

Marine ice-sheet experiments with the Community Ice Sheet Model using the MISIMP+ experimental framework

(Work under review in TC)

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Goal

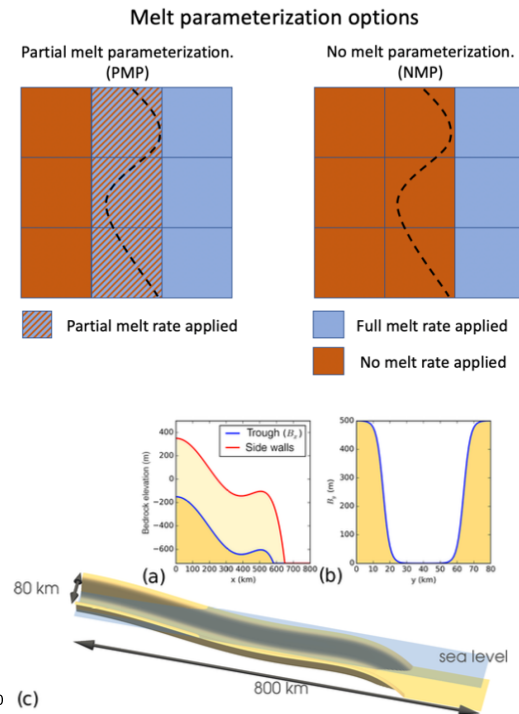
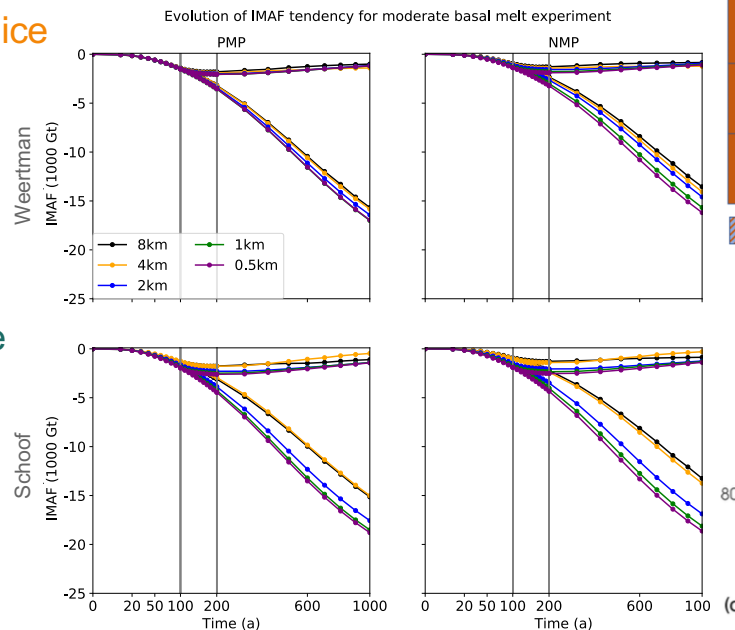
Investigate CISM numerical properties in marine ice sheet simulations subject to ocean basal melt.

Experimental set up

- CISM at 8, 4, 2, 1, 0.5 km
- 2 sliding laws: Weertman and Schoof
- Uniform accumulation of 0.3 m/yr
- Linearly increasing depth-dependent melt rate from 0 m/yr at -50m and above to 30 m/yr at -500m and below.

Results

- Allowing some melt in the cell containing the grounding line is beneficial **for CISM**.
- With a Weertman law, a resolution of 2 km (arguably 4 km) is adequate to accurately diagnose grounded ice loss.
- With a Schoof law, the resolution requirement becomes 1 km (arguably 2 km).
- Results are similar when the maximum melt rate is 150 m/yr or when the accumulation rate is 0.05 m/yr (slow-moving ice).



Above top: numerical melt parameterization. Above middle: bed topography from MISIMP+ (Asay-Davis et al. 2016). Center: evolution of ice mass above flotation (IMAF).