Hydrology and
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Discussions

Interactive comment on "Subgrid spatial variability of soil hydraulic functions for hydrological modelling" *by* P. Kreye and G. Meon

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We thank reviewer 2, Anatoly M. Zeyliger, for his detailed comments. This will help us to improve the manuscript.

Specific comments

> *The research on this article is based on a some statistical analyses of correlations between parameters linked with ROSETTA within the UNSODA soil database.*
> *In our opinion scientific significance of this research is limited by the use of the same database for analyzing relationships between*

> *saturated soil hydraulic conductivity and parameters of soil water retention curves where fitted. This limitation may be overcome by the use of another soil database like HYPRES to approve obtained results and may could provide a way for large verification of derived clusterization for any soil classes.*

As a pedotransfer function, ROSETTA works independent from its databases, which were used for its calibration. Besides UNSODA two other soil databases were used to calibrate the neural network of ROSETTA (Schaap et al., 1998). Of course you are right that our results are valid within the framework of ROSETTA only. However, parameterization of soil hydraulic functions on the hydrological meso- and macroscale are always based on one database or pedotransfer function. To have more variable van Genuchten parameter (VGP) sets, we use the method introduced in our manuscript. An inclusion of more databases (like HYPRES) is a good idea, but this demands for different methods (in our point of view).

> *In our opinion a scientific quality is also limited by the use of parameters of specific empirical models describing shapes of both unsaturated soil hydraulic properties that are "not always valid".*

We are not sure, if we understand your statement correctly. We don't use the empirical regression functions or their parameters to describe the shapes of pF and conductivity curves directly. The regression functions are only used to vary VGP. In case of low or no correlations between the saturated hydraulic conductivity and a VGP, we don't change this VGP.

> *First of all it is quite important for modeling infiltration to use*

adequate models for fitting and should be discussed more deeply according to some textural classes of soil and organic matter content. Thus is really important in many rainfall events for upper soil horizons with macropore structure controlling infiltration into soil profile which is not taken into account by selected Mualem-van Genuchten models.

Yes, you are right that Mualem-van Genuchten is valid for matrix flow. However, the calculation module of infiltration and percolation within the hydrological model PANTA RHEI uses different pathways to account for preferential flow (Kreye, 2015). In addition to that, using different sets of VGP at the same spatial location has a similar effect: We don't have a "homogeneous" soil matrix. If e.g. soil moisture conditions are high, the VGP set with high saturated conductivity becomes dominant. In dry conditions, it could be the other way round.

References

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