Contribution ID: **63** Type: **Oral Presentation**

Time evolution of biofilm' permeability field in porous media and control on fluid flow velocities

Tuesday, 31 May 2022 16:45 (15 minutes)

In soil ecology, as well as in environmental and industrial applications such as bioremediation and filters, it is of growing importance to understand the interplay between biogeochemical processes and hydrodynamics in porous media. In the latter, microorganisms can form surface-attached communities, known as biofilms. Biofilms lead to bio-clogged pores, which causes modified pore geometries, redirecting the fluid flow and impacting the spatial distribution of velocities within the porous medium. To quantify this impact, both in space and time, numerous experimental and numerical efforts have been done. However, the quantification of the permeability of the highly heterogeneous biofilm still presents a challenge.

We designed a microfluidic platform to study the influence of different flow rates and pore size on biofilm development in porous media systematically. Using the experimental images obtained, we developed a method to obtain the permeability field within the biofilm. We then simulate the fluid flow dynamics within the entire bio-clogged porous medium at different stages of biofilm development using a continuous approach. Time-resolved probability density functions of permeabilities and of the resulting velocities were computed. While the variance in the fluid flow velocities showed a steady increase in hydrodynamic heterogeneity, the variance of the permeability of the bio-clogged porous medium decreased.

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Time Block Preference

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

Participation

In person

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