Geophysical Research Abstracts
Vol. 20, EGU2018-18157, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Imaging and modelling of rhizosphere processes

Arjen van Veelen, Nico Koebernick, Dan McKay Fletcher, Callum Scotson, Keith Daly, Robbie Mayone, Simon Duncan, and Tiina Roose

University of Southampton, Faculty of Engineering and the Environment, United Kingdom (a.van-veelen@soton.ac.uk)

Most human food relies on the production of crops. Crops get their nutrients and water from the soil. In addition, soil has many other important functions, including the buffering of hydrological systems to prevent flooding and the provision of a carbon sink, lowering atmospheric carbon. Although bulk soil chemical processes are relatively well understood, there is a critical lack of studies characterising the dynamics of physico-chemical properties in the rhizosphere, such as nutrient cycles and release of plant exudates. These changes to the soil can drastically change the soil's hydraulic, nutrient and carbon functionality. This emphasises the importance to visualise physico-chemical information, in order to understand key processes of plant-soil interactions. In our interdisciplinary project, Data Intensive Modelling of the Rhizosphere Processes (DIMR), we aim to characterise and visualise these dynamics. The aim of the programme is to visualise pore geometry in soils using X-ray Computed Tomography (CT), combined with Nuclear Magnetic Resonance Imaging (NMRI) to visualize plant exudates and water distribution. In addition, we use synchrotron X-ray Fluorescence (XRF) and X-ray Absorption Spectroscopy (XAS) to understand both soil chemistry and speciation at the root-soil interface, all leading to a better understanding of rhizosphere processes. These methods can be combined with predictive models of soil-root processes to understand rhizosphere functionality. We will discuss how chemical data obtained from both NMR and XRF and XAS spectroscopy can enable a step change in multiscale modelling of rhizosphere processes.