Geophysical Research Abstracts
Vol. 19, EGU2017-4885, 2017
EGU General Assembly 2017

Heinrich events modeled in transient glacial simulations

Florian Ziemen, Marie Kapsch, and Uwe Mikolajewicz
Max Planck Institute for Meteorology, Hamburg, Germany (florian.ziemen@mpimet.mpg.de)

Heinrich events are among the most prominent events of climate variability recorded in proxies across the northern hemisphere. They are the archetype of ice sheet — climate interactions on millennial time scales. Nevertheless, the exact mechanisms that cause Heinrich events are still under debate, and their climatic consequences are far from being fully understood. We address open questions by studying Heinrich events in a coupled ice sheet model (ISM) atmosphere-ocean-vegetation general circulation model (AOVGCM) framework, where this variability occurs as part of the model generated internal variability.
The framework consists of a northern hemisphere setup of the modified Parallel Ice Sheet Model (mPISM) coupled to the global AOVGCM ECHAM5/MPIOM/LPJ. The simulations were performed fully coupled and with transient orbital and greenhouse gas forcing. They span from several millennia before the last glacial maximum into the deglaciation. To make these long simulations feasible, the atmosphere is accelerated by a factor of 10 relative to the other model components using a periodical-synchronous coupling technique.

To disentangle effects of the Heinrich events and the deglaciation, we focus on the events occurring before the deglaciation. The modeled Heinrich events show a peak ice discharge of about 0.05 Sv and raise the sea level by 2.3 m on average. The resulting surface water freshening reduces the Atlantic meridional overturning circulation and ocean heat release. The reduction in ocean heat release causes a sub-surface warming and decreases the air temperature and precipitation regionally and downstream into Eurasia. The surface elevation decrease of the ice sheet enhances moisture transport onto the ice sheet and thus increases precipitation over the Hudson Bay area, thereby accelerating the recovery after an event.