Dating Fossil Opal Phytoliths

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Opal phytoliths are microscopic silica bodies formed by the precipitation of hydrated silica dioxide (SiO_2nH_20) in, around and between cell walls. They are relatively resistant to degradation in most environments and thus, can occur in large quantities in palaeosediments. Consequently, they are valuable tools for environmental reconstruction. Furthermore, phytoliths are often the only recoverable organic material in well oxidised sediments, the occluded carbon provides the opportunity for dating sediment whose ages have previously been difficult to determine, and thus, increase the potential for fine resolution determination of environmental change.

This poster describes the results of an investigation assessing the viability of AMS radiocarbon dating of fossil phytolith inclusions using samples from Garua Island, West New Britain, PNG. Thirteen phytolith samples, isolated from sediments previously dated using tephrastratigraphy and C14 dating of macroremains of nutshells and wood charcoal, were used in the analysis. As a control measure, thirteen parallel samples of microscopic charcoal were also dated using AMS. The results show that the AMS dates for the microscopic charcoal samples are consistent with ages anticipated from the other dating methods, for all but one sample. However, the dates for eight of the thirteen phytolith samples are considerably younger than expected. This bias could be explained by several factors, including downwashing of phytolith through soils, bioturbation, carbon exchange through the siliceous matrix of the phytolith bodies, and contamination from extraneous sources of modern carbon retained in the samples. Research is currently focusing on the investigation of these issues and selected samples are in the process of being retreated with strong oxidising agents to clear contaminants prior to re-dating. Further to this, a full investigation of one profile with a long sequence is underway. High concentrations of phytoliths in the palaeosols within this profile, contrasting with low concentrations in associated tephras, suggest phytolith stability. Microscopic examination of samples have yet to be undertaken to determine size distributions and weathering patters, but at this stage, contamination from carbon, possibly derived from modern root material, is thought to be the major factor contributing to the young dates.