

Representational bias in phytoliths from modern soils

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Due to a dearth of suitable sites for the deposition and preservation of pollen in much of the USA, palynological studies have remained fragmentary, resulting in poor and scattered descriptions of vegetational history. Studies of modern phytoliths (siliceous plant microfossils) have shown that they can provide an accurate in-situ record of vegetation even for small scale variation across a catena, and due to their nearly ubiquitous presence in vascular terrestrial plants, provide a robust record of past and present vegetation. Despite this, little research has been done into whether the phytolith record derived from soils provides a representative sample of the associated vegetational assemblage.

In this study we sampled roughly 20 different ecosystems, including various types of native prairies, agricultural fields, temperate deciduous and coniferous forests, and arid scrublands. Samples consisted of both quantitative plot-based vegetation surveys and phytolith assemblages extracted from A-horizon soil samples, and were analyzed statistically for representational comparisons. A comparison of aboveground vegetation (% biomass per hectare) and soil phytoliths (% of total assemblage) for each site demonstrated that for most of the studied ecosystems, soil phytolith assemblages are roughly representative ($\pm 5\%$) of aboveground vegetation biomass and can be used effectively to distinguish between ecosystem types. However, in ecosystems with moderate graminoid populations (savannah-type grasslands, etc.), the presence of these species is typically overrepresented by 20-30% versus dicotyledonous species.

This indicates that phytolith assemblages from most modern soils and, due to their excellent preservation potential, from many paleosols, are robust indicators of environmental and ecological conditions.