Project: 965
Title: Our way to Europe - Palaeoclimate and Palaeoenvironmental reconstructions
Report for period 01.01.2016-31.12.2016

During the year 2016, different research questions have been addressed by using computing time in the granted project. Currently, two publications in scientific journals are prepared where the results of the realized simulations will be presented. In this report, a a short overview of achieved and ongoing research projects is given.

a) Impact of revised SSTs over the North Atlantic Ocean on European Climate during the Last Glacial Maximum

By means of the regional climate model WRF_CEMSYS, the impact of revised SSTs on the glacial climate (Last Glacial Maximum, 21ka BP) over Europe is evaluated. A comparison of modeled and reconstructed SST based on different proxy data shows a strong overestimation of the modeled SSTs over the North Atlantic. The application of the regional climate model (time slices of 30 years have been simulated) allows to test the influence of altered boundary conditions (here: changes in SST) on the European climate in comparison to a model run with boundary conditions as assumed by the driving earth system model (MPI-ESM). Our results suggest a better agreement of simulated quantities (temperature and precipitation climatology) compared to available proxy data. Additionally, the influence of changes in vegetation cover and land use according to glacial conditions is investigated. Results show a clear feedback on the climate over Europe. The results are currently summarized for publication.

Ludwig, P., Pinto, J.G., and Shao, Y.: Impacts of revised Sea Surface Temperatures over the North Atlantic Ocean in a regional climate model simulation on European Climate during the Last Glacial Maximum. (to be submitted to Geophysical Research Letters)

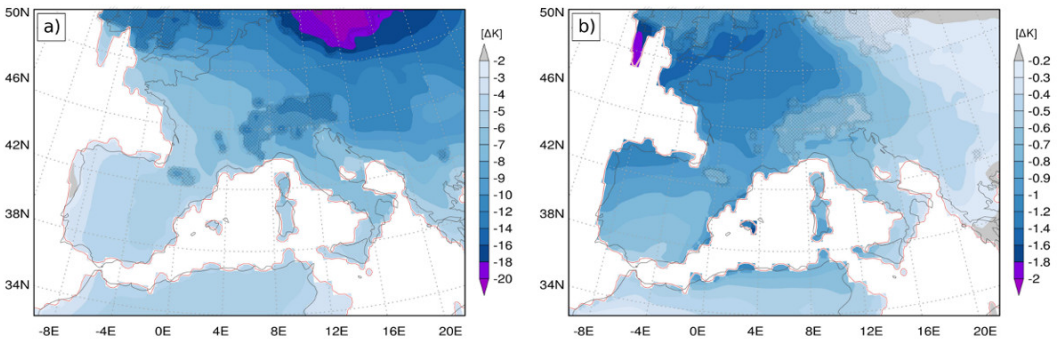

Figure 1: Results of WRF simulations (a) Temperature difference [K] between WRF-LGM and PI run; (b) Temperature difference [K] between WRF-MARGO and LGM run (note different color scaling. Grey shades: LGM glacier extend, red line: LGM coastline.

b) The Last Glacial Maximum and Heinrich Event I on the Iberian Peninsula

The Last Glacial Maximum (LGM) and the following Heinrich Event 1 (H1) were characterized by very cold and dry conditions over Europe. Thus, this time period (approx. 23ky – 16ky ago) played an important role for population dynamics at the end of the Pleistocene. In this study we focus on the population dynamics and distribution of settlement areas during LGM and H1 in the Iberian Peninsula (IP). Global paleoclimate model data form the MPI-ESM-P LGM experiment is used as boundary

conditions for a dynamical downscaling approach to obtain climate data (30 years of RCM simulations) with a horizontal resolution of 12.5km over the IP. The regional climate modeling approach reveals that changed climate conditions between LGM and H1 might have played a crucial role on the population dynamics in the IP. Modelling results for H1 suggest colder and much drier conditions compared to LGM particularly over southeastern parts of the IP. This leads to an increase of aridity in this region, which corresponds to a decrease of archaeological sites (and thus population density) for the H1 period.

Ludwig, P., Kehl, M., Weniger, G.-C., and Shao, Y.: The Last Glacial Maximum and Heinrich Event I on the Iberian Peninsula: A regional climate modelling study to understand different settlement patterns (in preparation).

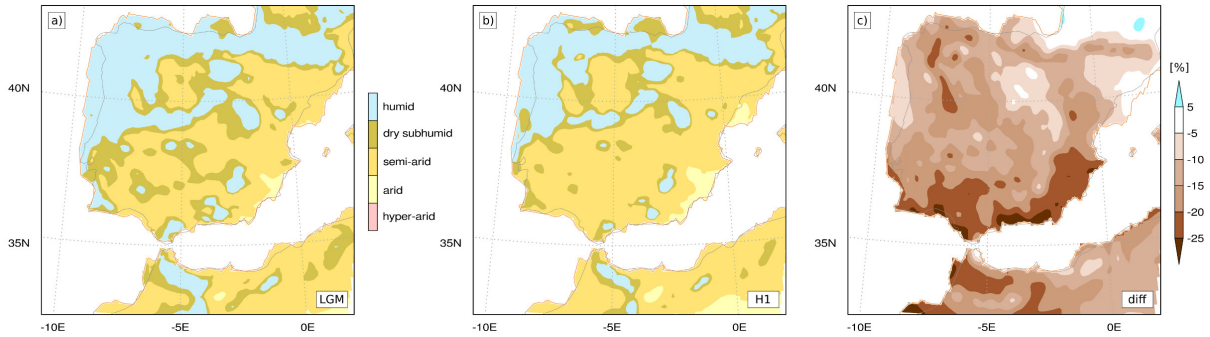

Figure 2. UNEP aridity index for (a)regional climate simulation for LGM and (b)for Heinrich I event. (c)shows the relative change of aridity index, revealing much drier conditions especially over southern parts of the IP.