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Climate change detection and attribution using high resolution paleoclimate observations

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Paleoclimate change detection and attribution (D&A) studies have the advantage of looking past the overwhelming GHG forcing of the 20th century, and are generally based on linear regression of hemispherically averaged temperature reconstructions on forced response patterns estimated from climate change simulations driven by single and cumulative combinations of external radiative forcings: well-mixed greenhouse gases, solar variations, orbital mechanics, volcanic aerosols, and land use change. However, these studies have ignored spatial information and incorporated uncertainties arising from the inversion of sparse observational networks of paleoclimate observations that may not be univariate and linearly ascribed to temperature variation. To improve upon these efforts, we use the VS-Lite tree-ring width model to map realistically forced climate change simulations to the observed variable. We use CRU TS3.23 gridded temperature and precipitation data, a recent global compilation of 2761 uniformly processed tree ring width chronologies, and a Bayesian estimation scheme to estimate and validate parameters for the VS-Lite model for each chronology. Then, bias corrected temperature and precipitation data from HadCM3 simulations with single and cumulative external radiative forcings serve as inputs for VS-Lite. First results suggest that valid parameter estimates may be uniformly, normally or bimodally distributed over realistic a priori ranges of plausible VS-Lite parameter values. However, the resulting TRW chronologies are not particularly sensitive to parameter estimates. At the meeting, we will report progress using distinctly temperature and moisture-sensitive subsets of observations and simulations to perform the fingerprinting exercise.