Geophysical Research Abstracts
Vol. 14, EGU2012-9253, 2012
EGU General Assembly 2012

Time-Dependent Soil Hydraulic Conductivity in Salt-Affected Soils

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Mixed salts such as sodium-calcium salts interact with the soil matrix. The physico chemical interactions between the soil solution and the soil matrix (SS-SM), particularly in the presence of smectite minerals (e.g., montmorillonite), may change the soil pore-size distribution; the latter could affect the soil hydraulic properties, i.e. the soil hydraulic conductivity and soil water retention. Since the magnitude of the SS-SM interactions depend on time-dependent flow-controlled attributes, i.e. soil solution concentration and composition and water content, the resultant hydraulic properties are also time-dependent.

The present talk focuses on the effect of mixed-ion solutions on soil hydraulic properties relevant to water flow and solute transport. Experimental evidence on, and an approach for modeling of the effect of soil solution concentration and composition on the local- (Darcy) scale soil hydraulic properties are presented and discussed. Long-term effect of the soil solution concentration and composition on the soil hydraulic properties, and, concurrently, on water flow and solute transport are presented through simulations of field-scale flow and transport.