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Reconstructing North American paleoclimate from pollen data for the past 21,000 years

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It is important to place the current climate change in context of past climate changes and to understand millennial scale variability and possible abrupt climate changes in the future. Additional large scale reconstructions are needed for comparison with model simulations of past climate. These data-model comparisons are part of the ongoing paleoclimate model inter-comparison project (PMIP2). North America is an excellent validation region since it is representative of large-scale climate changes in the Northern Hemisphere. Pollen data is a reliable indicator of past climate, due to the relationship between climate and vegetation. Hence we develop a new continental-scale North American paleoclimate reconstruction of climate and bioclimate variables (mean annual temperature, mean annual precipitation, mean temperature of the coldest month, mean temperature of the warmest month, growing degree days, precipitation minus evaporation) using pollen data as proxy, covering the last 21,000 years. The key intervals are the last glacial maximum, 21,000 years before present (BP) when ice sheets were at their maximum extent in the Northern Hemisphere and 6,000 years BP, when ice sheets were at their current extent and summer insolation in the Northern Hemisphere was higher than today, due to orbital changes. This time period is known as the Holocene thermal maximum. A new and improved paleo-environmental database is created from pollen data available from both the North American Pollen database (NAPD) and Neotoma. The reconstruction method used is the Modern Analog Technique (MAT), which compares a fossil pollen spectrum to all modern pollen samples, where the best analogue is the modern site that possesses the least dissimilar modern pollen spectrum. This reconstruction is improved over previous reconstructions since there is more pollen data available. This reconstruction will help us better understand past climate variability and narrow the uncertainties in projections of future climate change.