Vadose Zone Journal

Stable Isotope Approaches in Vadose Zone Research

Guest Editors:

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Stable isotopes are frequently used as environmental or artificial tracers to study water flow, transport, and biogeochemical processes in soils and the unsaturated zone. In recent years, new analytical and technical developments have transformed the field of isotope hydrology and isotope biogeochemistry and widened the scope of questions that can now be tackled. In particular, the challenges of measuring and parameterizing isotope dynamics within soils at increasingly finer temporal resolution or at increasingly larger scales are now possible. In addition, new automated systems of high-resolution in situ measurements and real-time data analysis have been developed. These breakthroughs are thus poised to improve our understanding and the modeling of water and matter fluxes in the atmosphere–plant–soil–groundwater continuum.

This special section will focus on a range of topics within vadose zone research such as: (i) water flow and transport using stable isotopes of water (e.g., evapotranspiration, groundwater recharge, water transit times, mathematical model calibration); (ii) processes in the nitrogen cycle using $\delta^{15}N$ and $\delta^{18}O$ (e.g., nitrification vs. denitrification rates, N turnover, source identification); (iii) the potential of stable isotopes to improve gaps in our understanding of processes involved in the exchange of other gases in soils such as carbon monoxide, molecular hydrogen, and carbonyl sulfide (among other sulfur gases); (iv) processes in the carbon cycle using carbon isotopes (e.g. C turnover, partitioning of autotrophic and heterotrophic respiration); (v) other isotope approaches for identifying geochemical processes and studying the fate of contaminants (e.g., degradation of contaminants, nutrient dynamics); (vi) experimental and theoretical links between key biogeochemical transformations in soils by the soil rhizosphere using stable isotope techniques; and (vii) the development of new analytical and technical tools for stable isotope analysis (e.g. clumped isotopes, rare isotopes such as $\delta^{17}O$, and novel in situ measurements of groundwater–soil–plant–atmosphere interactions).

Deadline for submission of papers: 1 Sept. 2017.