Before we can start making predictions about Greenland's future, we have to get the present state right.

• The modeled present state must
  • be devoid of unphysical transients
  • have a physically-based temperature distribution
  • simulate reasonable upper surface elevation and horizontal surface velocities

Which of the following experiments gets closest to the present state?
• Exp A: no paleo-climate, only present day information
• Exp B: paleo-climate spin-up
• Exp C: combination of A and B, uses paleo-climate information but mass balance is modified to obtain present day geometry at the end of the spin-up run

Model Controls
• we use the SeaRISE-Greenland data set (http://websrc.cs.umt.edu/isis/index.php/Present_Day_Greenland)
• all parameters related to ice dynamics are the same in all runs

SeaRISE Greenland — On "spin-up" procedures
Andy Aschwanden1, Constantin Khroulev2, and Ed Bueler3
1Arctic Region Supercomputing Center, University of Alaska Fairbanks, USA
2Geophysical Institute, University of Alaska Fairbanks, USA
3Dept of Mathematics and Statistics, University of Alaska Fairbanks, US

SYNOPSIS

• Before we can start making predictions about Greenland’s future, we have to get the present state right.
• The modeled present state must
  • be devoid of unphysical transients
  • have a physically-based temperature distribution
  • simulate reasonable upper surface elevation and horizontal surface velocities

QUESTION A
Which of the following experiments gets closest to the present state?
• Exp A: no paleo-climate, only present day information
• Exp B: paleo-climate spin-up
• Exp C: combination of A and B, uses paleo-climate information but mass balance is modified to obtain present day geometry at the end of the spin-up run

MODEL CONTROLS
• we use the SeaRISE-Greenland data set (http://websrc.cs.umt.edu/isis/index.php/Present_Day_Greenland)
• all parameters related to ice dynamics are the same in all runs

PARALLEL ICE SHEET MODEL (PISM)
• is the only fully parallel ice sheet model: Greenland runs on grids ≤ 5 km and up to 256 processors were performed
• is polythermal (T): both temperature and liquid water fraction are simulated
• uses a SSA as sliding law (T): avoids propagation of jump discontinuities in the horizontal velocity field and thus unbounded vertical velocities
• the basal mechanical model is based on a plastic flow assumption (e.g. T): produces convincing ice-streams
• is open source: get the latest version from www.pism-docs.org

PISM results
measured
steady-climate
paleo-climate
paleo-climate + FTT

COMMENTs on QUESTION A
• Exp A (steady climate) captures fast flow features best
• Exp B (surface climate) performs worst
• Upper surface elevation and horizontal surface velocities are not sufficient to assess model performance
• We still don’t know whether we got the present state right or not

COMMENTs on QUESTION B
• A possible metric: Compare model results with measured temperatures at GRIP

DOES IT MATTER FOR THE FUTURE?
• our modeled ice temperatures are too high
• is this very local result representative for the whole ice sheet?
• is that the palaeo signal?

Another possible metric: Compare simulated age with observed isochrones (future work).

REFERENCES
• Predictions require an accurate representation of the current state
• Surface velocities are an important but not sufficient metric for assessing model performance
• Initial conditions are extremely important for the short term response