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Spatial Aggregation of Paleoclimate Temperature Reconstructions using Variational Analysis

Benno Thoma (1), Vera Klinger (2), and Andreas Hense (1)

(1) Meteorological Institute, University of Bonn, Germany (bthoma@uni-bonn.de, 0228 / 73-5101), (2) Steinmann Institute, University of Bonn, Germany

The reconstruction of the past climate is fundamental for an understanding of the variability of the climate system. Continuous measurements are only available in the last 100 years. This time period is too short to understand the variability and sensitivity of the climate, though the knowledge of both is essential to build good climate models. With climate reconstructions it is possible to get information about the past climate and the climate changes in the period of interest, in this case the time between 15.000 BP and 8.000 BP in the Levant region. The Levant region is situated around the Jordan valley in Israel. In this work the presence of pollen and macrofossils is used as a proxy. In detail the method bases on the assumption that the presence of a plant in a certain area is addicted to the climate. This connection between the occurrence of the plants and the climate is described by transfer functions. The nature of these transfer functions has to be probabilistic because the climate-biosphere system is a stochastical system. In more detail the method is an extension of the Method of Mutual Climatic Range (MCR), developed by Grichuk (1969). and described with statistical methods by Kühl (2002), Gebhardt (2003), Schölzel (2005), and Simonis (2009). With this statistical transfer functions it is possible to create local reconstructions but it is also possible to do area or line reconstructions of temperatures. This aggregation of local reconstructions is based on a variational method, developed by Gebhardt (2003) The advantage of this field reconstructions are that it is possible to make a comparison with the simulation results of climate models.

In the SFB 806 project B3 "Our way to Europe" it is planned to apply local reconstruction as well as a meridional profile reconstruction of near surface temperature and annual precipitation amount. The archives which will be used are high-resolution lacustrine sediments. We extended the method to a reconstruction of $850\,\mathrm{hPa}$ temperatures. The goal behind this is to reduce local effects and to provide a more dynamical relevant temperature on the variational analysis.

In this talk, the topic of climate reconstruction with statistical methods is introduced. The results for the transfer functions of the $850\,\mathrm{hPa}$ temperatures, for the local reconstructions and the meridional profile are presented.

References

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