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Combining heterogeneous proxy data and model simulations to reconstruct European climate

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In the pre-instrumental period, climate variability can be assessed using proxy records, documentary data, and climate models. All of these have advantages and limitations. Proxy data and documentary records exist only at selected locations which are non-uniformly distributed in space. In addition, reconstructions are generally limited to temperature or precipitation, and rarely provide direct insights of important climate parameters such as pressure. Climate models simulate comprehensive and physically consistent climate states, though the simulations produced with them cannot be regarded as a detailed representation of the real past climate trajectory, particularly at higher frequency ranges where natural internal variability dominates. Based on the PSR (Proxy Surrogate Reconstruction) method, we present new results that simultaneously capitalize on the individual strengths of proxy data and model simulations. This is achieved by selecting the model states (analogs) that are most similar with arrays of proxy data available for specific moments of time. We will discuss methodological tests and the development of a model based European climate reconstructions for the last millennium.