Geophysical Research Abstracts
Vol. 15, EGU2013-11685, 2013
EGU General Assembly 2013

Parameter Estimation by Inverse Modelling of State Variable Observations in Porous Media with Hierarchical Heterogeneity

Wolfgang Durner (1), Henrike Schelle (1), Steffen Schlüter (2), Hans-Jörg Vogel (2), Olaf Ippisch (3), and Jan Vanderborght (4)

(1) Institute of Geoecology, TU Braunschweig, Braunschweig, Germany (w.durner@tu-bs.de), (2) Helmholtz-Centre for Environmental Research UFZ, Halle, Germany, (3) Interdisciplinary Center for Scientific Computing, Heidelberg University, Germany, (4) Agrosphere IBG-3, Forschungszentrum Jülich,Jülich, Germany

Soils are structured on multiple spatial scales, originating from inhomogeneities of the parent material, pedogenesis, soil organisms, plant roots, or tillage. This leads to heterogeneities that affect the local hydraulic properties and thus govern the flow behavior of water in soil. To assess the impact of individual or combined structural components on the water dynamics within a soil, complex 2D and 3D virtual realities, representing cultivated soils with spatial heterogeneity on multiple scales were constructed with a high spatial resolution by the interdisciplinary research group INVEST (virtual institute of the Helmholtz Association). At these systems, numerical simulations of water dynamics under different boundary conditions were performed. From the simulation results, datasets of water contents and matric heads, as are recorded in typical field campaigns were extracted. With these data, effective soil hydraulic properties were estimated by 1D inverse simulation, which were then used to predict the water balance. The results showed that measurements, particularly those of water contents, depended strongly on the measuring position and hence led to different estimates of the soil hydraulic properties. Nevertheless, in most cases, the average of the predicted water balances obtained from the 1D simulations and the estimated effective soil hydraulic properties agreed very well with those attained from the 2D systems. In contrast, when using data from only one observation profile, the calculation of the water balance was very uncertain.