Brief Introduction to SeaRISE*

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Additional information:
- Papers: Bindschadler et al. (2013), Nowicki et al. (2013a), Nowicki et al. (2013b)

*Sea-level Response to Ice Sheet Evolution
SeaRISE Goals

The Sea-level Response to Ice Sheet Evolution initiative is a NASA-led, international effort to investigate the sensitivity of ice sheets & inform the 5th IPCC of the potential contribution of ice sheets to sea level over the next 200 years.

http://websrv.cs.umt.edu/isis/index.php/SeaRISE_Assessment
SeaRISE Atmospheric Sensitivity Experiment

Is the spread in ice sheet response due to:
Initialization / Spin-up?
Ice sheet model physics?
Surface forcings and feedbacks?
How should SMB be computed?

Thickness change (m) @ t = 100 yr

SMB anomaly (m/yr) @ t = 100 yr

CISM2 does not have PDD scheme

SICOPOLIS (SIA) & Elmer/Ice (FS) have same PDD scheme

PISM PDD scheme result in largest ablation, hence ice loss

Which PDD scheme should be used?
Modeled - Observed Surface Elevation (m)

Present day VAF (m sle)

- UMISM: 6.95
- IcIES: 7.55
- SICOPOLIS: 7.07
- Elmer/Ice: 7.18
- PISM: 7.25
- ISSM: 7.10
- CISM2: 7.09
- AIF: 7.12

Control Simulation
Present day VAF (m sle)

- AIF: 55.32
- ISSM: 55.12
- PennState3D: 57.52
- PISM-PIK: 55.47
- SICOPOLIS: 55.21
- UMISM: 59.28

Control Simulation

Change in VAF (m sle) vs Time (years)
Thank you to:

- Tom Wagner (NASA HQ) for funding
- Everyone that contributed in building SeaRISE (from sharing data to ideas)
- Participating ice sheet models:
  - AIF
  - CISM2
  - Elmer/Ice
  - IcIES
  - ISSM
  - PennState2D
  - PennState3D
  - PISM
  - PISM-PIK
  - SICOPOLIS
  - UMISM

Additional information:
- “google SeaRISE”: http://websrv.cs.umt.edu/isis/index.php/SeaRISE_Assessment
- Papers: Bindschadler et al. (2013), Nowicki et al. (2013a), Nowicki et al. (2013b)
“Hot Shelves”
(remove all floating ice instantly)

Initial upper surface elevation

Control

Hot Shelves

Model Simulations from Penn State University (David Pollard)
Upper surface elevation: control run

- E0, 50 yrs
- E0, 250 yrs
- E0, 100 yrs
- E0, 500 yrs

Legend:
- 0 meters
- 1000 meters
- 2000 meters
- 3000 meters
- 4000 meters
- 5000 meters
Variation in ice volume and area

Aim: difference between the experiments and control run
Sensitivity to melt rates

- **M1**: 2 m/a
- **M2**: 20 m/a
- **M3**: 200 m/a

**Time (years)**

- 100 years
- 200 years
- 500 years
Thickness change from the M2 experiment (20m/yr after 100yr)