



Validation of the paleoclimate modelling using statistical methods in the spatio-temporal domain

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We propose a statistical approach for comparing paleoclimates simulated by coupled climate models with climate reconstructions obtained from pollen data, tree-ring series or foraminifera. A cluster analysis is used to extract patterns of multivariate climate response from the reconstructions; these are then compared to the patterns simulated by models, using fuzzy logic distance measurement. It has the advantage to take into account the error bars of reconstructions and the internal variability of model simulations. Our approach therefore solves one of the recurring problems in model-data comparisons that arises when a model simulates the correct response but in the wrong location (as a consequence, for instance, of model resolution and topography). It has also the advantage to facilitate the interpretation of the intercomparison by focusing on the main climate patterns. Last but not least advantage is that it works easily on site data and does not necessarily need gridded reconstructions.

The method is applied to climate simulations done for the 6ka period in Europe in the frame of PMIP II project compared to the climate reconstructions from pollen data done by Davis et al (2003). It is also applied to PMIP II climate simulations for the Last Glacial Maximum (LGM: 21 ka BP) compared to the climate reconstructions from pollen done by Wu et al. (in prep) for Africa, Europe and former Soviet Union countries. The latter data are much sparser, which is an additional difficulty in such quantitative approach. The same method is also applied to sea-surface temperature reconstructed from planktonic foraminifera in the frame of the MARGO initiative for the LGM in the Atlantic Ocean. This shows the ability of our approach to work with different type of data, as well on the marine domain than the continent. Finally, we have adapted the method to work as well with time series than time slices. So it is applied to annual climate reconstruction of the summer drought in the Mediterranean

area from 1500 AD to 2000 AD which are compared with climate simulations of the last millennium done with two European models. This presentation is a contribution to EU projects MOTIF (EVK2-CT-2002-00153) and SOAP (EVK2-CT2002-00160).