Geophysical Research Abstracts
Vol. 16, EGU2014-16862, 2014
EGU General Assembly 2014

Gravity flow and solute dispersion in variably saturated sand

Samuel K. Kumahor, Gerrit H. de Rooij, and Hans-Joerg Vogel
Department Soil Physics, Helmholtz Centre for Environmental Research - UFZ

Solute dispersion in porous media depends on the structure of the velocity field at the pore scale. Hence, dispersion is expected to change with water content and with mean flow velocity. We performed laboratory experiments using a column of repacked fine-grained quartz sand (0.1-0.3 mm grain size) with a porous plate at the bottom to controle the water potential at the lower boundary. We established gravity flow conditions – i.e. constant matric potential and water content throughout the column - for a number of different irrigation rates. We measured breakthrough curves during unit gradient flow for an inert tracer which could be described by the convection-dispersion equation. As the soil water content decreased we observed an initially gradual increase in dispersivity followed by an abrupt increase below a threshold water content (0.19) and pressure head (-38 hPa). This phenomena can be explained by the geometry of phase distribution which was simulated based on Xray-CT images of the porous structure.