Ice sheet modelling of the last deglaciation

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Abstract

Massive climate changes were evident during the last deglaciation. Melting of ice sheets resulted in about 130 m of sea level rise within 10 kyr which, on average, represents a rate comparable to future sea level rise projections. We study this period with an ice sheet – climate model system, consisting of the Parallel Ice Sheet Model (PISM) coupled to the solid-earth model VILMA and the Max Planck Institute Earth System Model (MPI-ESM). By including VILMA, we account for glacial isostatic adjustment and the effect of ice sheets on the geoid.

Linear combinations of twelve stand-alone climate experiments with MPI-ESM for different orbital configurations, greenhouse-gas concentrations and ice sheets are used to calculate the ice sheet surface mass balance with an energy balance model. The surface mass balance is then used to force the ice sheet-solid earth model setup throughout the deglaciation. To obtain basal shelf melt rates, ocean temperature and salinity are extrapolated below the shelves and then processed in the Holland and Jenkins (1999) three-equation ice shelf melt model. We present results of deglaciation sensitivity studies, as well as first test runs with the fully coupled ice sheet – climate model system.

Keywords: Ice sheet – climate modelling, model coupling, glacial-isostatic adjustment

References

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