Geophysical Research Abstracts, Vol. 7, 07532, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07532

Glacial climate ensemble-simulations for constraining climate sensitivity

T. Schneider von Deimling, H. Held, A. Ganopolski and S. Rahmstorf

Potsdam Institute for Climate Impact Research, P.O. Box 60 12 03, 14412 Potsdam, Germany, schneider@pik-potsdam.de {Fax: +49-331-288-2600}

In view of the continuing increase in the concentration of greenhouse gases (GHGs) in the atmosphere, estimating the climate systems sensitivity to changes in GHG concentration is of vital importance. Uncertainty in climate sensitivity (commonly defined as the equilibrium global-mean surface temperature change following doubled CO2 concentrations) is a main source of uncertainty in projections of future climate change. We constrain climate sensitivity by using a large ensemble of model simulations together with proxy-data from the Last Glacial Maximum (LGM).The ensemble is realized for a simultaneous perturbation of eleven model parameters, which mainly modify the model's feedback strengths. We run the model (CLIMBER-2, model of intermediate complexity) for a) doubled CO2 concentration to determine the value of climate sensitivity for each parameter combination, and b) for a full set of glacial forcings to simulate the pronounced temperature difference between glacial and pre-industrial climate. The basis of our approach is a close link between the simulated warming due to a doubling of CO2, and the cooling obtained for the LGM - irrespective of uncertainties in model parameters and feedback strengths. LGM proxy-data from tropical sites as well as high latitude temperature reconstructions from Antarctica all yield climate sensitivity estimates consistent with the IPCC range of 1.5-4.5°C.