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Evolution of the polar ice sheets during the Last Interglacial from coupled ice sheet-climate experiments with LOVECLIM

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The Last Interglacial warm period (LIG, ∼130 to 114 kyr BP), for which increasingly better proxy data have recently become available, is the most recent analogue for future warming in the climate history of the Earth. It represents a real-world test case for the stability of the Greenland and Antarctic ice sheets, both thought to have lost considerable amounts of ice compared to their present-day configuration.
We use the Earth system model of intermediate complexity LOVECLIM version 1.3 to perform transient simulations over the LIG forced with changes in orbital parameters and greenhouse gases. The model includes thermomechanically coupled models of the Greenland and Antarctic ice sheets, which are interactively coupled with the atmosphere and ocean component. We present modelling results with focus on the evolution of the polar ice sheets and their sea-level contribution, ice-climate interactions and inter-hemispheric coupling. In preliminary experiments LOVECLIM simulates annual mean temperature and summer temperature anomalies over the present-day ice covered area on Greenland relative to the present day that peak at 2.5 °C and 4 °C, respectively. The Greenland ice sheet sea-level contribution peaks at 3 m mainly in response to increased summer temperatures and to a smaller extent due to reduced precipitation. The evolution of the Antarctic ice sheet over the LIG with a peak sea-level contribution of 3.8 m is governed by changes in global sea-level stand and melting below the ice shelves that control the grounding-line position, while changes in surface melting have a negligible effect.