Geophysical Research Abstracts
Vol. 19, EGU2017-16373, 2017
EGU General Assembly 2017

Can organic matter hide from decomposers in the labyrinth of soil aggregates? Micro-engineered Soil Chips challenging foraging fungi

Edith C. Hammer (1), Kristin Aleklett (1), Carlos G. Arellano Caicedo (1), Martin Bengtsson (2), Paola Micaela Mafla Endara (1), and Pelle Ohlsson (2)

(1) Department of Biology, Lund University, SWEDEN (edith.hammer@biol.lu.se), (2) Department of Biomedical Engineering, Lund University, SWEDEN

From the point of view of microorganisms, the soil environment is an enormously complex labyrinth with paths and dead-end streets, where resources and shelters are unevenly distributed.

We study foraging strategies of soil organisms, especially fungi, and the possibility of physio-spatial stabilization of organic matter by “hiding” in occluded soil spaces. We manipulate growth habitat microstructure with lab-on-a-chip techniques, where we designed complex environments with channels and obstacle at dimensions of the size of hyphae, and construct them in the transparent, gas-permeable polymer PDMS. We fill those with different nutrient solutions or combine with mineral nutrient gradients, and inoculate them with soil organisms. We analyze organisms and substrates with microscopy, fluorescence microscopy and analytical chemistry.

We compared different soil litter decomposers and an arbuscular mycorrhizal fungus for their ability to forage through complex air-gap structures and attempt to classify them into functional traits concerning their mycelium directionality, space-exploring approach and ability to grow through acute angles and narrow constrictions. We identified structures which are very difficult to penetrate for most species, and compounds located behind such features may thus be spatially unavailable for decomposers.

We discuss our approach in comparison to soil pore space tomographic analyses and findings we made in the pore space of colonized wood biochar.