Reply to comments of reviewer No. 2

Comment:
The problem of providing good soil parameters to LSMs is undoubtedly acute. The work is technically solid.
Reply:
We thank the reviewer for their constructive comments.

Comment:
Several conceptual aspects of the work have to be explicitly discussed. 1. The authors are estimating van Genuchten parameters. Does this mean that they are going to run the Richards equation for the spatial support scale of 40 x 40 km? Do they have any indications of the applicability of this model at this scale? If they do not then it would be prudent to state that and to outline the means of proving such applicability.
Reply:
We fully agree with this statement that the scale discrepancy between horizontal resolution (e.g. tens of kilometers) and vertical resolution (e.g. centimeters or even millimeters) of many global applied models is an issue valued for extensive discussion. However, several globally applied land surface models, which are within the target audience of this data set, already apply Richards´ equation globally, or at scales larger than pedon-scale. Example models are NOAH-MP (Niu et al., 2011) and LEAF/OLAM (Walko et al., 2000). This issue has been discussed in detail before, e.g. by Beven (2001). Therefore, we do not discuss this in this manuscript.

References:
Niu, G.-Y., et al. (2011): The community Noah land surface model with multiparameterization options (Noah-MP): 1. Model description and evaluation with local-scale measurements. *J. Geophys. Res.*, 116, D12109
Walko, R. L., W. R. Cotton, G. Feingold, and B. Stevens (2000): Efficient computation of vapor and heat diffusion between hydrometeors in a numerical model.Atmos. Res., 53, 171–183.
Beven, K.: How far can we go in distributed hydrological modelling?, Hydrol. Earth Syst. Sci., 5, 1-12, 10.5194/hess-5-1-2001, 2001.

Comment:
2. The authors base their estimates on the Rosetta PTF. They indicate that they plan to repeat this work for other PTFs such as Rawls-Brakensiek, HYPRES, etc. Why do they want to do that? How can a future user of their results decide which PTF should be used? The authors should either state that they will provide some guidance on PTF selection or refrain from producing several of conceptually equal but numerically different datasets.
Reply:
A large number of land surface models exist that are all being used to infer global distributions of energy and water balance fluxes, for a wide range of applications. These models are run either in uncoupled mode (where they are simply driven by global fields of atmospheric variables) or are embedded in Global Circulation models that allow for feedback between the land surface and the atmosphere. All of these models (rightly or wrongly) use the Richard’s equation at large scales to calculate water flow in soils and hence need hydraulic functions. These are either described using the Brooks and Corey or van Genuchten approach. These models therefore need hydraulic parameters, derived from PTFs derived for either Brooks and Corey or van Genuchten. Land surface models currently use Look-up tables or arbitrarily selected PTFs to derive these parameters. In our follow-up studies we aim to provide coherent, reliable and well documented parameter sets for both Brooks and Corey or van Genuchten that can be used by the modelers to test the impact of these selections on their model results, for example.

However, the application of further PTFs is future work and should not be discussed in this manuscript which is specifically focused on the application of the Rosetta PTF model H3 after Schaap et al., 2001. The valued decision of land surface modelers for a specific PTF is justified by their application, the focus region and model structure. Therefore, we plan to offer data sets for the main applied PTFs. With this data set we provide van Genuchten parameters, which cannot be used by models where the Brooks-Corey hydraulic model is implemented. Therefore, additional specific parameterization (e.g. based on Rawls) different from van Genuchten is still needed.

Comment:
3. Although the authors claim that they use the MIller-Miller scaling, they do not use it. They use the Warrick's scaling. The difference is that M-M scaling is formulated in terms of water contents, and the Warrick's scaling is formulated in terms of saturation degree, and this is what this paper is using.
Reply:
This is correct. The basic is Miller-Miller scaling under the assumption that porosity is constant. Warrick relaxed this assumption. We clarified this in the manuscript.

Comment:
4. The Miller-Miller scaling so far was demonstrated for relatively small spatial extents. It was shown for these small extents that the scaling multiplier is lognormally distributed. However this never was shown for the large extents. Therefore the use of the log-transform for scaling multiplier has to be either justified or discussed.
Reply:
We discuss this issue in the newly formed section 3.4 about inherent uncertainties.

Comment:
5. The authors propose to average the saturated hydraulic conductivity using log transform, essentially using the geometric mean. The saturated hydraulic conductivity is known to scale with the extent. Neither arithmetic nor geometric mean follow such scaling. The authors should justify or at least discuss the selection of the geometric mean.
Reply:
We discuss this issue in the newly formed section 3.4 about inherent uncertainties.