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Did fluctuations of the thermohaline circulation in the North Atlantic play a role during Arctic warm episodes of the past millennium?

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Some hypotheses propose that fluctuations in the intensity of the North Atlantic thermohaline circulation (THC) could have influenced regional and global temperature changes during the past millennium. Nevertheless, the role played by the oceanic circulation in this changes is not yet well understood. To investigate this point, simulations with the Earth system model of intermediate complexity LOVECLIM have been performed with a data assimilation technique. A first set of experiments had been realized over the last millennium, in which the model was constrained to follow terrestrial surface temperature proxies. In those different simulations, the 15th century warm period in the Arctic is to a large extent explained by changes in atmospheric circulation, as in these simulations the variability of the oceanic circulation is very weak. The aim of this study is to investigate if changes in the THC might provide an alternative explanation to this past climate change in the Arctic. In order to do that, we have launched another series of simulations, in which we have constrained the model with information about changes in the strength of the THC during the past. One method to do that is to force the model to follow observed spatial distributions of sea surface temperature (SST), which are available for the last century, since it has been suggested that a close relation exists between the THC and SST variations. For the previous centuries, the available information about the variability of the THC is rather limited. We have therefore carried out different simulations using different assumptions about the behavior of the THC based on fragmentary available information. By comparing these simulations with forced THC variations and those with weak oceanic circulation variability obtained before, we analyzed whether variations in the intensity of the THC could play a role in some regional temperature changes observed in the Arctic.