Geophysical Research Abstracts
Vol. 12, EGU2010-3754-1, 2010
EGU General Assembly 2010

Saturation-Dependent Anisotropy of Structured and Random Layered Soils

Jianting Zhu
Desert Research Institute, Hydrologic Sciences, Las Vegas, United States (jianting.zhu@dri.edu)

Large scale heterogeneous soils often demonstrate different moisture spreading and solute transport patterns at different water saturations (or capillary pressures). The main objective of this study is to improve basic understanding of saturation-dependent soil hydraulic conductivity anisotropy by examining how the anisotropy characteristics are related to the layered structure of soils. Both structurally heterogeneous soils consisting of repeated unit cells of homogeneous sublayers and randomly arranged layered soils are considered in this study. Specifically, we investigate the hydraulic conductivity anisotropy of the layered soils subject to same capillary pressure at both ends of the domain. The anisotropy is determined by the different fluxes in vertical and horizontal directions under the same capillary pressure. The impact of various conditions is extensively examined and discussed. Results demonstrate that many factors such as capillary pressure, number and structure of the layers and correlations of layer hydraulic parameters significantly impact the anisotropy of unsaturated layered soils. The potential that orders of magnitude variation in hydraulic anisotropy might exist as illustrated in this study can have important implications on many hydrological phenomena.