Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03488, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03488
EGU General Assembly 2008

Eemian and Holocene Climate Variability in a Coupled Atmosphere-Ocean-Biosphere Model

N. Fischer (1,2), J. Jungclaus (1), T. Raddatz (1), V. Brovkin (3)

(1) Max Planck Institute for Metorology, Hamburg, Germany (nils.fischer@zmaw.de / Phone: +49-40-41173-116), (2) International Max Planck Research School on Earth System Modelling, Germany, (3) Potsdam Institute for Climate Impact Research, Potsdam, Germany

According to the Milankovic theory variations of the orbital parameters of the Earth's motion around the sun yield varying spatio-temporal insolation forcing and therefore changes in the amplitude of seasonal cycles. These changes are considered to be the leading forcing mechanism of glacial-interglacial cycles.

Model simulations of pre-industrial climate (150 years before present) characterized by relatively low summer insolation at high northern latitudes are compared with the Holocene optimum (6000 years before present) and the optimum of the last interglacial, the Eemian, (125000 years before present). The main difference between the Holocene optimum and the pre-industrial stage on the one hand and the Eemian period on the other is an enlarged eccentricity of the Earth's orbit in the latter leading to an enhanced seasonal cycle over the Northern Hemisphere as the perihelion was during boreal summer. The aim is to unravel the influence of natural forcing factors, i.e. orbital parameters, on climate variability and regional heterogeneity.

In order to investigate variability up to decadal and multi-decadal scale we perform 1000 year long unperturbed equilibrium integration runs of a coupled atmosphere-ocean general circulation model (ECHAM5/MPIOM) including a dynamic land cover model. Greenhouse gas concentrations are fixed at pre-industrial levels in all runs.

We analyze changes in the large scale ocean circulation, deep water formation, and the variability patterns North Atlantic Oscillation (NAO) and El Nino/Southern Oscillation (ENSO) and feedback mechanisms between thermohaline circulation changes

and low-frequency variations of climate.