Geophysical Research Abstracts,
Vol. 11, EGU2009-178-3, 2009
EGU General Assembly 2009

Transient Simulation of Deglacial Evolution towards Bolling-Allerod

Z. Liu (1), B. Otto-Bliesner (2), F. He (1), E. Brady (2), R. Tomas (2), P. U. Clark (3), A. Carlson (1,4), J. Lynch-Stieglitz (5), W. Curry (6), E. Brook (3), D. Erickson (7), R. Jacob (8), J. Kutzbach (1), J. Cheng (9,1)

(1) University of Wisconsin-Madison, USA (zliu3@wisc.edu), (2) School of Atmospheric and Earth Sciences, (3) Dept. Geosciences, Wilkinson Hall, Oregon State University, Corvallis, Oregon 97331, USA, (4) Dept. Geology and Geophysics, University of Wisconsin-Madison, Madison, WI53706, USA, (5) School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA 30332, USA, (6) Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA, (7) Oak Ridge National Laboratory, Oak Ridge, TN 37831-6016, USA, (8) Mathematics and Computer Science Division, Argonne National Laboratory, Argonne, IL 60439-4843, USA, (9) KLME and College of Atmospheric Sciences, Nanjing University of Information Science and Technology, Nanjing, 210044, China

We present a first synchronously coupled atmosphere-ocean general circulation model (CCSM3) to simulate the well-documented evolution of global climate from the Last Glacial Maximum (LGM) 21,000 years ago to the time of the abrupt Bølling-Allerød (BA) warming 14,500 years ago. Our model reproduces the major features of the deglacition evolution, including the magnitude of the climate response, suggesting good agreement between observed and model climate sensitivity. The model simulates the abrupt BA warming in the Northern Hemisphere as a transient response of the Atlantic meridional overturning circulation (AMOC) to the termination of freshwater discharge associated with Heinrich event 1 (H1), but only if this discharge is terminated several hundreds of years prior to the BA. Three effects contribute to this large magnitude of BAwarming: the warming from ongoing CO2 rise, the AMOC recovery, and an AMOC overshoot. This response is in contrast to a mechanism involving non-linear bifurcation of multiple equilibria in the AMOC as simulated in climate models of intermediate complexity. Finally, it is suggested that an improved knowledge of the meltwater history prior to BA is critical for clarifying the nature of the abrupt BA warming.