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Bayesian hierarchical modelling of dendrochronological data

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Dendrochronology is the scientific dating method based on analysis of tree-ring growth patterns. It has been frequently applied in climatology. The basic premise is that tree-rings can be viewed as a climate proxy, i.e. rings are assumed to contain some hidden information about past climate. From a statistical persperctive, 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 have 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 poster, we represent such a hidden variable using a Bayesian hierarchical model. We apply this method on observations from a European tree-ring database.