



## **Assessing Uncertainty in Paleoclimatic Estimates from Paleobotanical Data in North America**

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Paleoclimatic conditions can be estimated from paleobotanical assemblages through examination of the present-day environmental requirements of the plants in the assemblages. Modern climatic and plant distributional data on a grid with more than 25,000 points for North America were used to assess how well climatic variables can be estimated from botanical assemblages. Two approaches were considered: 1) "analog methods" that estimate climate for a "target point" by comparing the overall species composition of a target assemblage with the composition of the vegetation assemblages at all other grid points. The climatic data associated with the closest analogs are then used to estimate the climate at the target point., and 2) a "mutual overlap method" that examines the overlap in the present-day climatic preferences of the species in an assemblage to determine the range of permissible climates for the assemblage. The analog methods capture continental-scale climatic patterns and provide very precise and accurate estimates of the present-day climate at a large majority of grid points. However, the accuracy of the estimate is highly dependent upon the number of species in the target assemblage. The mutual overlap method provides less-precise estimates but does provide a range of "permissible climates" for the target assemblage. This range actually may be more useful in data-model comparisons than the precise analog-based estimates. Neither approach can correctly estimate the climate of an assemblage that is living at the edge of the climates represented in the calibration data set, and neither approach can factor in the potential past changes in water-use efficiency that would be associated with changing levels of atmospheric carbon dioxide.