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A space-time modeling approach to North American regional pollen-based hydroclimate paleoclimate reconstructions during the past 2,000 years

Matthew Ladd, Andre Viau, Mike Sawada, and Konrad Gajewski
University of Ottawa, Geography, Ottawa, Canada (mladd036@uottawa.ca, 613-562-5145)

In order to identify spatial patterns in paleoclimatic reconstructions from proxy data, it is essential to understand not only the temporal scale of the archive but also its spatial scale in recording regional climate variability. However, it is often the case that regional paleoclimate reconstructions reveal spatial heterogeneity due to factors such as chronological control, resolution and sensitivity to climate variables under reconstruction in both time and space. In order to reduce these uncertainties without the need for spatial interpolation/modeling, grid-point averaging or other statistical methods (e.g. PCA, EOFs), we explore the use of local indicators of spatial association (LISA) using Moran's I statistics to identify sites that violate the spatial continuity assumption at specific distance radius before spatial smoothing of the raw data; sites that are closer to each other should record similar regional climate variability through time. This approach should reveal which sites to include in a regional climate reconstruction at specific distance radius. We discuss how heterogeneity can impact in the identification of regional spatial patterns using pollen data in North America during the MWP.