Geophysical Research Abstracts, Vol. 7, 05741, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05741

Interfacial Area Based Variable Tortuosity Models for Predicting Unsaturated Hydraulic Conductivity for Repacked Sands

R. Khaleel (1), P. Saripalli (2)

(1) Fluor Government Group, Richland, WA, USA, (2) Pacific Northwest National Laboratory, Richland, WA, USA (Raziuddin_Khaleel@rl.gov / Fax: 509-376-5396)

A new model is developed for the prediction of unsaturated hydraulic conductivity, K as a function of moisture content, θ. The $K(\theta)$ estimates are obtained using laboratory measurements of moisture retention and saturated hydraulic conductivity, and a saturation-dependent tortuosity (τ_a) based on the immiscible fluid (air-water) interfacial area. A correspondence between the real and idealized media is established by using the laboratory-measured soil moisture retention curve to calculate the interfacial area. Our method uses commonly used retention functions and $K(\theta)$ models. The $K(\theta)$ predictions for 22 coarse-textured, repacked Hanford sediments agree well with measurements; the agreement is especially good for the interfacial area based Brooks-Corey-Burdine and van Genuchten-Burdine models. For the samples analyzed, the $\tau_a$based Burdine tortuosity model results in more accurate predictions than the $\tau_a$based Mualem tortuosity model, and provides a better match at low θ between the measured and predicted K than the standard, widely used predictive models that are based on the fitted moisture retention and saturated conductivity. While results based on the new model appear promising in predicting $K(\theta)$ for the repacked, sandy soils considered in this study, a further testing is needed using undisturbed sediments and other soil textures.