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Gridded land surface conditions at the Last Glacial Maximum in Eurasia and Africa reconstructed from pollen data

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In order to test the output of global climate models (GCMs) under climate forcings that are significant different to the present day, it is necessary to model palaeoclimates during periods in the past where these conditions varied from the present day (Joussaume and Taylor, 1995). These palaeoclimate model requires terrestrial vegetation data as an input, which help represent land surface conditions, including albedo and surface roughness. At present, palaeoclimate models have used modern vegetation or a modelled past vegetation as input. The construction of a global data set of vegetation types based on fossil pollen data (BIOME6K, Prentice et al, 2000) offers the opportunity to recreate continuous maps of land surface conditions based on observed data for two periods in the past, the mid-Holocene and the Last Glacial Maximum. We have used this dataset to produce biome maps for Africa and Eurasia for these two periods, using two approaches. The first of these uses an artificial neural network to interpolate biome score anomalies in geographical space. The second is an inverse modelling approach which estimates the biome by iterating the Biome4 model (Kaplan, 2001) using a set of possible climate data. Verification against observed biomes at modern sites shows agreement ranging from 42% to over 95%. The agreement appears largely dependent on biome type, with open vegetation types showing a worse agreement. When closely related biomes are taken into account, the overall agreement rises to between 73 and 95%. Although gridded biome maps produced by the two methods show local differences, the overall trends and patterns of vegetation change are consistent, and match the amplitude and direction of change observed in fossil data.

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