Geophysical Research Abstracts
Vol. 14, EGU2012-574, 2012
EGU General Assembly 2012

Reconstructing basal boundary conditions in a regional ice sheet model: Application to Jakobshavn Isbræ

M. Habermann (1), D.A. Maxwell (2), and M. Truffer (1)

(1) Geophysical Institute, University of Alaska Fairbanks, Fairbanks AK 99775-7320, United States (marijke.habermann@gi.alaska.edu), (2) Department of Mathematics and Statistics, University of Alaska Fairbanks, Fairbanks, AK 99775, United States

A crucial assumption in all ice sheet models concerns the nature and parametrization of the basal boundary condition. Direct observations on large spatial scales are not possible, but inverse methods can be used to determine the distribution of basal properties from surface measurements. We developed open-source iterative inverse algorithms and applied them to PISM, a hybrid ice sheet model that solves a combination of the Shallow Ice and Shallow Shelf Approximations. In a regional-scale model of Jakobshavn Isbræ, the fastest flowing ice stream of Greenland, we invert for basal stickiness over the entire drainage basin. The sensitivity of the reconstructed basal stickiness to the following modeling choices is evaluated: temperature distribution within the ice, definition of the misfit functional, tolerance for the stopping criterion and initial estimates of basal stickiness. The effects and the management of missing data are analyzed.

In 2002 the floating tongue of Jakobshavn Isbræ disintegrated catastrophically, leading to increased speeds and rapid thinning of the inland ice. Detailed velocity maps from before and after this breakup allow us to compare retrieved basal parameters and to track the continuing evolution of the basal boundary condition.