Geophysical Research Abstracts
Vol. 20, EGU2018-13967, 2018
EGU General Assembly 2018

Visualising habitats in soil: moving beyond the techniques

Wilfred Otten (1), Xavier portell-canal (1), and Ruth Falconer (2)
(1) Cranfield University, (2) Abertay University

The ability to visualise soil at ever smaller scales has come a long way in recent years, driven by a conviction that understanding of the growth of microorganisms in soils requires quantitative observation at the scale of individual organisms. In particular since the advancement of X-ray computed micro-tomography (μCT), first using synchrotron facilities but now increasingly with commercial table-top scanners, quantitative data on the geometry of the pore space has become available. In parallel, different methods have and are being developed to visualize roots, microorganisms and chemical characteristics leading step-by-step to a full characterization of the soil microhabitat. These technologies have made a significant change in the way we now can observe, study and understand soil systems. Nevertheless, there is a danger that we are 'technique-focused' and persistent problems remain; these include: (i) the quality and validation of images (what level of uncertainty remains and does it matter?), (ii) integration of multiple techniques (can we obtain full characterization of the physical, chemical and biological environment?; how do we combine techniques that deal with different spatial scales and dimensions?), (iii) what scale do we really require (what evidence do we have that this microscale is advancing our understanding?; at what scale do we stop?), (iv) what can we truly learn from a snapshot in time and space (how do we scale in space and time from images?). A generic answer of these questions may not always exist as these may need to be addressed within the context of the problems we were studying in the first place.
We will address some advances that have been made in recent years with respect to the questions raised above and in particular will demonstrate how statistical and modelling approaches in combination with imaging may offer us a way forward to introduce a step-change in our understanding of soil systems. We will exemplify this by presenting results from image based modelling of below-ground fungal ecology and show how imaging and modelling enables us to advance the knowledge we obtain from imaging alone and allows us to identify key traits and environmental drivers that shape fungal communities and affect the evolution of CO_2 from fungal activity. Within this context we identify where we see the need for further development.