

Silicon isotope composition of single phytoliths

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Silicon, one of the most abundant elements, is not only abiotically cycled through the Critical Zone, but also incorporated into plants. This cycling is accompanied by a mass-dependent isotope fractionation.[1] Previous studies investigated the Si fractionation between soil and plants on a bulk scale. Although the uptake of Si into plants is significant in terms of mass, the plant specific Si isotope fractionation is not well constrained[2], and a large range of isotope composition has been reported ($\delta^{30}\text{Si} \approx -2 - 6 \text{ ‰}$).[1,3]

Silicon is deposited as microscopic silica in different plant compartments. These deposits, called phytoliths, differ greatly in shape and size, and are characteristics for various plant species. Biogenic opal is very stable, and persists during the decay of plants. Under ideal conditions phytoliths are preserved through time and can be used in paleo-climate research and archaeology.[4] However, an *in situ* analytical routine is needed for sparsely available phytoliths.

We developed an *in situ* routine based on femtosecond laser ablation split stream analysis (fs-LASS) to make the information stored in a single phytoliths available. Phytoliths from two locations within Germany (Beerenbusch and Chicken Creek) were simultaneously analysed for their silicon isotope and chemical composition. Single phytoliths were either embedded in epoxy, and polished or simply fixed with lacquer and subsequent analysed by standard sample bracketing techniques. These results were compared to results from bulk solution analysis. The bulk solution method is favoured in terms of precision achievable (typically $< 0.1 \text{ ‰}$ 2 s.e.). This method however, cannot unravel inhomogeneity within a bulk population. Our developed routine, using fs-LASS, offers a clear advantage for this type of analysis.

[1] Opfergelt & Delmelle (2012) *C. R. Geoscience* 344 723–738. [2] Ma & Yamaji (2006) *Trends Plant Sci.* 11, 392–397. [3] Ding *et al.* (2005) *Chem. Geol.* 218, 41–50. [4] Piperno, (2006) *Phytoliths: a comprehensive guide for archaeologists and paleoecologists*, *AltaMira Press*.