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Factors controlling the last interglacial climate as simulated by LOVECLIM1.3

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More and more proxy-based reconstructions of the last interglacial (LIG) climate become available and the major climate forcings during the LIG are rather well known. Therefore models can be tested against paleoclimatic datasets and then used to better understand the climate of the LIG. Here, we focus on a single climate model, LOVECLIM, to investigate potential causes of discrepancy between simulated and reconstructed climate during the LIG. Therefore, we perform transient simulations, starting at 135 kyr BP and run until 115 kyr BP. With these simulations, we test the role of a prescribed evolution of the Northern Hemisphere (NH) ice sheets on the simulated LIG climate and the importance of parameter choices (internal to the model, such as the albedos of the ocean and sea ice), which affect the sensitivity of the model.
The magnitude of the simulated climate variations through the LIG remains too low for climate variables such as surface air temperature. Moreover, in the North Atlantic, the large increase summer sea surface temperature towards the peak of the interglacial occurs too early (at $\sim$128 kyr BP) compared to reconstructions. This feature as well as the climate simulated during the optimum of the LIG, between 130 and 121 kyr BP, are robust to changes in NH ice sheets and parameters.
The additional freshwater flux (FWF) from the melting NH ice sheets is responsible for a temporary abrupt weakening of the North Atlantic meridional overturning circulation, which causes a strong global cooling in annual mean. However, the changes in the configuration (extent and albedo) of the NH ice sheets during the LIG only slightly impact the simulated climate. Together, NH ice sheet configuration of and FWF greatly increase the magnitude of temperature variations over continents as well as over the ocean at the beginning of the simulation and reduce the difference between simulated climate and reconstructions. At last, we show that the contribution from the parameter sets to the climate response is actually very modest.