



Non-traditional isotopes in analytical ecogeochemistry assessed by MC-ICP-MS

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Analytical ecogeochemistry deals with the development and application of tools of analytical chemistry to study dynamic biological and ecological processes within ecosystems and across ecosystem boundaries in time. It can be best described as a linkage between modern analytical chemistry and a holistic understanding of ecosystems ('The total human ecosystem') within the frame of transdisciplinary research. One focus of analytical ecogeochemistry is the advanced analysis of elements and isotopes in abiotic and biotic matrices and the application of the results to basic questions in different research fields like ecology, environmental science, climatology, anthropology, forensics, archaeometry and provenancing.

With continuous instrumental developments, new isotopic systems have been recognized for their potential to study natural processes and well established systems could be analyzed with improved techniques, especially using multi collector inductively coupled plasma mass spectrometry (MC-ICP-MS). For example, in case of S, isotope ratio measurements at high mass resolution could be achieved at much lower S concentrations with ICP-MS as compared to IRMS, still keeping suitable uncertainty. Almost 50 different isotope systems have been investigated by ICP-MS, so far, with – besides Sr, Pb and U – Ca, Mg, Cd, Li, Hg, Si, Ge and B being the most prominent and considerably pushing the limits of plasma based mass spectrometry also by applying high mass resolution. The use of laser ablation in combination with MC-ICP-MS offers the possibility to achieve isotopic information on high spatial (μm -range) and temporal scale (in case of incrementally growing structures). The information gained with these analytical techniques can be linked between different hierarchical scales in ecosystems, offering means to better understand ecosystem processes.

The presentation will highlight the use of different isotopic systems in ecosystem studies accomplished by ICP-MS. Selected examples on combining isotopic systems for the study of ecosystem processes on different spatial scales will underpin the great opportunities substantiated by the field of analytical ecogeochemistry. Moreover, recent developments in plasma mass spectrometry and the application of new isotopic systems require sound metrological approaches in order to prevent scientific conclusions drawn from analytical artifacts.