Influence of biogeochemical reactions on inert gas fluxes in soil

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Abstract

Gaseous exchanges at the geosphere-atmosphere interface must be accurately quantified in order to address many environmental and societal issues due to anthropogenic and/or geological activities. Water content, organic mater degradation as well as plant and microorganism respiration control gas fluxes in the subsurface because these parameters have a major influence on the partial pressures of important gas species, such as O_2 and CO_2 [1]. Many biogeochemical processes of this kind locally control the pressure and the concentration gradients, thus the advective and diffusive transport of all the gaseous species, including the inert ones which are not directly involved in such reactions. Because these processes vary in intensity with time and space, it is very challenging to predict gas emission at the surface and it becomes complex to extrapolate point measurements obtained in the field to get significant values necessary for establishing relevant mass budgets. The aim of this project is i) to carry out percolation tests with inert gaseous tracers through sand columns under various controlled conditions and increasing complexity regarding biogeochemical reactions in order to quantify their effects on the tracer breakthrough and ii) validate and calibrate numerical modeling with the research code HYTEC [2].

[1] Freundt et al. (2013) *Chem. Geol.* **339,** 283-290. [2] Steefel, C.I. et al. (2015) *Computat. Geosci.* **19**, 445-478.