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# Climate and vegetation dynamics reconstructed by inverse vegetation modeling

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We present a new statistical framework (model and inference algorithm) to temporally link climate, vegetation and pollen data using Bayesian statistics and dynamic vegetation model LPJ-GUESS. This new method optimally inverts the vegetation model to reconstruct explicitly climate and vegetation from pollen data. It takes advantage of the dynamic aspect of vegetation model to link climate and vegetation in time to perform a time-coherent reconstruction of climate. Vegetation model inversion to infer climate is based on a sequential Monte Carlo algorithm, called particle filter. Another key point of the approach is to define an inference of the pollen data from the species simulated by the model. It is done by a response surface.

The model is validated using several modern pollen spectra extracted from the European Pollen Data base (EPD). We show that the posterior distribution of the climatic variables estimated by inversion is narrower than the prior distribution and that it encompasses the observed modern climate. Afterwards, the method is applied to the high resolution Meerfeld Maar sediment core (data to appear) for the Holocene. The results are compared with those obtained with a statistical method by the authors.