

## **Applications of quantitative reconstructions of terrestrial climate for the Last Glacial Maximum and Mid Holocene to the evaluation of paleoclimatic simulations**

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As a contribution to the analyses of simulated and observed paleoclimates by the Palaeoclimate Modelling Intercomparison Project (PMIP), we synthesized the available quantitative reconstructions of six "bioclimatic" variables based on fossil pollen for 6 ka (n=4706) and 21 ka (n=349). The density of points is highest for North America and Europe, less high for Africa and Asia, and extremely low for South America and Australasia. Despite being developed from a heterogeneous mix of data sets and approaches that were applied over a 25-yr period, the reconstructions provide remarkably coherent (and robust with respect to individual data sets) spatial patterns of climate anomalies relative to the present. The syntheses, expressed as gridded climate anomalies and associated uncertainties, show in particular large positive anomalies of growing degree-days in eastern North America and Europe, coupled with contrasting anomalies of moisture in those regions at 6ka, and generally cold and dry (with the exception of the southwestern United States) conditions at 21 ka. The utility of such reconstructions in diagnosing and benchmarking paleoclimatic simulations arises from the potential for directly comparing paleo "observations" with climate-model output. There are, however, a number of issues that arise making such comparisons, including data treatment (i.e., downscaling and aggregation), and the choice of the appropriate spatial scale for comparison as well as the comparison metrics. These issues are illustrated using the reconstructions and individual and ensemble-average simulations from the PMIP database.