Geophysical Research Abstracts, Vol. 7, 03765, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03765

The impact of ice sheet topography on the glacial atmosphere: An intercomparison of results for ICE-5G and ICE-4G models

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A growing number of studies have demonstrated the extent to which changes of planetary topography may significantly influence climate state. The work to be described in this presentation explores the impact of employing the new paleotopography dataset denoted ICE-5G (Peltier, 2004) on the ice-age atmosphere, land surface and sea surface temperature. The study is based upon coupled climate simulations performed with an ocean-atmosphere-sea-ice model of intermediate complexity, ECBilt-Clio. Two simulations focusing on the Last Glacial Maximum (21,000 years B.P.) have been analyzed: a first simulation made use of ICE-4G ice sheet topography of Peltier (1994, 1996), and a second simulation employed the new ice sheet topography ICE-5G. Intercomparison of the experiments demonstrates that the ICE-5G simulation delivers significantly enhanced cooling over Canada compared to the ICE-4G simulation whereas positive temperature anomalies are simulated over southern North America and the northern Atlantic. This in turn, intensifies the meridional thermal gradient and induces changes in the baroclinic structure of the atmosphere. Moreover, introduction of the ICE-5G topography decelerates the sub-tropical westerlies and generates a ridge over North America which has a profound effect upon the hydrological cycle and thus upon ice sheet mass balance.