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Stochastic models for climate field reconstruction over the Euro-Mediterranean region

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Over the last decades, several different methods have been used to reconstruct past climatic change. These methods consist of an - often statistical - model and a related inference step. While recently a lot of the discussion has been focused on the latter (Smerdon et al. 2011, Christiansen et al. 2011), the focus on more appropriate models seems promising. In a series of recent pseudoproxy experiments (PPE) for climate field reconstructions (Tingley+Huybers 2010a,b; Werner et al. 2013), Bayesian inference was used toghether with a localised stochastic description of the spatio-temporal evolution of annual temperature fields. In contrast to other methods that are based on large scale patterns over the full reconstruction domain, the local temporal evolution and spatial dependencies are modelled. The models are based on simple assumptions about the spatio-temporal evolution and have been shown to perform well for temperature reconstructions, at least in pseudo proxy experiments.

We show in this contribution how localised climate models can be checked using the Kramers Moyal expansion. We apply this method to estimate models for temperature and precipitation over Europe and the Mediterranean. While such simple models fare well enough for temperatures, precipitation poses new problems. We show that while the model mismatch does indeed introduce errors, it can be neglected when compared to the influence of the proxy data. The effect of noisy proxy time series and spatial sparseness still remains the most prominent source of errors.

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