Hydrol. Earth Syst. Sci. Discuss., 10, C5610–C5613, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C5610/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Influence of soil, land use and climatic factors on the hydraulic conductivity of soil" *by* N. Jarvis et al.

Anonymous Referee #3

Received and published: 14 October 2013

Review of the manuscript HESSD 10, 10845-10872, entitled "Influence of soil, land use and climatic factors on the hydraulic conductivity of soil" by Jarvis et al.

The manuscript presents a deep and thoughtful analysis of a vast dataset of published data on soil hydraulic conductivity (K). The authors reveal and highlight the frequently neglected importance of many site-specific factors in the most widely used pedotransfer functions as previously highlighted by Vereecken et al. (2010) among others. They elucidate the factors that limit the application of the traditional approaches and present a first attempt to predict Ks with the multiple linear regression. The topic is highly relevant for both the HESS readers and the community of hydrologists as K is one of the most important factors in (eco) hydrological modeling. The manuscript is well

written, concise, to the point and would only require minor to moderate revision before being published. Given said that I still have a few major and minor comments for the authors that I think could help them to improve the manuscript.

Mention to the support of the soil volume sampled is limited to a sentence in the introduction referring to the soil sampling and subsequent analysis in the laboratory. Information about the confined infiltrometers size is limited or absent but may be interesting for the readers. Their size will determine the extent to which macropores and soil cracks are accounted for in the experiments.

The authors acknowledge the poor performance of the multiple linear regression to predict K from site-specific information even though they include the parameters that influence most on K at low suctions such as macroporosity. Given the poor performance and the availability of data I think the authors should apply non-linear methods to predict K and go further with the analysis of data given the rather explanatory than predictive nature of the multiple linear regression under these circumnstances.

Minor comments: Introduction. Nothing is said about inverse modeling to obtain soil hydraulic parameters and more specifically K. Recent studies, e.g. Hardie et al. (2013); Martinez et al. (2013); Schindler (2014), present alternative ways to estimate Ksat and, in my opinion are worthwhile to be mentioned.
P. 10850, L. 6. The authors mention, "mean values were recorded in the database for a given plot". Given that Ksat distribution is usually assumed to be log-normal why not to use median rather than mean values? Also, just as auxiliary and illustrative purposes I would appreciate to know the range of variability in the Ks for plots where they have several observations.
P. 10850, L. 28. I would include here that the method of interpolation in LocClim is the inverse distance method to provide with more information to the readers.

P. 10852. L. 7-16. Is there any study in the database in which the direction of the sequence of infiltration is compared? I guess that if the variability inside the group of ascending or descending sequence is very large it will mask the fact that there could exist or not a significant difference between both groups. Therefore to assure that performing an ascending or descending experiment will significantly affect the K that you are measuring you will need replicates of both of them under the same conditions.

P. 10856, L. 4. “significant”. I would use a different term if I were not performing a statistical analysis.

P. 10856, L. 5-9. The effect of climate on K is not sufficiently supported given that the only graph showing this is the scatter plot of logK vs estimated rainfall in figure 3 and temperature.

P. 10859, L. 27. The reference is not included in the text.

Figures and tables must be self-explicative. Meaning of the abbreviations might be included in the captions.

Figure 3. I miss more information about the graph. Are the graphs in the principal diagonal giving the pdf of each variable? I would include also the Pearson’ correlation coefficient and increase the size of the text and figures in the text. They are hardly readable. At least a sentence or a reference to explain what is LOESS (locally weighted scatterplot smoothing?) might be needed. Otherwise, the red lines might be omitted to avoid the readers to get lost as they don’t add to much value to the

description of your results and their discussion.

References: Hardie, M.A., S. Lisson, R.B. Doyle, and W.E. Cotching. 2013. Evaluation of rapid approaches for determining the soil water retention function and saturated hydraulic conductivity in a hydrologically complex soil. Soil and Tillage Research 130(0): 99–108Available at http://www.sciencedirect.com/science/article/pii/S0167198713000482.

Martinez, G., Y.A. Pachepsky, H. Vereecken, H. Hardelauf, M. Herbst, and K. Vanderlinden. 2013. Modeling local control effects on the temporal stability of soil water content. Journal of Hydrology 481: 106–118Available at http://www.scopus.com/inward/record.url?eid=2-s2.0-84873086266partnerID=40md5=3035e39db1c6db3944ddb14ab5b736fa.

Schindler, U. 2014. A Novel Method for Quantifying Soil Hydraulic Properties. p. 145–158. In Mueller, L., Saparov, A., Lischeid, G. (eds.), Novel Measurement and Assessment Tools for Monitoring and Management of Land and Water Resources in Agricultural Landscapes of Central Asia SE - 7. Springer International Publishing.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10845, 2013.