

Mapping Carbon Flow through Soils: Ecosystem and Global Impacts

Presented by Dr. Marco Keiluweit

Soils contain the largest dynamic stock (changing on decadal time scales) of carbon (C) on the planet, with soil organic matter (SOM) containing approximately twice the amount of C stored in the surface oceans and three-times that in the atmosphere. Yet it remains largely unknown why some SOM persists for millennia whereas other SOM decomposes readily—and this uncertainty limits our ability to predict how soils will respond to changes in climate and land use. Recent analytical and experimental advances have undermined the long-standing theory that molecular structure alone controls SOM turnover: in fact, environmental and biogeochemical controls predominate.

In this talk, I will highlight research on how (bio)geochemical factors, such as reactions of organic molecules with metals and minerals, control SOM turnover in soil microenvironments such as litter layers, the root-soil interface, and aggregates. I will further show that explicit consideration of such microsite-specific (bio)geochemical controls, together with climatic variables, is necessary for accurate predictions of SOM turnover and C storage in ecosystem-scale models.