



Fresh water content variability in the Arctic Ocean in a global ocean-sea ice-atmosphere model

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The climate simulations specified by the IPCC for assessment report 4 were carried out at CNRM with CNRM-CM3 global coupled model. This model includes ARPEGE-Climat v3 AGCM (CNRM), OPA8 OGCM (CNRS/IPSL), Gelato2 sea ice model (CNRM) and TRIP river routing (University of Tokyo). The whole system is coupled by OASIS2 software (Cerfacs). Preindustrial, historical experiments (1860-2000) and several 21st century scenario experiments were run with this coupled model. These simulations served as a basis to study the coupled ice-atmosphere-ocean system in the Arctic. All the experiments are characterized by a lack of penetration of Atlantic Waters into the Arctic ocean, which is caused by the atmospheric forcing. This was confirmed by running OPA-Gelato forced by ECMWF's ERA40 reanalysis over the period 1958-2001. The North Atlantic and Arctic barotropic circulation was realistic in this forced experiment. However, even if the link between the North Atlantic and the Arctic is weak in the fully coupled system, the fresh water content of the Arctic ocean still presents significant decadal variability. In the 1860-2000 fully coupled experiment, ocean fresh water content in the Arctic is dominated by decadal variability, whereas in the scenario experiments, the Arctic ocean undergoes a significant freshening, mostly due to the increased river discharge.