

EGU21-15463

<https://doi.org/10.5194/egusphere-egu21-15463>

EGU General Assembly 2021

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Simulation of LGM ice sheets with the Community Earth System Model version 2

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The last deglaciation provides a unique framework to investigate the processes of ice sheet and climate interaction during periods of mass loss as in the current climate. Here we simulate the Last Glacial Maximum (LGM) northern hemisphere ice sheets climate, surface mass balance (SMB), and dynamics with the Community Earth System Model version 2 (CESM2, Danabasoglu et al., 2020) and the Community Ice Sheet Model version 2 (CISM2, Lipscomb et al., 2019). This LGM simulation will be later used as starting point for coupled CESM2-CISM2 simulations of the last deglaciation.

CESM2 is run at the nominal resolution used for IPCC-type projections (approx. 1 degree for all components). The model includes an advanced snow/firn and SMB calculation (van Kampenhout et al, 2019; Sellevold et al, 2019) the land component (CLM, cite) that has been evaluated and applied to the simulation of the future Greenland melt (van Kampenhout et al, 2020, Muntjewerf et al., 2020a,b, Sellevold & Vizcaino, 2020).

Our analysis examines how the global, Arctic, and North Atlantic climate result in the simulated radiative and turbulent heat fluxes over the ice sheets, and the mass fluxes from precipitation, refreezing, runoff, and sublimation. We also examine the simulated ice streams in CISM2, which is run at 8 km under a higher-order approximation for ice flow.