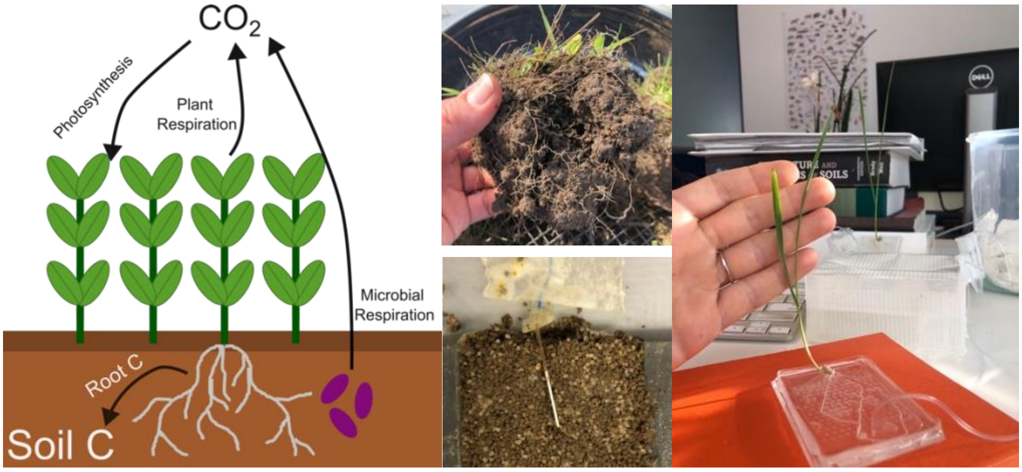
Rhizosphere dynamics: revealing the fate of root-derived carbon



Context

Increasing soil C content promises to increase soil fertility and mitigate climate change. In theory, increasing soil C content is simple: soil C inputs (e.g., plant-derived C) must be greater than soil C outputs (e.g., microbial respiration). Growing more plants is simple, but how do we ensure that freshly delivered C stays in the soil? Plant roots supply ~50% of soil C inputs. As a result, the region around plant roots (i.e., the rhizosphere) is a hotspot of microbial activity that fuels soil mineral transformations, redox dynamics, and other biogeochemical processes. Rhizosphere processes and their relationship to plant, soil, and climate properties are not yet fully characterized.

Goals

This project will investigate the fate of root-derived C across gradients in texture, moisture, and soil mineral reactivity. To achieve this goal, we will monitor known biogeochemical mechanisms that may stabilize root-derived C or render root-derived C susceptible to microbial respiration. We will use chemical and biological techniques as well as microscopic model systems to investigate how soil texture, moisture, and mineral reactivity alter root C i) extent, ii) mineral (de)stabilization of root-derived C, iii) redox dynamics, and iv) the overall fate of root and soil-derived C. The results of this work will inform sustainable agricultural practices and global Earth Systems models.

Knowledge and skill required:

- Enthusiasm for learning about soils and laboratory practices
- Attention to detail
- Willingness to learn
- Reasonable proficiency with spoken and written English

Collaboration

This project will be co-supervised by Emily Lacroix (Emily.lacroix@unil.ch) and Marco Keiluweit (marco.keiluweit@unil.ch) at the Institute of Earth Surface Dynamics.

Keywords: Soils, climate change, plants, roots, rhizosphere, redox

Working Place: Université de Lausanne