

Ice sheets in the Community Climate System Model

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I am leading the effort to implement an ice sheet model in the Community Climate System Model (CCSM), with the aim of performing credible climate change experiments with dynamic ice sheets for the next IPCC assessment. This work is supported primarily by the DOE Office of Science. We have the following goals in the near to medium term:

- (1) Incorporate the GLIMMER ice sheet model as a standalone component of CCSM.
- (2) Allow the ice sheet model to exchange fields with other CCSM components, in particular the land surface (CLM, the Common Land Model).
- (3) Compute the ice sheet surface mass balance in CLM for multiple elevation classes, and downscale the mass balance from the land grid to the ice sheet grid.
- (4) Develop a parallel ice sheet model that can run at fine resolution (~5 km).
- (5) Run the ice sheet model with full stresses. (The current version of GLIMMER uses the shallow-ice approximation.)
- (6) Implement an ice shelf model with a sub-shelf circulation model that exchanges mass and heat with the global ocean.

Goals (1) and (2) are complete, and (3) is in progress. Once we have finished (3), we will begin climate change experiments with a dynamic Greenland ice sheet. The Antarctic ice sheet will be added when higher-order stresses and a shelf model are available. To the extent possible, these developments will be incorporated in the next model version, CCSM4, which is scheduled for release in summer 2009. In the longer term we plan to focus on subglacial hydrology, deformation of subglacial till, and adaptive grids. The rate of progress will depend on the available resources, and we are working to obtain additional support for model development and analysis.