Geophysical Research Abstracts
Vol. 20, EGU2018-17598, 2018
EGU General Assembly 2018

Flows through confined micro-structures in presence of microbial growth

Camille Kerboas, Mayumi Hamada, Stephane Mahe, and Pietro de Anna
Univeristy of Lausanne, Lausanne, CH (camille.kerboas@unil.ch)

Small scale chemical and biological processes taking place in the natural subsurface environment are spatially heterogeneous and control the underground fluid flow the is coupled to bio-chemical processes dynamics. Microorganisms in the subsurface contribute to these dynamics: they can be mobile or attached to surfaces by secreting EPS to keep microbial community physical together as biofilms. The classical way to investigate bio-chemical systems is through careful analysis of well mixed batch reactors: while powerful to investigate the biomass response to variations in chemical and biological parameters, this approach misses the possibility to investigate the system response to, and interaction with, the physical parameters of the close environment. Here we present a novel set-up and procedure to measure the hydraulic conductivity variations associated to the flow, driven by a constant pressure gradient, through a confined material (mimicking the subsurface or soil). Using time-lapse video-microscopy applied to microfluidics devices, the biofilm formation and growth rate under controlled flow conditions has been visualized and quantified. Occupying more and more space, the growing biofilm is confining more and more the fluid motion. We link the macroscopic measurement of the hydraulic properties (flow and pressure) to the microscopic analysis, done with video-microscopy, of the microbial population growth.