Geophysical Research Abstracts
Vol. 21, EGU2019-10287, 2019
EGU General Assembly 2019

Physical heterogeneity of liquid flow and bacterial horizontal gene transfer in subsurface porous ecosystems

Stéphane Mahé and Pietro de Anna

University of Lausanne, Faculty of Geosciences and Environment, Institute of Earth Sciences, Lausanne, Switzerland (stephane.mahe@unil.ch)

In subsurface ecosystems, the physical structure changes across distances of a few micrometers creating a multitude of microenvironments where abundant bacterial species thrive under fluctuating conditions. Porous media such as soils consist in a distribution of pores fulfilled by fluids such as gases or liquids characterised by flow dynamics. This physical system is coupled with the microbial life. For example, fluid flow transports resources creating gradients affecting spatial distribution of bacteria which in turn, through planktonic biomass growth or the development of a biofilm, can modify the dynamics of fluid flow. Some bacteria, called competent bacteria, have the ability to uptake free DNA from their environment and to express it, a mechanism known as natural transformation. Thus they may acquire new genetic traits that can help them to adapt to changing environmental conditions.

Here we focus on liquid flow contributing to the dispersion of free DNA. We combined microfluidics methods with fluorescent optical microscopy in order to have a dynamic visualization of the horizontal gene transfer. Microfluidics chips allow a fine control of hydrodynamic conditions in small confined environment. Different designs were used to evaluate the efficiency of the transformation under different flow conditions. This method is very promising to study this natural process source of bacterial biodiversity involved in soil key processes.