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# Last millenium temperature simulations and reconstructions: overview, comparison and uncertainties

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A review of the current state of knowledge of the temperature evolution over the last millennium is presented. The study is based on an exhaustive comparison of the two main tools for paleoclimatic studies, i.e. simulations and reconstructions. Thus, this work explores the available hemispherical and global last millennium temperature reconstructions, a suite of simulations coming from the various existing high complexity general circulation models (including PMIP3/CMIP5 and "non-PMIP3" ones) as well as the external forcing configurations applied. All these variables, i.e. simulations, external forcings and reconstructions, are subjected to uncertainties and to understand the factors that contribute to such uncertainties becomes relevant to improve model data comparison exercises. We present an assessment of the factors that contribute to model and reconstruction spread and how they change our perspective of model and reconstruction responses to external forcing in the last millennium.

Additionally, at multidecadal and longer timescales, simulations and reconstructions evidence a linear relationship with total external forcing at hemispheric and global scales. The latter implies the availability of a measure of the climate response of the simulations and reconstructions to the forcing configuration for the last millennium. These values allow to analyze the consistency of the simulated and reconstructed response to the variety of external forcing configurations considered in the model ensemble. We provide then, not only a qualitative, but also a quantitative assessment of the model-data comparison exercises for the whole available suite of reconstructed and simulated evidences.