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The potential of isoscapes and isozones of non traditional isotopes in analytical ecogeochemistry

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Analytical Ecogeochemistry deals with the development of analytical methods for the accurate and reliable measurement of elements and isotopes in abiotic and biological media and their application to fundamental questions of ecosystem ecology following a holistic approach, including the human sphere. Selected isotopic systems (e.g., H, C, N, O, S, and Sr) are in use to study these processes. Nonetheless, new isotopic systems are increasingly investigated (e.g., B, Mg, Ca, Zn, Cu, Cd, and Hg). The analytical process is still challenging due to small magnitudes of fractionation effects and potential interferences. In this context, the development and application of isoscapes (isotopic landscapes) represents a crucial pre-requisite for many applications, point-ing out the strong spatial relation of this ecosystem-based scientific approach.

This paper focuses on the development and use of isoscapes, which reflect spatially depicted distributions of isotopic compositions usually generated using Geographic Information Systems. Isozones are defined areas such as e.g. rivers, lakes, geological layers. Even though the term is mainly used for geographical areas, both concepts of isoscapes and isozones can be used for maps of isotopes in different dimensions (geographical areas, surface distributions in biological materials down to cellular distributions). An approach for the use of isoscapes in terrestrial and aquatic ecosystems as well as in biological materials will be discussed on the example of the Sr isotopic system together with the need for accurate and reliable data and limits arising from measurement uncertainties.