Geophysical Research Abstracts
Vol. 12, EGU2010-13531, 2010
EGU General Assembly 2010

Experimental challenge of observing the dynamics of water movement in unsaturated porous media

Ulf Mohrlok

Karlsruhe Institute of Technology, Institute for Hydromechanics, Karlsruhe, Germany (ulf.mohrlok@kit.edu, +49 721 608-8755)

Water movement in unsaturated porous media is a key process for groundwater recharge and infiltration of solutes into the groundwater. In general, this water movement has its specific dynamics caused by temporal variation of the inflow boundary condition and by non-linear hydraulic properties of the porous media itself. Under laboratory conditions water movement can be visualized by dye tracer experiment in transparent experimental set-ups such as glass columns. However, quantitative analyses are only possible for the surface of the porous media by applying image processing techniques in such cases.

More direct approaches observing the dynamics of the water movement by using sensors that determine physical quantities is still a challenging issue in experimental investigations. One major reason is that the water tension and the water content cannot be measured directly with the required spatial and temporal resolution even in experimental set-ups in the laboratory. On the other hand fluxes and tracer breakthrough can be determined experimentally quite well. However, these only give integral information about the dynamics of the water movement between the inflow and outflow boundary of the set-up.

Experiments on observing the water movement by infiltration into sandy soil as well as the by dynamical behaviour of the capillary fringe were conducted with focus on the ability to observe the dynamics of water movement. The attempt was made to combine flux budgeting and water tension measurement by tensiometers in order to characterize the water movement in unsaturated sandy soils. Also the limitations of specific measurement techniques with respect to their application in this context will be discussed.