Geophysical Research Abstracts, Vol. 8, 07467, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07467

The response of the glacial ocean circulation to spatio-temporal freshwater discharges derived from an ice sheet model for the glacial period

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Decaying Northern Hemisphere ice sheets during deglaciation and variable ice sheets during MIS3 affect the high latitude hydrological balance and therefore the thermohaline circulation. Using a hybrid-coupled three-dimensional atmosphere-ocean model we investigate the response of the thermohaline circulation to spatio-temporal variable freshwater discharges and time varying routing. The inputs are calculated by a three-dimensional thermomechanically coupled ice sheet model of the Northern Hemisphere for the last glacial cycle, discriminating between surface runoff and calving as the most contributing components. While calving occurs along the shores, runoff follows the ice sheets and continental surface slopes and enters into the ocean in certain drainage regions. In contrast to earlier studies, where rough estimates of the net freshwater release at the end of LGM or during Heinrich events were used to force a predetermined ocean region of the Atlantic, we simulate special epochs with realistic local freshwater discharges including changes of freshwater routing. Responses in the Pacifc and Atlantic flow regimes are discussed. Key regions of high sensitivity for the thermohaline circulation during glacial times are detected.