Geophysical Research Abstracts
Vol. 12, EGU2010-10751, 2010
EGU General Assembly 2010

Regional expressions of climate variations over the last Millennium

Johann Jungclaus, Davide Zanchettin, and Stephan Lorenz
Max-Planck-Institute for Meteorology, Hamburg, Germany (johann.jungclaus@zmaw.de)

Climate change over the last Millennium, such as the transition from the Medieval Warm Period (MWP) to the Little Ice Age (LIA), has mostly been characterized by hemispheric mean temperature evolution. Resent research, however, emphasizes the role of regional variations, variability patterns, and their relationship to external forcing. Moreover, non-stationarity in these relations has to be taken into account.
Here we present analyzes of ensemble simulations carried out with the comprehensive Earth System Model ECHAM5/MPIOM. The combination of a multi-millennia control run, single-forcing experiments, and simulations using all natural and anthropogenic forcings allows for discrimination between internal variability and externally-driven climate change.
We describe the regional expression of forced and unforced variability for different sectors of the Earth and discuss limits of the model results in comparison with proxy reconstructions.
Particular emphasis is given to the role of the Meridional Overturning Circulation (MOC) and the modes of atmospheric variability over the northern hemisphere. For the MOC, a diverse model emerges: On the one hand, MOC variations are a strong driver of climate variation over the North Atlantic region and may be responsible for multi-decadal to multi-centennial temperature changes of the order of the MWP-LIA transition. On the other hand, the MOC responds to changes in the external forcing and this response results in variations of the distribution of heat and changing teleconnection patterns.