Pore scale processes governing biofilms location in a dual porous media: effects on Cr, Cu, Pb, and As mobility.

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Understanding in situ processes within the soil remains difficult, as coupling the spatial heterogeneity of soil structure and microbiological functions, because of the complexity of this media. Direct and non-destructive methods to switch from macro down to micro-scale are still poorly used, as well as the monitoring of communities activity at different scales. Non-invasive technics such as X-ray microtomography (X-ray μCT) are frequently used for soil characterization, but the observation of biofilms requires more complex image processing (image segmentation and image analysis).

The aim of the present work was to understand the preferential microbial habitats conditions inside soil porosity and the biofilm effect on metals mobility. Our experimental device is based on two complementary different scale set up:

A bimodal porous media using mini columns (ø 0.8cm) that creates different unsaturated conditions allowing activation of a specific range of pore size. Solutions from a soil highly polluted in metallics and metalloid elements (Cr, Cu, Pb and As) and associated microbial community percolated through these media.

Microfluidic analog device coupled with microscopic kinetic monitoring were also used, for analyse relations between (i) biofilm activity (ii) effect on porosity structure (iii) metal speciation, in the same conditions.

These results highlight the feedback relationship between the biofilm location and the speciation of metallic elements through porous media.