



Modeling Land Ice in the Community Earth System Model

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Mass loss from glaciers and ice sheets is accelerating. In order to better understand and predict ice mass loss and resulting sea-level rise, we are coupling land-ice models to the Community Earth System Model (CESM). The current version of CESM includes the Glimmer Community Ice Sheet Model (Glimmer-CISM), which uses the shallow-ice approximation. We are now incorporating a new version of CISM with scalable, higher-order dynamical cores for improved simulations of fast ice flow. Also, we are implementing two-way coupling between ice sheets and the land and atmosphere.

Here, we summarize results to dates and describe ongoing model development. We show that the simulated present-day surface mass balance of Greenland is in good agreement with observations and regional models, and we describe the sensitivity of the mass balance to climate changes. We show initial results from higher-order ice-sheet models with prescribed atmosphere and ocean forcing, including SeaRISE and ice2sea scenarios. Finally, we describe progress in coupling ice-sheet and ocean models (which will enable simulations with a dynamic Antarctic ice sheet) and in modeling smaller glaciers and ice caps.