



Expert selection vs. statistical screening – How to best choose input data for paleo-climatic reconstructions?

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Researchers who reconstruct local climate based on indirect observation such as tree rings often argue that very specific knowledge about each single record is required to achieve a reliable climate reconstruction. For instance, tree-ring width from a moisture sensitive tree may correlate with temperature just because growing season temperature and precipitation are correlated. However, this tree would not show a warming trend in the 20th century and hence should not be used to reconstruct temperature. In contrast, researchers developing statistical reconstruction methods often argue no information should be wasted. Statistical methods could still extract temperature information from the moisture sensitive tree-ring data due to co-variances in the climate system. Thus, it would be better to have some information with larger uncertainties than less or no information at all.

To study the impact of the input data selection on spatial climate reconstructions, we perform experiments with classical Principal Component Regression and our state-of-the-art Ensemble Kalman Fitting (EKF) data assimilation technique to generate paleo-reanalyses. In EKF, a multiple regression based proxy system model translates between monthly temperatures during the growing season and proxy units. The regression residuals are used as error estimates. Thus, records with a weaker climate signal get less weight in the assimilation. We compare reconstructions based on two recently published paleodata collections: first the N-TREND tree-ring data set, which was selected by experts and contains a small number of temperature sensitive tree-ring proxies with highest signal-to-noise ratio. Second, we use the tree-ring proxies from the PAGES data base, which were screened mainly statistically and include a significantly larger amount of time series. We will present which input data set leads to more realistic climate states during the past century.