



The impact of ice shelf – iceberg coupling on the North Atlantic Ocean in a global climate model of intermediate complexity

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The influence of icebergs on the climate system is well known. On the one hand they act as a source of fresh water and on the other hand icebergs are a sink of latent heat. As a consequence icebergs clearly affect the ocean stratification and the formation of sea ice. The influence of icebergs on the climate system is especially important during so – called Heinrich events, which were periods with huge armadas of icebergs during the glacial climate. So far, icebergs have mostly been parameterized in global climate models as freshwater and heat fluxes. More recently, an iceberg module was used to generate bergs at specific locations.

In this study a version of the Earth System Model of Intermediate Complexity, LOVECLIM, that includes a 3D dynamic – thermodynamic iceberg module (Jongma et al, 2008) is coupled to the Grenoble model for ice shelves and land ice (GRISLI, Ritz et al, 1997; 2001). Therefore, the icebergs are generated according to the amount of mass loss at the calving sites of GRISLI. The ice shelf model itself depends on the precipitation and temperature that is calculated by LOVECLIM. The calving rate of GRISLI is given back to the dynamic iceberg module in the form of an ice volume flux. The volume flux is taken to generate icebergs according to the size and mass distribution of Bigg et al. (1997). These bergs are then released at the same locations as the calving took place.

In the present study we analyse the effect of moving icebergs on sea surface temperature, salinity and convection in comparison to an experiment where the ice volume that is lost by calving is given to the ocean directly as a freshwater flux at the calving site.

Moreover, the influence of the start position of the icebergs on their tracks and on the ocean is investigated as we examine the differences between a model run using prescribed locations and the model run with the coupled ice shelf – iceberg model. All the experiments are done under preindustrial forcing.

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