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A pseudoproxy evaluation of a BHM based method for European temperature field reconstructions

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Reliable climate predictions require an in-depth understanding of the physical and geochemical processes in the earth system that need to be validated against observations and paleoclimate evidence.

Sophisticated statistical methods are currently used to to reconstruct past climate at different space and time scales including associated uncertainties. One of those promising methods is based on Bayesian hierarchical modeling (BHM) and is applied to estimate temperature variations at hemispheric scale and for North America (e.g. Tingley and Huybers '10, Li et al. '10).

In this contribution we investigate the performance of BHM for annual gridded temperature field reconstructions over Europe through pseudo proxy experiments using the data of Smerdon et al. (2010). The climate fields were simulated with a millennium length run of the NCAR CCSM (Ammann et al. 2007) paleo GCM. The instrumental data corresponds to locations where less than 30% of the data points are missing in the Jones et al. (1999) dataset. The proxy locations correspond to the locations of the multiproxy network of Mann et al. (1998) as described by Smerdon (2010). Such an approach has been used in earlier articles e.g. Mann et al. (2005), Smerdon et al. (2010) (and references therein) to compare the performance of different statistical methods for reconstruction at hemispheric scale.

We present a preliminary comparison of our BHM based stochastic climate field reconstruction with the European section of the canonical correlation analysis based one presented by Smerdon et al. (2010). Our preliminary results show that our method yields reliable results. We plan to apply this method to real multiproxy networks for seasonal temperature and precipitation over the past millennium for Europe and conduct data model comparison. To this end we will extend the underlying stochastic models to better reflect the dynamics of the climate fields and the proxy response functions.

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