

ISMIP7 - SMB Focus Group report

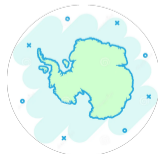
ISM forcing and SMBMIP

Group leads: Nicole Schlegel (nicole.schlegel@noaa.gov)

Brice Noël (brnoel@uliege.be)

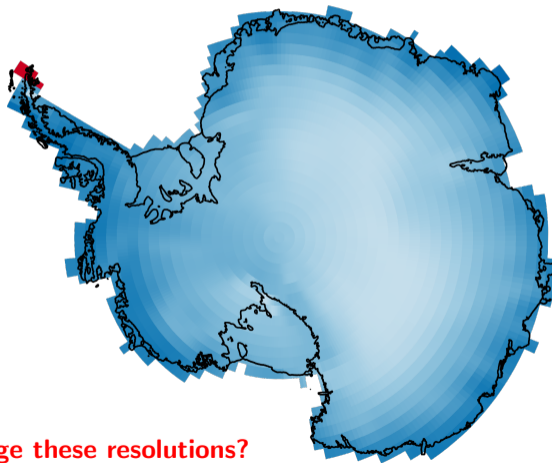
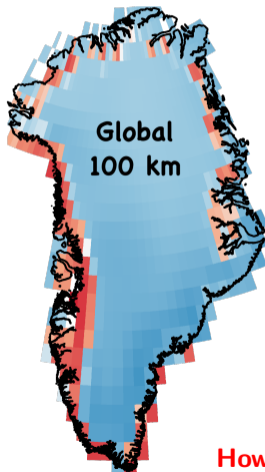
Liaison: Sophie Nowicki (sophien@buffalo.edu)

Sunday 8th of December 2024



Adequate SMB/temperature forcing for ISMs

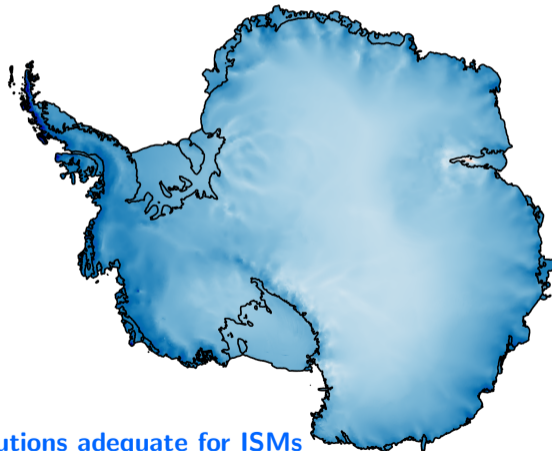
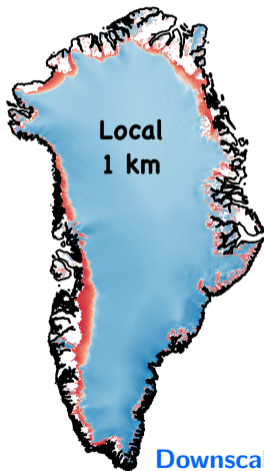
Input: ESM projections at ~ 100 km \rightarrow **Output:** ISM forcing at ~ 1 -10 km



How do we bridge these resolutions?

Adequate SMB/temperature forcing for ISMs

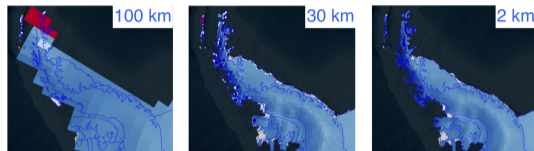
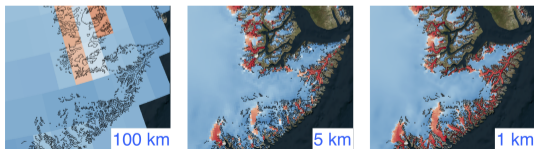
Input: ESM projections at ~ 100 km \rightarrow **Output:** ISM forcing at ~ 1 -10 km



Downscaling to resolutions adequate for ISMs

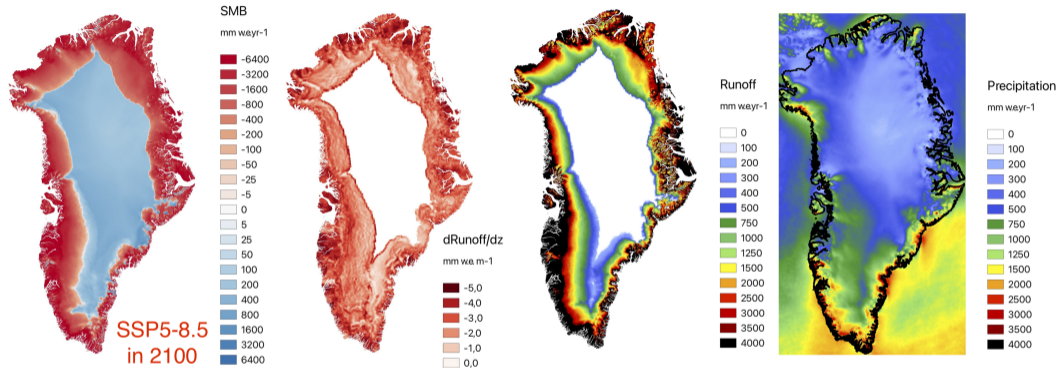
SMB Focus Group members and downscaling techniques

- 1. RCM: Fettweis, Mottram, v. d. Broeke
→ GrIS 5-15 km | AIS 10-30 km
- 2. Statistical downscaling: Noël
→ GrIS 1 km | AIS 2 km
- 3. PDD model: Hanna
→ GrIS 1 km
- 4. Machine learning: Dunmire
→ GrIS 1 km | AIS 2 km



- 5. dEBM: Krebs-Kanzow
→ GrIS 1 km | AIS 8 km
- 6. GEOSIdas: Cullather
→ GrIS 10 km | AIS 10 km
- 7. BESSI snow model: Born
→ GrIS 8 km | AIS (maybe)
- 8. SMB-temperature regression: Agosta
→ GrIS 5-15 km | AIS 10-30 km

ISMIP7 protocol = ISMIP6... but consistent for GrIS and AIS



- **Output:** SMB, runoff, precipitation, and near-surface temperature
- **Format:** monthly cumulative, anomalies, and vertical gradients
- **Changing ice geometry:** spatial extrapolation using vertical gradients

Testing ISMIP7 protocol through SMBMIP

- 1. ESM selection: CMIP6
 - Model: CESM2 r11i1p1f1
 - Scenario: SSP3-7.0 (1950-2100)

- 2. Forcing: ESGF server / Globus.org
 - 6-hourly: T, q, u, v, SST, SIC
 - Daily: T, q, PR, LWd, SWd, SWu
 - Monthly: SMB comp, T, q, u, v, p
SWd, SWu, LWd, CLcov

- 3. Outputs: monthly
 - SMB, PR, RU, T, anomalies (1950-89)
 - Vertical gradients (mask correction)
- 4. Historical evaluation:
 - Reanalysis-based runs (ERA5 since 1940)
 - In situ SMB | remote sensing (GRACE)

