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Quantifying conjoint patterns of multiple paleo signals based on Bayesian inversion

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In comparative studies of multiple paleo-climate time series, the statistical quality of conjoint patterns or synchronized events are rarely discussed. Even the synchronization of data sets for a single proxy over the same time period is often inconclusive and a statistical quantification of the comparison is difficult to achieve. Therefore we develop a mathematical framework that rather than referring time series to each other, relates a conjoint time scale and signal as a reference for all time series under consideration.

We introduce an Bayesian algorithm which enables us to infer on a mapping function, such that a set of time series may be synchronized to each other. Instead of assuming any of the signals as a reference signal, we map the signals relatively to a common imaginary signal by means of diffeomorphisms between the time profiles. This artificial reference time profile can be used to unify sparse dating points of multiple time series into one joint age model applicable on all data sets.

We will present the performance of our Bayesian algorithm on artificial time series sets by estimating the underlying common time profile. Moreover, we will provide an outlook for the combination of this technique with advanced dating procedures to employ the full information available for every dating point.