Geophysical Research Abstracts
Vol. 17, EGU2015-2949, 2015
EGU General Assembly 2015

Determining hydraulic properties of a loam soil by alternative infiltrometer techniques

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Testing alternative infiltrometer techniques to determine soil hydraulic properties is necessary for specific soil types. For a loam soil, the water retention and hydraulic conductivity values predicted by the BEST (Beerkan Estimation of Soil Transfer parameters) procedure of soil hydraulic characterization were compared with data collected by more standard laboratory and field techniques. In addition, six infiltrometer techniques were compared in terms of estimated saturated soil hydraulic conductivity, K_s. The BEST-intercept algorithm with a saturated soil water content set at 76% of the porosity yielded water retention values statistically similar to those obtained in the laboratory and K_s values practically coinciding with those determined in the field with the pressure infiltrometer (PI) since the means differed by a negligible 1.9%. The unsaturated soil hydraulic conductivity measured with the tension infiltrometer (TI) was reproduced satisfactorily by BEST only close to saturation, i.e. for an established pressure head of -10 mm. BEST, the PI, one-potential experiments with both the TI and the mini disk infiltrometer (MDI), the simplified falling head (SFH) technique and the bottomless bucket (BB) method yielded statistically similar estimates of K_s for the sampled area, differing at the most by a factor of three. The suggestion was that smaller values were obtained with longer and more soil-disturbing infiltration runs. In conclusion, an applicative scenario of BEST yielding good predictions of water retention and saturated or near-saturated hydrodynamic parameters was suggested for the sampled loam soil. Any of the tested infiltration techniques appears usable to obtain the order of magnitude of K_s at the field site but the TI, MDI and SFH data seem more representative of a dry, non-disturbed soil whereas the BEST, BB and PI data appear more appropriate to characterize a wet soil at some stage during a rainfall event. Additional investigations carried out on both similar and different soils would allow development of more general procedures to apply BEST and other infiltrometer techniques for soil hydraulic characterization.