Geophysical Research Abstracts, Vol. 9, 09221, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09221

The atmospheric response to North Atlantic freshwater forcing

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The mechanism of a weakening of the thermohaline circulation following freshwater forcing in the North Atlantic has been proposed to explain large climate variations in the past as well as being a possible scenario for future climate change where the North Atlantic freshening is caused by the anthropogenic warming. Using a Community Earth System Model framework we performed several simulations investigating the sensitivity of the climate system with respect to moderate North Atlantic freshwater forcing. In this study we investigate the atmospheric response following the weakening of the THC and their effect on the recovery of the overturning circulation. Our results propose an atmospheric response which resembles the positive phase of the North Atlantic Oscillation pattern and increases the westerly winds. This leads to an increased heat loss in the North Atlantic and could reinforce the THC as proposed earlier in another context. To quantify the role of this mechanism we modify the forcing in coupled model runs and investigate the recovery of the THC under the modified forcing.