



Bayesian hierarchical model applied to climatic reconstruction

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In environmental sciences, Bayesian Hierarchical Models (BHM) have become more and more popular during the last two decades. For example Cooley et al. (2005) implemented a Bayesian Hierarchical Model to infer glacial retreats in Bolivia using lichen growths as a proxy, Hooten and Wikle (2007) recently investigated with a Bayesian Hierarchical Model shifts in the spatio-temporal growth dynamics of shortleaf pine and Boreux et al. (2009) use this type of model to extract an inter-annual high frequency signal from tree-ring series. The main idea of Bayesian Hierarchical Models is to statistically model a complex process and its relationships to observations in several simple components throughout a hierarchy of layers. There are several advantages to use Bayesian Hierarchical Models in climatic reconstruction. First, the Bayesian paradigm allows the use of unobserved variables in the hierarchical structure. Then modeling uncertainties is natural for each different level of this structure. Furthermore, expert information can be integrated via probability densities. In this presentation, we use a Bayesian Hierarchical Model to a European dendrochronological database. We assess the different factors that affect the tree growth as well as their uncertainties. We compare the inferred reconstruction with contemporary meteorological data.