

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

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Manuscript hess-2017-706 investigates whether entropy measures for the soil texture are better predictors for the saturated hydraulic conductivity (K_s) 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 K_s are established. Most of them are breathtakingly good (avg. $R^2 = 0.734$), considering that K_s is notoriously difficult to predict (with typical R^2 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 improve 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 K_s 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 K_s with an R^2 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 K_s of the samples from the 45th data source. You will obtain an idea of how well you could predict the K_s 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 K_s is known to be log-normal distributed (you could even check it for your data). It is therefore advisable to only predict logarithmized K_s values. If the K_s in your database would rather be normal distributed, only use the plain K_s values instead of the log K_s .

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

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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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