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Towards a reliable projection of the contribution of the Greenland Ice Sheet to sea level rise during the next 100 years

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A coupled model system consisting of a regional climate model (HIRHAM5 RCM) and a state-of-the-art ice sheet model (Parallel Ice Sheet Model, PISM) is applied to quantify and project the contribution of the Greenland Ice Sheet to sea level rise. With this system we address previous modelling limitations that have included, among other things, the low resolution of the climate forcing and the lack of representation of fast flowing ice streams. PISM simulates spatially and temporally varying ice streams by use of the shallow shelf approximation as a 'sliding law' for the shallow ice approximation. The surface mass balance that drives the ice sheet model is calculated within HIRHAM5 to take advantage of a newly implemented energy balance model. The surface scheme of the climate model has also been upgraded over glaciers and ice sheets to account for important processes including snow transformation, melt and refreezing.

As a part of the ice2sea project future projections of the Greenland Ice Sheet mass loss are made by forcing the RCM with lateral boundary conditions derived from the A1B scenario run from the GCM ECHAM for the 21st century. The initialised model for present day conditions and the current mass loss is validated with comparison to reanalysis data (ERA-Interim), satellite derived mass loss data, as well as meteorological observations around the coast of Greenland and on the ice sheet.