**Hydrology and
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Discussions**

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Comment

Interactive comment on "Evaluating models for predicting hydraulic characteristics of layered soils" *by* S. S. W. Mavimbela and L. D. van Rensburg

Anonymous Referee #2

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The article deals with the measurement and estimation of soil hydraulic properties. Three sets of equations are used to express the soil water retention and hydraulic conductivity curves. The main goal is to compare different hydraulic conductivity models. Despite that the main differences between the model performances are known, results may be interesting for some model users. Unfortunately, the manuscript is not well written. It is written in a very chaotic way. The method part does not clearly show an applied procedure. There are even some serious problems. Therefore it is hard to asses (and discuss) the results part.

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Introduction

From the introduction it is hard to see, what is the background and purpose of this study. It seems me that authors do not distinguish between the prediction of hydraulic conductivity curve from the shape of the retention curve and estimation of soil hydraulic parameters (of various soil hydraulic models) using the numerical optimization. There are statements like "To improve parameters estimation of various soils the pedo-transfer functions were developed ...", which is complete misunderstanding of this issue. The pedo-transfer functions are used when no other data are available. Their application is very problematic particularly in structured soils. Predictions may be very different in comparison with real data. Many sentences in the text feel like copied without understanding their meaning.

Theory

Equations are not written consistently. Function for soil water retention curve is sometimes written for effective saturation, sometimes for soil water content (similarly the function for hydraulic conductivity). Unites for alpha parameter are missing etc. What is the meaning of Equation (1)? There are m parameters calculated in the result part. The meaning of m parameter is explained only for one model. By the way equations for soil water retention curves (BC, wG, K) are coupled usually with two model for K(h) – Burdine (B) and Mualem (M) ... The usually applied combinations are BC-B, wG-M, K-M).

Experimental setup and measurements

This part is written very purely. The basic information is missing. For example:

Part 2.3.2 ... Were the samples oven dried to measure soil water content? Or did you mean the bulk density? The soil water content is discussed in 2.3.5.

Part 2.3.3. The procedure and following application in this study would need a little more explanation.

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2.3.4 So what was actually measured? Neutron probe measures soil water content. What is DFM probe? How could you use matric suction for calculating K values when no tensiometers were installed? Did you calculate h from the measured soil water contents? – this would not be probably correct (SWRC hysteresis etc.)

2.3.5 This part is very confusing. I do not understand procedure applied for measuring soil water retention curves - especially the disturbed soil packing into the PVC tube.

The part describing parameter estimation using the HYDRUS is absolutely incomplete. Sentences Pg. 11, L 11-19 were probably only copied. They say nothing important – e.g. describing applied procedure. The numerical inversion is usually based on measured data like: inflow/outflow at boundaries, soil water content and pressure head measurements at particular points. Sometimes points of soil water retention and/or hydraulic conductivity curves may be included. Presented procedure is confusing. Again – did you actually measure h? Application of K(h) value (especially with respect to their reliability) is complicated. The initial and boundary conditions must be clearly described, as well as other conditions like: the length of the experiment, fluxes, which parameters were set (e.g. measured or estimated from other data somehow), which parameters were optimized, etc.

I will not discus the results and discussion parts since there are too many unknowns in the applied methodology.

Finally, there are many mistakes. Particularly using Kasugi instead of Kosugi is very frustrating, especially when this is the name of the author of one of the tested models. In addition there are (Pg. 24, L. 4-11) two references. They are completely the same except the name of the author - Kasugi / Kosugi

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 301, 2012.

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