Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10740, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10740
EGU General Assembly 2008

Probabilistic climate reconstructions using Holocene pollen records from lake Holzmaar and Meerfelder Maar

C. Schölzel (1), T. Litt (2), N. Kühl (2), A. Hense (1)

(1) Meteorological Institute at the University of Bonn, Bonn, Germany, (2) Institute of Paleontology at the University of Bonn, Bonn, Germany

Climate reconstructions based on proxy data help to understand natural climate variability. It is essential that palaeoenvironmental transfer functions between climate and proxy variables take in to account the stochastical nature of the climate system. Transfer functions can be seen as conditional probability density functions (pdf). By using a Bayesian framework classical approaches to palaeoenvironmental reconstructions can be reformulated to probabilistic approaches. Especially, this allows to estimate the the uncertainty of the reconstruction.

Here we apply a Bayesian reformulation of the classical indicator taxa and mutual climatic range method to Holocene pollen records from the Eifel region in order to reconstruct Holocene January and July temperatures as well as annual precipitation. This involves trivariate random vectors with non-normally distributed marginals. Therefore the so called copula framework is used to estimate the conditional probability density functions. Concerning the proxy data, the method uses presence/absence information, hence the method can use climate sensitive taxa that have a low pollen representatity and can incorporate pollen as well as macrofossil data. It is robust to the lack of modern analogues, which is an advantage in highly anthropogenically influenced areas such as Europe.

The sites lake Holzmaar and Meerfelder Maar have a high sample resolution and an absolute chronology based on warve counts. Some major events are visible in the reconstructions of all sites, differences occur in detail. The early Holocene optimum

is reconstructed for July temperature, which is consistent with reconstructions using other methods. A Mid-Holocene decrease in January temperature is reconstructed between approx. 4.000 and 6.000 yr BP, which is in accordance with reconstructions using also a Bayesian reconstruction approach, but chironomids as proxy data. Finally, the application of a probabilistic approach shows the importance of uncertainty estimation in paleoclimate reconstruction.