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Greenland ice sheet retreat during the Eemian

Michiel Helsen, Roderik Van de Wal, Michiel Van den Broeke, Johannes Oerlemans, and Willem Jan Van de Berg
Utrecht University, IMAU, Physics and Astronomy, Netherlands (m.m.helsen@uu.nl)

We simulate the volume and extent of the Greenland ice sheet during the Eemian using a 3D 'shallow' ice sheet model forced with Eemian surface mass balance (SMB) and temperature fields. These Eemian forcing fields are obtained from a time slice experiment of the regional climate model RACMO2/GR forced with the ECHO-G GCM on its lateral boundaries using orbital parameters and GHG concentrations representative for the Eemian (125 BP). Using net SMB fields from a climate model as a forcing for the ice sheet model replaces conventional SMB parameterizations, such as an approach based on positive degree-days. To improve the treatment of ice sheet – climate interactions due to a retreating ice sheet, we regularly rerun the regional climate model with an updated ice sheet elevation and extent after significant ice sheet changes. In between these couplings with the climate model, we account for the height – mass balance feedback by application of a SMB perturbation based on the local mass balance gradient rather than applying lapse rates for temperature.
The SMB forcing dominates the strength of the ice sheet retreat. We observe that the southern part of the ice sheet rapidly retreats from west to east in about 5 ky, but a narrow band along the southeastern coast remains glaciated due to high accumulation in this area. In contrast to earlier studies in the literature, our simulations suggest that the South Dome remained connected to the Central Dome during the Eemian, due to persistent high accumulation in this region.