Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08909, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08909
EGU General Assembly 2008

Estimating soil hydraulic properties by Wind's method using free-form functions

S. C. Iden and W. Durner

Institut für Geoökologie, Technische Universität Carolo-Wilhelmina zu Braunschweig, Germany

Transient evaporation experiments allow us to determine simultaneously the soil hydraulic properties necessary to simulate water flow in unsaturated soils. We present a new algorithm implementing Wind's method which uses a free-form soil water retention curve. This means that no a priori shape is assigned to the function, as opposed to the use of classic parametric functions. Our algorithm uses the SCE-UA global optimization algorithm to estimate nodal values of water content and cubic Hermite interpolation to derive a smooth monotone function. A multilevel routine identifies the adequate number of nodes by balancing model performance, the cross-correlation of the estimated model parameters and their number. Point values of unsaturated hydraulic conductivity are calculated by use of the instantaneous profile method. A coupled conductivity function, obtained by a numerical solution of Mualem's integral, is fitted to these. Results for three synthetic data sets and real data show that the algorithm identifies the soil hydraulic properties both correctly and precisely. The advantages of the proposed method are the very high flexibility of the free-form approach, the insignificant cross-correlation between the estimated parameters, and the possibility to assess the uncertainty of the retention curve individually in different ranges of pressure head. As a consequence, the necessity to test many competing model structures from which the most adequate needs to be selected is excluded and an improved uniqueness in the parameter estimates is obtained.