

# ***Interactive comment on “SWRC fit – a nonlinear fitting program with a water retention curve for soils having unimodal and bimodal pore structure” by K. Seki***

**Anonymous Referee #1**

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## **General comments**

The paper provides a new tool for fitting soil water retention models to measured retention and water content data. Furthermore it provides a “new” retention model for describing multimodal pore-size distributions.

New about the fitting procedure is that no initial estimate of the parameters for the five models that are implemented in the software is necessary. This is a rather practical aspect and of no direct scientific meaning as pointed out by the author himself (page 409, lines 17-20).

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The new model is a linear superposition of two or more unimodal Kosugi models. A linear superposition of two or more unimodal retention models is a very common way to describe soil water characteristics of soils with more complex pore pore-size distributions (Durner, 1994; Ross and Smettem, 1993). These two aspects make the paper rather to a technical note but not to a full paper.

A major part of the paper is the description of the software that is rather helpful in a users manual (page 415, line 18 to page 417, line 9; page 418, line 12 to line 28). Another large part is rather textbook information ( for example the description of the merits of the different unimodal functions in page 421, lines 1-13), or a repetition of other contributions (for example the derivation of the Kosugi model in page 411, line 14 to page 412, line 20 that is given in Kosugi (1996). These parts should be omitted. Equation 15 can be directly derived from Eq. 11 and thus page 414 line 3 to line 11 are also dispensable.

Since the software fits retention models to data obtained from hydrostatic column experiments, the state of the art is to treat the measured water contents as the integral of the soil water distribution over the column height (Liu and Dane, 1995; Schroth et al., 1996; Jalbert and Dane, 2001; Peters and Durner, 2006. This avoids linearisation errors that are especially significant for soils with bimodal pore-size distributions as pointed out by (Peters and Durner, 2006).

## specific comments

page 408, lines 2-5: we do not fit retention curves to functions or models, but models or functions to measured data.

page 408, lines 11-14: should not be part of the abstract.

page 408, lines 15-17: This is easily expected.

page 408, lines 24-25: what is  $z$ ?

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page 410, line 24:  $K$  was already defined after equation 1.

page 411, line 3-4: there is an analytical solution for the multimodal van Genuchten model (Priesack and Durner, 2006).

page 413, line 16:  $n_i > 1$

page 413, line 20 to page 413, line 2: could be written a lot shorter.

page 417, line 25: we do not fit retention curves to functions or models, but models or functions to measured data.

page 418, lines 1-3: This is rather arbitrary. Even 1 % of large pores can have a major impact on the prediction of the conductivity function.

page 419, line 26 to page 420, line 21: Since this part is not analyzed in the paper this section is dispensable.

page 423, lines 4-5: This only suggests that the BL-model is flexible enough to give a good fit to the data.

Equation 1: since the paper is about hydrostatic column experiments writing the Richard's equation is dispensable.

Equation 3: since no analysis of the impact of the different retention models on the prediction of  $k_r$  is made writing the equation is dispensable.

Table 1: The analytical solutions for  $k_r$  are dispensable.

Fig. 6 and Fig. 7 are identical!

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## technical corrections

page 408, line 8: "... model propose in this ..."; write "... model proposed in this ..."

page 410, line 6: "In the Table 1 ..."; write "In Table 1 ..."

page 410, line 16: "... the BC model is identical to another famous model by Campbell (1974)."; write "... the BC model is identical to the model of Campbell (1974)."

page 410, line 23: "... is a relative hydraulic conductivity,..."; write "... is the relative hydraulic conductivity,..."

page 413, lines 9-10: "... the large pore is that between the aggregates and the small pore is that ..."; write "... the large pores are that between the aggregates and the small pores are that ..."

page 413, line 14: "In Table 1, k is the number ..."; write " $k$  is the number ..."

page 414, line 3: "The Pore-size distribution ..."; write "The pore-size distribution ..."

page 423, line 12 "... BC models, ..."; write "... BC model, ..."

## References

[Durner(1994)] Durner, W., Hydraulic conductivity estimation for soils with heterogeneous pore structure, *Water Resour. Res.*, 30, 211–223, 1994.

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- [*Kosugi(1996)*] Kosugi, K., Lognormal distribution model for unsaturated soil hydraulic properties, *Water Resources Research*, 32, 2697–2703, 1996.
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- [*Peters and Durner(2006)*] Peters, A., and W. Durner, Improved estimation of soil water retention characteristics from hydrostatic column experiments, *Water Resour. Res.*, 2006, in press.
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- [*Schroth et al.(1996)*] Schroth, M., S. Ahearn, J. Selker, and J. Istok, Characterisation of Miller-similar silica sands for laboratory subsurface hydrologic studies, *Soil Sci. Soc. Am. J.*, 60, 1331–1339, 1996.

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