Teleconnections and upscaling relationships for the Eemian

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The aim of our model based study is to investigate the hemispheric circulation differences between Eemian(last interglacial) and Holocene in terms of teleconnections (Wallace and Gutzler 1981) and to find a statistical upscaling model, which links local proxydata to the intensities of large scale circulation patterns, for further reconstruction from proxydata. As a coupled atmosphere-ocean GCM we use a 1000 year long control run (CTRL) from the ECHO-G with Milankovitch-forcing for the Eemian (125kyBP) (MPI-Met Hamburg, F. Kaspar, pers.com.). We compare the Eemian CTRL with a CTRL with preindustrial greenhouse -gas concentration (270ppm CO_2) (MPI-Met Hamburg, S. Lorenz, pers.com.).

Teleconnections (here, strongest negative correlation between one gridpoint and any other) (Fig.1) are sligthly different in the two periods. In Fig.2 the difference (Holocene minus Eemian) between the teleconnection is shown. In particular the Pacific region (corresponding to PNA) shows different correlations, but also over the North Atlantic (NAO) we see stronger correlations in summer for the Eemian. Further studies for explanations and possible impacts from these results are planned.

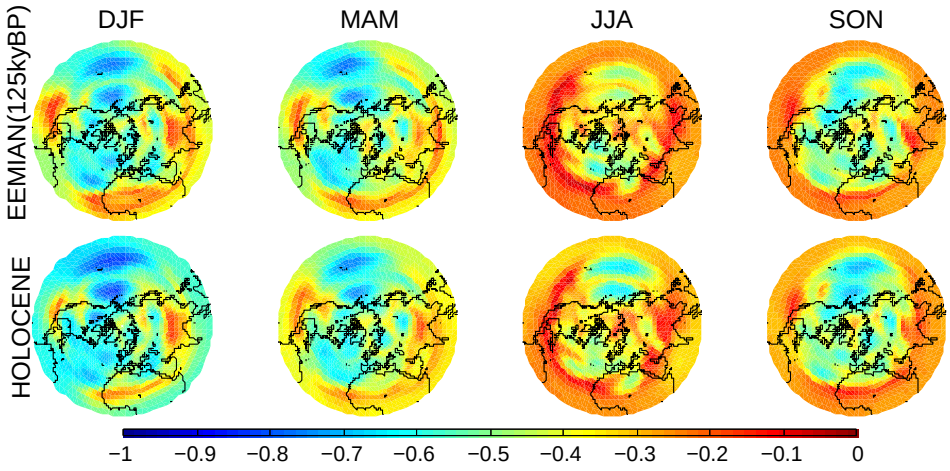

Figure 1: Teleconnections for 500hPa geopotential height

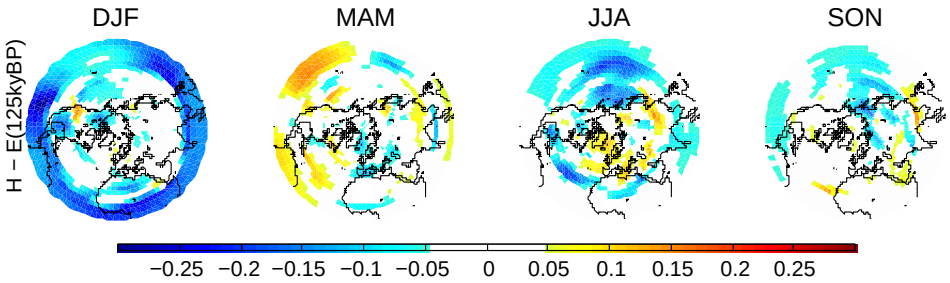

Figure 2: Differences of teleconnections for 500hPa geopotential height (Holocene - Eemian 125ky BP), only differneces > 0.05 are shown, > 0 (< 0) stronger(weaker) negative Eemian correlation.

Upscaling has been successfully applied for the Late Holocene, for instance to reconstruct large-scale temperature (Mann et al. 1998, Briffa et al. 2001, Esper et al. 2002), or circulation anomalies (Cook et al. 2001, Jones and Widmann 2003) from proxy data. Since the Eemian

climate may have substantially differed from current conditions, we cannot fit the upscaling model within the instrumental period, therefore we use simulated GCM climate as a surrogate to derive the relationship between regional climate and large-scale circulation. These relationships can then be applied to local climate information derived from proxy data by local transfer functions. Reconstructed temperature series from Germany and France for the period around 125 ky BP are available. The sites are located in highly correlated, adjacent grid cells of the GCM ECHO-G, and therefore all reconstructions represent the central European temperature on the scales resolved by the model. Thus the relation between simulated central European temperature and the SLP field has been investigated by means of regression maps (Fig.3). In summer higher central European temperatures are associated with high pressure over central Europe. In the other seasons a strong link between European temperatures and larger-scale pressure anomalies, similar but not identical to the (N)AO, associated with southwesterly (northeasterly) advection of warm (cold) air masses becomes evident. Significant differences between the Eemian and the Holocene are simulated in spring, while in the other seasons the upscaling relationships in the two periods are very similar.

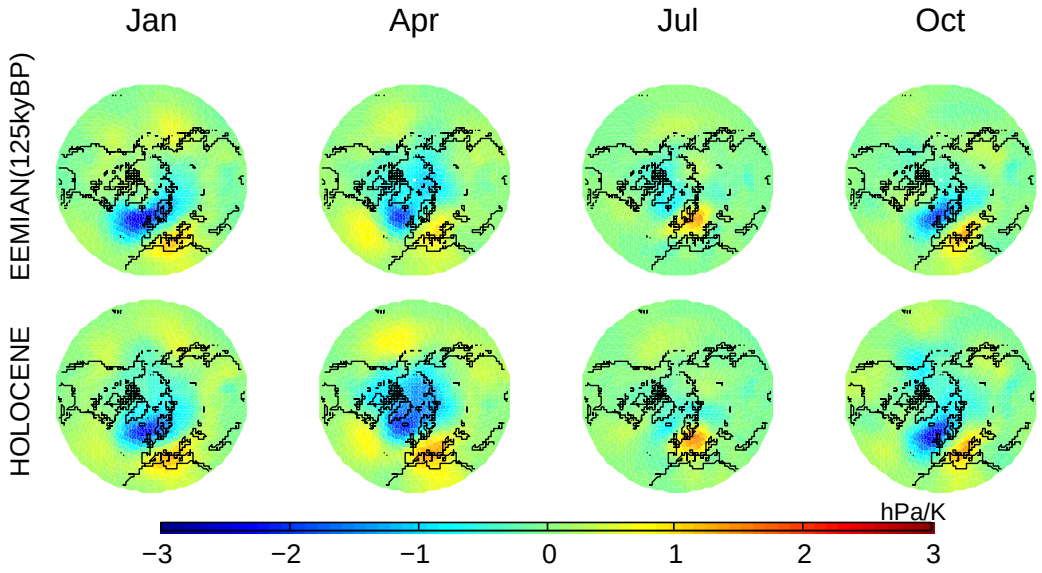

Figure 3: Regression coefficients of SLP against central European temperature from equilibrium run with the ECHO-G model for Eemian and Holocene

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