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Modeling the last deglaciation with an ice sheet – solid earth model system

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Massive climate changes were evident during the last deglaciation. Melting of ice sheets resulted in about 100 m of sea level rise within 10 kyr, which on average is comparable to future projections of sea level rise. The exact location and timing of the meltwater releases is crucial for the response of the ocean circulation. To account for such processes and interactions between climate components and ice sheets it is important to integrate ice sheet models into state-of-the-art climate models.

To investigate ice sheet changes throughout the last deglaciation we present results of the Parallel Ice Sheet Model PISM coupled to the solid earth model VILMA, as a first step towards a fully coupled ice sheet – climate model system. By including VILMA, we account for glacial isostatic adjustment and gravitational sea level effects. Linear combinations of twelve stand-alone climate experiments with the Max Planck Institute Earth System Model (MPI-ESM) for different orbital configurations, GHG concentrations and ice sheets are used to calculate the ice sheet surface mass balance (SMB) using an energy balance model. The SMB is then used to force the ice sheet – solid earth model setup. Ocean temperatures and salinities are used to obtain basal shelf melt rates.