



Simulations of the Greenland ice sheet with the ice sheet model SICOPOLIS including a fully coupled model of basal hydrology

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We present simulations with the dynamic/thermodynamic ice sheet model SICOPOLIS (version 3) coupled to HYDRO, a model of basal hydrology. SICOPOLIS describes the evolution of ice thickness, temperature and water content of ice sheets. Recently, the treatment of longitudinal and lateral stresses (“shelfy stream approximation”) for the dynamics and the enthalpy method as an alternative method for solving the energy equation were included into the model. HYDRO describes the basal water transport using the hydrological potential. In a bi-directional coupling, HYDRO receives the basal water fluxes from SICOPOLIS, while the basal water from HYDRO affects the basal sliding in SICOPOLIS. Here, we present offline simulations with HYDRO as well as simulations with SICOPOLIS-only and the coupled model SICOPOLIS-HYDRO. Several sensitivity studies highlight the importance of basal processes. In particular, we inspect the role of horizontal resolution. It shows that not only horizontal resolution plays an important role for resolving outlet glaciers, but also the coupled model better reproduces outlet glaciers compared to the uncoupled one; even the North-East-Greenland Ice Stream is modelled quite well without the need for special regional tuning.