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Visualization of colloidal mobility and removal at the pore scale in soil saturated conditions

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Colloid transport is studied at the pore-scale in order to gain insight into the processes governing pathogen removal under soil saturated conditions. Monodisperse suspensions of colloids and homogeneous transparent PDMS micromodels with pore throats in the order of 6-20 μm are employed. The micromodels are generated using a transparent silicon polymer (PDMS) and a soft photolithography technique. Experiments are carried out for different particle sizes, surface roughness of the pore grains and flow rate conditions. Straining and attachment are observed and measured by tracking the trajectory and fate of individual colloids using optical microscopy. Results of theses experiments indicate that the mechanisms of removal and the spatial distribution of colloid retention differ greatly as a function of the T/C ratio (pore throat/colloid diameter). Straining is found to be important for small T/C ratios. Removal increases with increasing surface roughness and decreasing the flow rate. For a given flow velocity there is a limited number of sites available for attachment. As favorable sites are been filled a constant decrease in retention is observed. The role of hydrodynamic interactions on colloid deposition will be discussed.