Geophysical Research Abstracts
Vol. 20, EGU2018-4637, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Constructing a Bayesian model for spatio-temporal climate reconstructions of the last deglaciation

Nils Weitzel, Andreas Hense, and Christian Ohlwein
Meteorologisches Institut, Universität Bonn, Bonn, Germany (nils.weitzel@uni-bonn.de)

Spatio-temporally resolved reconstructions of past climate are important to understand the large scale behavior of the climate system and the response to changes in forcings. Unfortunately, they are subject to large uncertainties, have to deal with a complex proxy-climate structure, and a physically reasonable interpolation between the sparse proxy observations is difficult. In theory, Bayesian hierarchical models (BHMs) are well-suited to deal with these problems.
We present a BHM to reconstruct the spatio-temporal temperature evolution during the last deglaciation on continental to hemispheric domains. The approach is inspired by the model of Tingley and Huybers (2010) for reconstructions of the common era, but we make several adjustments to deal with the different behavior during the last deglaciation compared to the common era. The focus is on centennial to millenial scale variations due to the low sampling resolution of available proxy data.

Our BHM is non-stationary in space and time and it can reconstruct gradual as well as abrupt climate changes. Gaussian Markov random field techniques are used for computational efficiency. Inference is performed using a Metropolis-within-Gibbs MCMC approach.
Pseudo-proxy experiments for Eurasia with the CCSM3 TraCE-21ka simulation of the last deglaciation (Liu et al. 2009) examine the reconstruction skill of the BHM.
Finally, we look at the physical interpretation of model parameters and deduce possible extensions to increase the physical consistency of the reconstructions and to include additional sources of information.