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Using a transient GCM simulation of the last deglaciation to model the evolution of Northern Hemisphere ice sheets

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Climate-ice sheet interactions played an important role during the last deglaciation. To better understand these interactions, coupling between a 3D ice sheet model and an intermediate complexity model has been used to simulate the transient evolution of climate and ice sheets over the deglaciation (Charbit et al. 2005; Bonelli et al. 2009). As pointed out by these studies the geographical distribution of ice sheets obtained could be improved by having a better spatial distribution of precipitation. This could be achieved by using a General circulation model. It is only recently, however, that fully coupled GCM's can provide us with a continuous simulation of the climate during the last deglaciation and made it possible to simulate the transient evolution of climate and ice sheets.

We use a transient climate simulation of the last deglaciation (21000 to 9000 years ago) realised with FAMOUS (a low resolution version of HadCM3) to force the 3D ice sheet model Glimmer, set up to simulate the Laurentide and Fennoscandian ice sheets. The climate model was forced with continuous changes in insolation, greenhouse gases concentration and realistic freshwater fluxes. The land sea mask, bathymetry, orography and ice sheets extent were updated every 1000 years following Ice-5G reconstruction. Evolving temperature and precipitation fields from this climate simulation were then used to force Glimmer using a standard PDD mass balance scheme.

The simulated evolution of Northern hemisphere ice sheets through the deglaciation is presented. We investigate the causes of change in the ice sheet geometry by comparing the role of internal ice dynamic against climate forcing.