Contribution ID: **508** Type: **Poster (+) Presentation**

Pore-Scale Simulation of Mucilage Drainage in the Rhizosphere

Tuesday, 1 June 2021 10:00 (1 hour)

Compared to bulk soil, the rhizosphere has different properties because of the existence of root mucilage which affects the physical, chemical, and also microbial processes. Hydraulic phenomena like limiting water flow at certain dry soil conditions, modulating extreme water contents by slow response to water potential changes; and also influencing solute transport and gas diffusion by varying the connectivity of liquid and gas phases are all classified under the set of the physical processes which are affected by mucilage in the rhizosphere.
Overview of the literature and previous models shows the lack of a three-dimensional pore-scale dynamic model for a better understanding of the connectivity between different phases during imbibition and drainage processes. A major challenge is that mucilage shows a complex behavior which at low concentrations is more like a liquid while at higher concentration when it is almost dry, it becomes a solid. In between, a viscoelastic state is observed and then, mucilage can be considered as a hydrogel.
In particular, this study will use the Lattice Boltzmann method as a powerful tool for fluid dynamics studies and the Discrete Element method for describing solids to present a three-dimensional pore-scale model to simulate the drainage of mucilage between two soil particles. The model will be examined by comparing simulation results and ESEM images of real systems. In real systems, due to the concentration of mucilage and the distance between soil particles, different structures may be formed such as thin filaments or hollow cylinders. This model is able to reproduce observed structures, successfully.
The proposed model may provide us with a new perspective on hydrodynamic processes within the pore space in the rhizosphere. In addition, some other valuable data such as liquid bridges, connectivity of phases, solute transport and etc. would be resulted out of this model.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

Acceptance of Terms and Conditions

Click here to agree

Newsletter

I do not want to receive the InterPore newsletter

Student Poster Award

Primary author: Mr ESMAEELIPOOR JAHROMI, Omid (Jülich Forschungszentrum GmbH)

Co-author: Prof. KRÖNER, Eva (Jülich Forschungszentrum GmbH)

Presenter: Mr ESMAEELIPOOR JAHROMI, Omid (Jülich Forschungszentrum GmbH)

Session Classification: Poster +

Track Classification: (MS2) Porous Media for a Green World: Water & Agriculture