Geophysical Research Abstracts
Vol. 18, EGU2016-4082, 2016
EGU General Assembly 2016

Sensitivity of Northern Hemisphere ice sheets to AMOC variability during the last glacial cycle

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The ocean played an instrumental role during the last glacial cycle, not only as a carbon trap but also during Dansgaard-Oeschger and Heinrich events. But did the variability of the ocean circulation on timescales of hundreds to a few thousand years also affect the long-term evolution of the Northern Hemisphere ice sheets?

We address this question using stand-alone ice sheet - ice shelf model simulations of the last glacial cycle. The boundary conditions for these simulations are derived from simulations with the intermediate complexity earth system model LOVECLIM, and from an estimate of past Atlantic meridional overturning circulation (AMOC) changes based on SST reconstructions.

First ice model results suggest that interruptions of the AMOC may have supported the ice sheet build-up during the glacial inception. In particular, during Marine Isotope Stage 3, the AMOC interruptions may have stabilised the Laurentide ice sheet via surface cooling, rather than destabilised it via subsurface warming.