



Multispectral analysis of Northern Hemisphere temperature records over the last millennia

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We perform a multispectral analysis of the spatio-temporal temperature variability on decadal-to-centennial time scales in a data set of 26 temperature-calibrated proxy records extending back 1000 to 5000 years. The series have been obtained from different proxy archives from the extratropical Northern Hemisphere (NH), including ice cores, marine and terrestrial sediment cores, tree rings and speleothems.

Two advanced spectral methods, namely singular-spectrum analysis (SSA) and the continuous wavelet transform, were applied to the individual temperature records to separate significant oscillations from the high noise background.

The results of this analysis show common, hemispheric and regional modes of variability over time scales of decades to millennia. To study common NH oscillations, we then applied Multichannel SSA. Evidence for persistent temperature variations with near-periodicities in the multi-decadal (45, 60 and 80 yr) and centennial (100 and 200 yr) range is found in the proxy records, with distinct spatial features being associated with the areas of enhanced variability. Temperature variations on longer time scales appear in our analysis as a dominant trend component, which shows climate features consistent with the Medieval Warm Period and the Little Ice Age.