Geophysical Research Abstracts
Vol. 18, EGU2016-13344-3, 2016
EGU General Assembly 2016

Correlative Imaging and Analyses of Soil Organic Matter Stabilization in the Rhizosphere

Alice Dohnalkova, Malak Tfaily, Rosalie Chu, Alex Crump, Colin Brislawn, Tamas Varga, and William Chrisler
Pacific Northwest National Laboratory, Richland, WA, United States (alice.dohnalkova@pnnl.gov)

Correlative Imaging and Analyses of Soil Organic Matter Stabilization in the Rhizosphere

Understanding the dynamics of carbon (C) pools in soil systems is a critical area for mitigating atmospheric carbon dioxide levels and maintaining healthy soils. Although microbial contributions to stable soil carbon pools have often been regarded as low to negligible, we present evidence that microbes may play a far greater role in the stabilization of soil organic matter (SOM), thus in contributing to soil organic matter pools with longer residence time. The rhizosphere, a zone immediately surrounding the plant roots, represents a geochemical hotspot with high microbial activity and profuse SOM production. Particularly, microbially secreted extracellular polymeric substances (EPS) present a remarkable dynamic entity that plays a critical role in numerous soil processes including mineral weathering. We approach the interface of soil minerals and microbes with a focus on the organic C stabilization mechanisms. We use a suite of high-resolution imaging and analytical methods (confocal, scanning and transmission electron microscopy, Fourier transform ion cyclotron resonance mass spectrometry, DNA sequencing and X-ray diffraction), to study the living and non-living rhizosphere components. Our goal is to elucidate a pathway for the formation, storage, transformation and protection of persistent microbially-produced carbon in soils. Based on our multimodal analytical approach, we propose that persistent microbial necromass in soils accounts for considerably higher soil carbon than previously estimated.