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Coupling a fast AOGCM to a thermo-mechanical model of Greenland ice-sheet.

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There is strong evidence of rapid climate change in the North Atlantic region during the last glacial period. This excursions are possibly related to the sensitivity to freshwater discharge of the North Atlantic buoyancy driven circulation (THC). At present we do probably not have a storage of freshwater on land capable to trigger events like Heinrich events or Dansgaard-Oeschger oscillations. Nonetheless Greenland ice-sheet is the biggest single store of freshwater in the northern hemisphere, containing an equivalent of ˜7m in sea level rise.

The contribution to freshwater run-off in the North Atlantic by Greenland is about ˜0.02Sv with errors of 20%. But future warming scenarios suggests that the run-off could increase in the next centuries, which could affect the THC.

In this work we consider the coupling between a fast AOGCM and a complete thermo-mechanical model of Greenland ice-sheet (GLIMMER). This is to consider the full range of feedback between the ice-sheet and the climate system as well as to be able to do a range of sensitivity tests under different parameter combinations.

The fast AOGCM is FAMOUS, a low-resolution version of HadCM3. FAMOUS has been calibrated to reproduce the climate of HadCM3 as nearly as possible.

Preliminary results of the coupled AOIGCM will be shown both for its control climate and for climate change resulting from increased CO2 concentrations. Moreover non-return thresholds in the ice-sheet evolution and multiple steady states are investigated.