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Bayesian herarchical modelling ofdendrochronological data

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Dendrochronology is the scientific dating method based on the analysis of tree-ring growth patterns. It has been frequently applied in climatology. The basic premise is that tree rings can be viewed as climate proxies, i.e. rings are assumed to contain some hidden information about past climate. From a statistical perspective, this extraction problem can be understood as the research of an hidden variable which represents the common signal within a collection of tree-ring width series. Classical average-based techniques used in dendrochronology has been, with different degrees of success (depending on the tree specie, the region and the statistical method), applied to estimate the average behavior of this latent "climatic" variable. Still, a precise quantification of uncertainties associated to the hidden variable distribution has been lacking. In this presentation, we represent such a hidden variable with a site-effect using a Baesian hierachical model.We apply this method on simulated data from the ORCHIDEE model and observations from a European tree-ring database. We also use this model to examine the impact of some extreme climate events on tree growth.