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Ice Sheet - Climate Interaction at the End of an Interglacial

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We investigate the climate changes at the end of an interglacial (MIS 1; 5; 7; 9; 11) by use of the Earth system model of intermediate complexity CLIMBER-2.3. The model describes the dynamics of atmosphere, ocean including sea ice, vegetation, and inland ice (SICOPOLIS). Here, the model is driven by changes in solar insolation and atmospheric CO2 content from 128 to 100 kyr BP.

Last Glacial Inception as a bifurcation transition: In our transient run, glacial inception in terms of a rapid ice-sheet expansion especially in North America takes place at about 117.5 kyr BP. The sea-level change at the last glacial inception amounts to about -40 m as maximum in the course of our simulation. The Laurentide inland sheet expands very rapidly because of a strong snow-albedo feedback.

Impact of ocean and vegetation changes: When we fix the state of the Earth's surface in our transient run to conditions reflecting a warmer climate (e.g. Eemian), a glacial inception can be suppressed in our model. Thus, surface feedback plays a crucial role here.

Freshwater disturbances in the North Atlantic and cold events: Abrupt cold and warm events in the course of the last glacial inception can be reproduced in the model by artificially introducing freshwater disturbances into the North Atlantic (that may partly originate from the northern hemisphere ice sheets). The disturbed ocean circulation impacts on ice-sheet size and location.

Earlier glacial inceptions (MIS 7; 9; 11) and the end of the Holocene: With our model, we are able to reproduce glacial inceptions at the end of MIS 7, 9, and 11 as well. Ice-sheet growth at the end of MIS 7, however, is too strong. Future glaciation in our

model happens only in about 50 kyr from now.