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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Saturated Hydraulic Conductivity and Textural Heterogeneity of Soils" *by* Carlos García-Gutiérrez et al.

J. K. Koestel (Referee)

john.koestel@slu.se

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Manuscript hess-2017-706 investigates whether entropy measures for the soil texture are better predictors for the saturated hydraulic conductivity (Ks) than the traditional three class texture information (sand/silt/clay). An (to my knowledge) innovative variant of calculating information entropies (IE) from the 7 USDA standard texture classes is introduced. Furthermore regressions between the IE and Ks are established. Most of them are breathtakingly good (avg. RËĘ2 = 0.734), considering that Ks is notoriously difficult to predict (with typical RËĘ2 of around 0.2 in cases where realistic validation approaches are undertaken). It is difficult to understand why the use of a 7 texture class derived entropy measure should outperform prior pedotransfer functions (PTF) by such a large margin.

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From the methods section of this article, I am missing a description of a proper validation approach. I therefore suspect that the authors are presenting training errors which are known to be overly optimistic. Also the authors choice to perform their regressions on binned data has probably helped to imprve the goodness of fit. I therefore advise against publishing the paper in its present form as it would have considerable potential to mislead the reader.

It is difficult to understand why the authors miss the chance of presenting their regression equations and trying to use them to predict Ks in a cross-validation approach. Without the regression equations and proper cross-validations, I am seeing little value in publishing this manuscript. I therefore request the authors to introduce both of it in their article. If they could show that the regressions based on their IE's predict Ks with an RËĘ2 of clearly more than 0.2 in a source-wise cross-validation, they would demonstrate the usefulness of their entropy measures for real. With "source-wise" cross-validation I mean the following: a) train regression relationships using all data from 44 of your 45 data sources and b) then try to predict the Ks of the samples from the 45th data source. You will obtain an idea of how well you could predict the Ks for newly sampled soil. Preferably do the cross-validation sample wise (not binned), so that the range of prediction error for individual samples becomes obvious.

I recommend major revisions.

Minor comments

The Ks is known to be log-normal distributed (you could even check it for your data). It is therefore advisable to only predict logarithmized Ks values. If the Ks in your database would rather be normal distributed, only use the plain Ks values instead of the log Ks.

The explanation and terminology used for the different texture class triplets is difficult to follow. It needs to be better explained. Moreover, how about denoting the triplets using the grain diameters for the boundaries between coarse, medium and fine texture. E.g. the classic texture classification (now '5-1-1') would be referred to as 50/2 (for the

equivalent grain diameters at the sand/silt and silt/clay boundaries in micron). Or '3-2-2' would become 250/50. I would find such a naming convention much more intuitive.

I do not think that the manuscript is ready for more detailed comments, yet.

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