SIMULATION OF THE LAST GLACIAL CYCLE WITH A COUPLED CLIMATE-SYSTEM MODEL

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We present simulations of the last glacial cycle with the climate-system model CLIMBER-2 (CLIMate and BiosphERe model) coupled to the polythermal ice-sheet model SICOPOLIS (SImulation COde for POLythermal Ice Sheets). CLIMBER-2 is a low resolution geographical explicit climate-system model of intermediate complexity which describes the atmosphere, sea ice, ocean, and the biosphere. SICOPOLIS simulates the time-dependent extent of thickness, velocity, temperature, water-content and age for grounded ice sheets. The bedrock responds to the load of the ice through the buoyancy forces of the asthenosphere. For the coupling energy and mass balance are calculated on the fine grid of SICOPOLIS using interpolated climate characteristics (air temperature and humidity, long-wave and short-wave radiation, precipitation) from the coarse grid of the CLIMBER-2 model and accounting for the orography on the fine grid. In turn, SICOPOLIS provides CLIMBER-2 with the temporal change of orography and fractions of land and glaciers. The new coupled model CLIMBER-2/SICOPOLIS was validated for the present and glacial steady-state climate. In particular, the modeled present-day surface mass balance and precipitation of Greenland are in good agreement with observations. Here, we study the response of the northern Hemisphere ice sheets to changes of the Earth's orbital parameters and atmospheric CO_2-contents. Additionally, the role of oceanic heat transport and reorganization in vegetation are investigated.