Projekt 457 (preliminary)

Johann Jungclaus (Max Planck Institute for Meteorology)

Gerrit Lohmann (Alfred Wegener Institute for Polar and Marine Sciences)

Project title: Evaluation of Eemian and Holocene Climate Trends: Synthesis of marine archives with climate modelling

The major objective of the project is to investigate the spatio-temporal pattern of temperature changes during the Eemian and Holocene as derived from integrations with a comprehensive global climate model, marine surface ocean temperature and oxygen isotope records as well as from terrestrial archives on a global scale.

We will explore the worldwide distribution of existing, reedited, and newly collected marine and terrestrial palaeotemperature data and compare it with results from transient experiments with state-of-the-art general circulation models used in the assessment of future climate change. The palaeodata collection and the modelling efforts will aim to investigate the regionally very different temporal climate patterns during the middle to late Holocene and the Eemian (125kyr before present). Special emphasis is placed onto the last 3000 years. With advanced statistical analysis of spatial and temporal variability in the palaeodata records and in the model results, natural climate variability modes and their amplitude will be identified in the data and compared with the climate variability tracked down in the model experiments. Pattern analysis will unravel heterogeneity in temperature trends. The extension of the Latest Holocene climate simulations into the next centuries, using scenarios for future greenhouse gas emission, will help to assess future climatic change influenced by natural and anthropogenic “forcing”. The statistical analyses will extract climate phenomena from different proxy time-series and elaborate common variability and teleconnections for the last two interglacial periods. This should allow to unravel the influence of internal variability and natural forcing factors, like e.g. parameters of the Earth's orbit, on climate variability and regional heterogeneity in climate trends. The variations in the large-scale ocean circulation and feedback mechanisms between thermohaline circulation changes and low-frequency variations of climate will be investigated.

The simulations of the Eemian and Holocene interglacial climates as well as the future climate will concentrate on the most recent version of the COSMOS model available at the MPI-M. A medium resolution version of this model, which is T31 resolution for the ECHAM5 model and approximately 3° horizontal resolution for the MPIOM, will be used for the long-term model experiments.