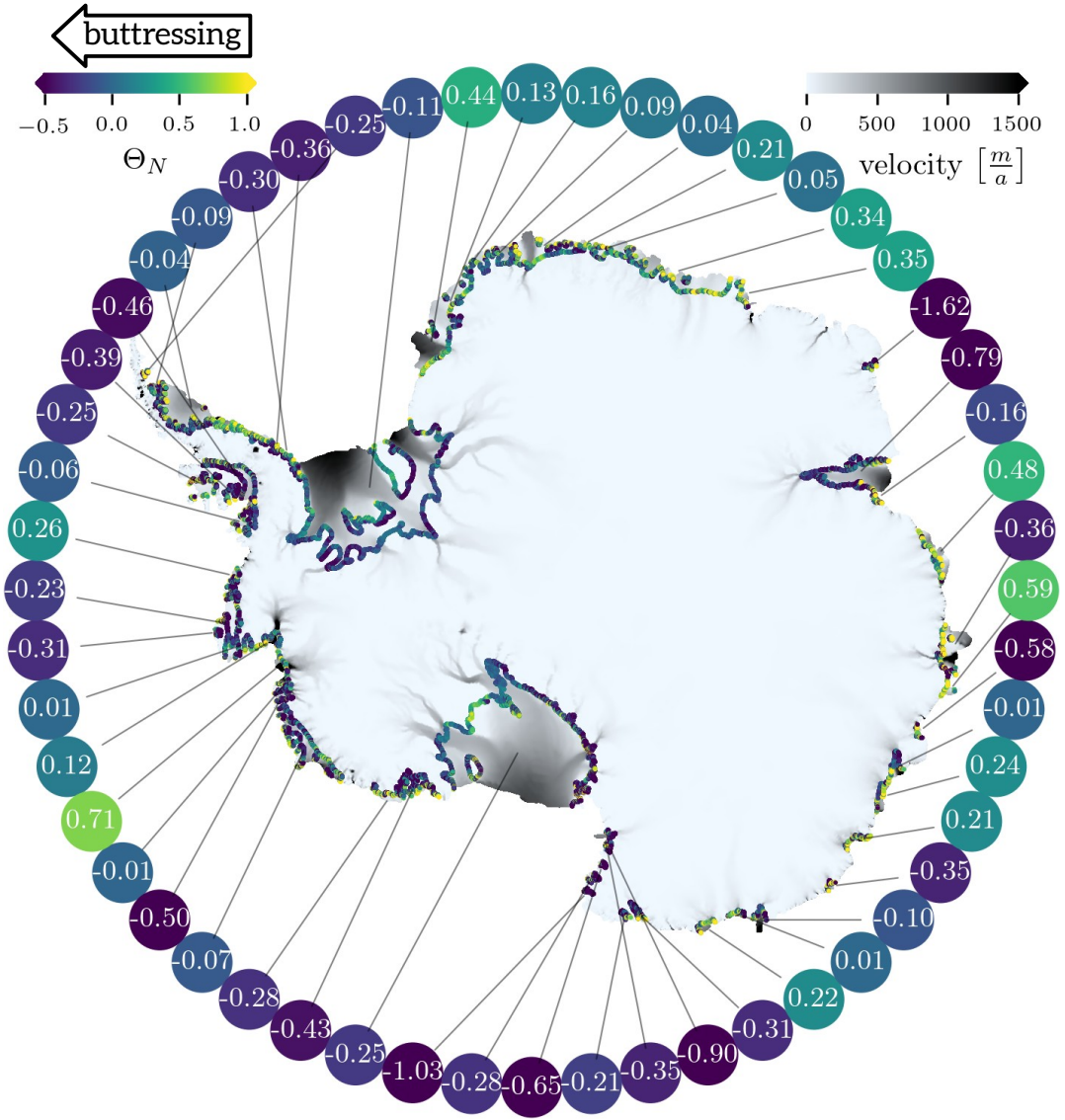


- diagnostic mode
- > 200m resolution at GL
- Inversion to observed velocities

Seroussi et al. (2019), Reese et al. (2018)

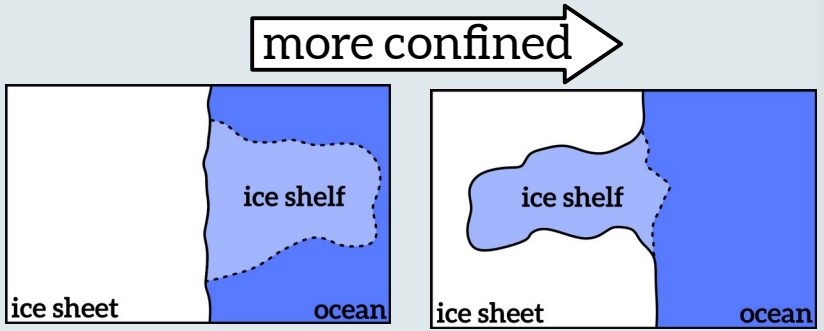
Present-day buttressing

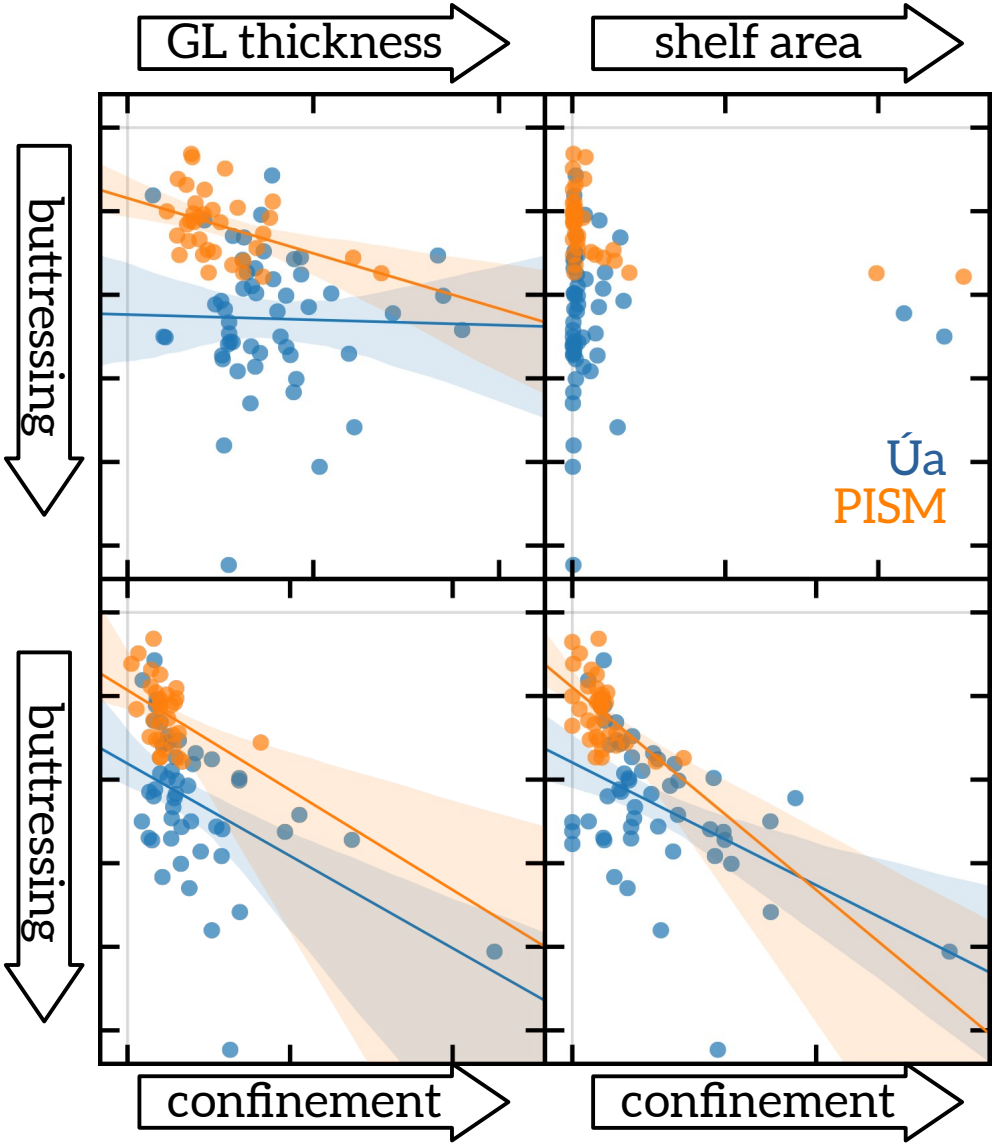
- aggregated shelf-wide buttressing values
- Strong buttressing in large ice shelves (e.g. Filchner-Ronne, Ross and Amery)
- Lowest buttressing in Thwaites glacier



Characteristics of Buttressing

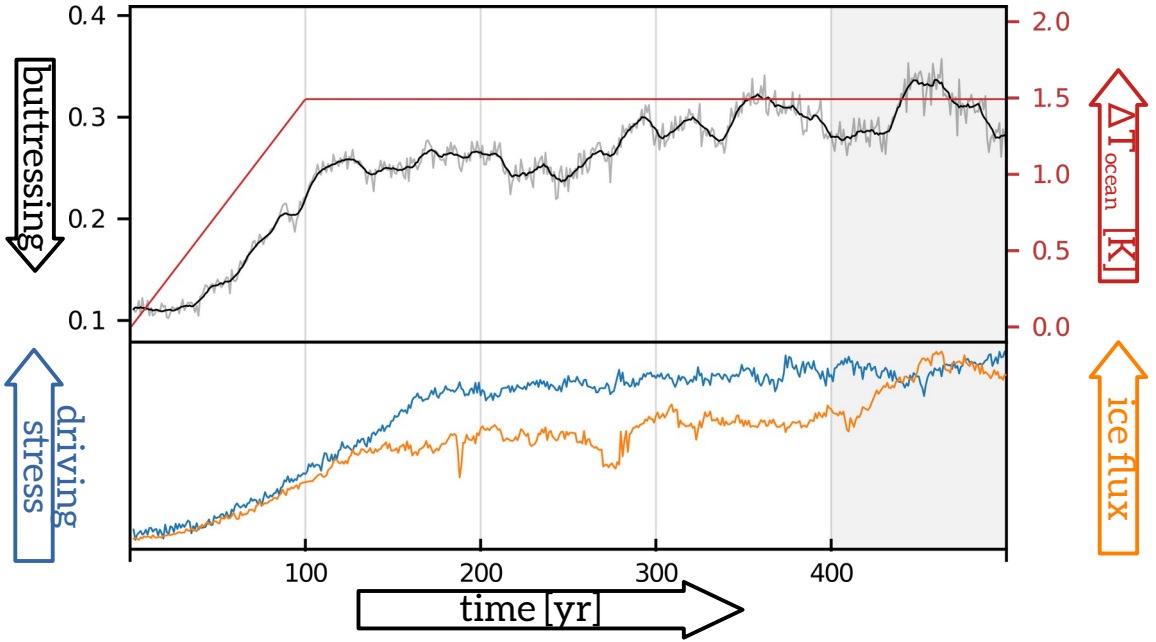
- Positive correlation for **more confined** ice shelves
- No correlation with shelf area, thickness, ice flux or driving stress





Transient buttressing under ocean warming

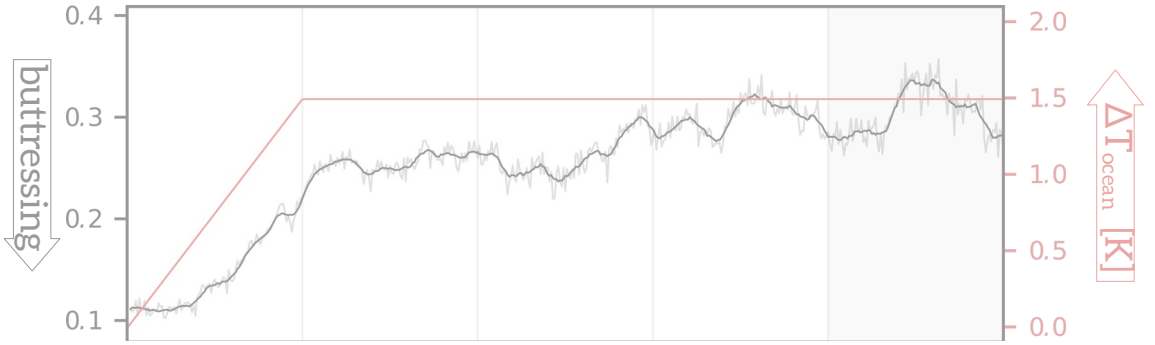
- **idealized ocean warming** with melt rates from the box-model PICO leads to **reduced buttressing** and increased driving stress and ice flux

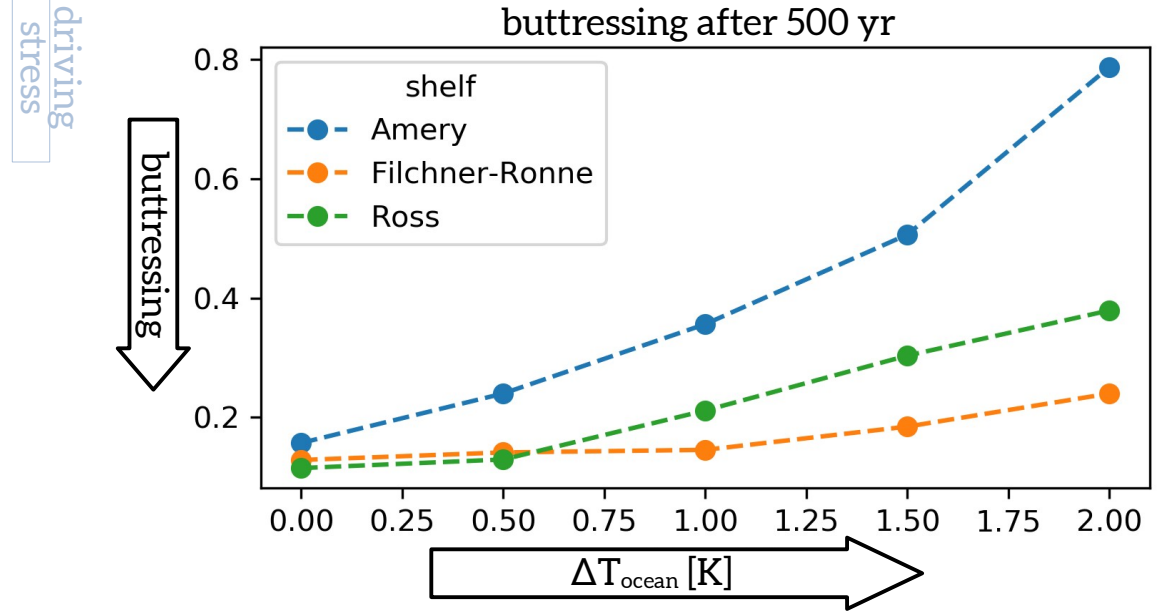


Transient buttressing under ocean warming

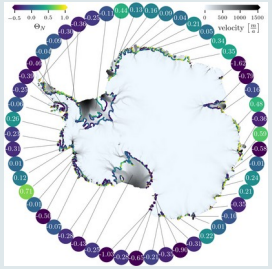
- **idealized ocean warming** with melt rates from the box-model PICO leads to **reduced buttressing** and increased driving stress and ice flux

- consistent **decrease of buttressing** after 500 years in different ice shelves across range of temperature offsets

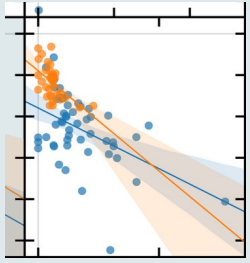




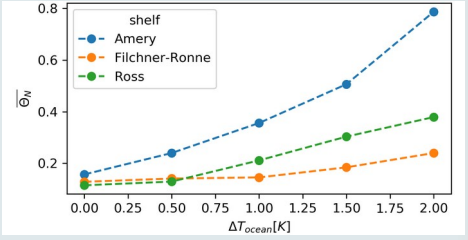
- Shelf-wide buttressing measure allows to **compare different ice shelves and transient evolution**



- Buttressing is higher in **more confined** ice shelves



- Buttressing **decreases under idealized warming** accross several temperatures



...manuscript in preparation.

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