

Publication

Holocene global mean surface temperature, a multi-method reconstruction approach

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An extensive new multi-proxy database of paleo-temperature time series (Temperature 12k) enables a more robust analysis of global mean surface temperature (GMST) and associated uncertainties than was previously available. We applied five different statistical methods to reconstruct the GMST of the past 12,000 years (Holocene). Each method used different approaches to averaging the globally distributed time series and to characterizing various sources of uncertainty, including proxy temperature, chronology and methodological choices. The results were aggregated to generate a multi-method ensemble of plausible GMST and latitudinal-zone temperature reconstructions with a realistic range of uncertainties. The warmest 200-year-long interval took place around 6500 years ago when GMST was 0.7 °C (0.3, 1.8) warmer than the 19th Century (median, 5th, 95th percentiles). Following the Holocene global thermal maximum, GMST cooled at an average rate −0.08 °C per 1000 years (−0.24, −0.05). The multi-method ensembles and the code used to generate them highlight the utility of the Temperature 12k database, and they are now available for future use by studies aimed at understanding Holocene evolution of the Earth system.

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