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Plant root impacts on soil carbon reservoirs in a mountainous watershed in Colorado, United States

Motivation:

Soils are the largest and most dynamic terrestrial carbon reservoir—storing more than twice as much carbon as atmosphere and biosphere combined—and, thus, directly respond to and drive global climate. Up to 90% of soil carbon is stored in organic compounds intimately associated with reactive minerals. Such mineral-organic associations can protect carbon compounds against microbial or enzymatic attack for centuries to millennia. However, plant roots and associated microbes in the rhizosphere have a well-known ability to transform minerals through dissolution and exchange reactions. Yet, the impact of such root-mediated reactions on mineral-organic associations and carbon protected therein remain elusive. A better understanding the response of otherwise stable MOAs to rhizosphere processes is critical to improving predictions of the vulnerability of this vast soil carbon reservoir to environmental change.

Aim of the study:

The goal of this study is to examine the root-induced destabilization of mineral-organic associations along hydrological gradients in a mountainous watershed. To do so, the candidate will utilize and ongoing field experiment at the Watershed Function Observatory in Gothic, Colorado, United States. The candidate will be responsible for sampling across a catena and conduct a detailed chemical and biological characterization of the MOA and the C stored therein. The candidate will be trained in advanced chemical, biological, and microscopic tools. The results will inform our understanding of the magnitude of root-induced destabilization at the landscape-scale.

Requested skills:

Field work will include transatlantic travel as well as strenuous hikes and long field days in a subalpine watershed in the Rocky Mountains, Colorado. Basic knowledge of soil science, microbiology, and chemistry is recommended. Prior experience in the laboratory, including sample processing and analysis, is beneficial. Availability for Sept 2022 for field work would be ideal.

Collaboration:

Field work in collaboration with the Rocky Mountain Biological Laboratory (Gothic, CO) and Watershed Function Observatory (East River, CO). Chemical analyses in collaboration with Tobias Bolscher (INRAE, Versailles).

Keywords: climate change, soil organic matter, decomposition, microbial activity, nutrient cycling

Working place: field work at Harvard Forest long-term ecological research (LTER) site, Massachusetts, United States, and soil science and biogeochemistry laboratories in IDYST (UNIL)

References:

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