Interactive comment on predicting the soil water characteristic curve from particle size distribution based on a pore space geometry containing slit-shaped space by Chen-chao Chang and Dong-hui Cheng

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The authors propose a modified approach to estimate the soil moisture characteristic curve (SMC) from the measurement of the particle size distribution (PSD) and specific surface area (SSA). The authors used an empirical power equation with two fitting parameters to estimate SSA proposed by Sepaskhah et al. (2010). Subsequently, estimated SSA is used to estimate two other fitting parameters (α and β), and at the end estimated α and β are used to estimate the slit pore volume fraction. In spite of adding seven soil samples with more clay content in the validation dataset and Comparing proposed model with the scaling approach proposed by Meskini-Vishkaee et al. (2014), result and discussion part of manuscript must be extended.

The minimal requirements for possible publication mandate the following revisions:

i: In response to reviewer's comment "Specific surface area (SSA) is a required parameter to obtain the values of α and β. The authors used a power equation with two fitting parameters (Eqn. 10) to estimate SSA proposed by Sepaskhah et al. (2010). Sepaskhah et al. (2010) used twenty soil samples from a depth of 0–30 cm were collected from different locations in Fars province, in the south of Iran to calibrate the power equation. In addition, a different set of data was used to validate the calibrated model. Their results indicated that in the range of around 20 up to 200 m^2 g^-1 the values of measured SSA were in quite a good agreement, while for SSA greater than 200 m^2 g^-1, the deviations increase distinctly. As respects higher SSA is related to finer texture soils that usually have underestimation problem of estimated SWCC from PSD, Indeed, I think use power model to estimate SSA cannot be useful to improve estimated SWCC in fine-textured soils. ", the authors mentioned that in proposed method, the values of parameter α and β were firstly figured out using SSA and the measured SWC, and then these parameters were used for predicting SWC as input parameters. For the predicted SWCs of fine-textured soils which calculated from the parameter α and β, the errors from estimated SSA, to some extend, could been offset by the parameter α and β. Besides, the parameter α and β were main used to estimate the volume fraction of the slit-shaped spaces, thus the estimation accuracy of SSA influence the estimation of the volume fraction of the slit-shaped spaces, consequently the degree of improvement of predicted SWC.

The main objective to estimate SMC from PSD is to have SMC data when this data is not available. However, as mentioned above, SMC data is needed to develop proposed model for the accurate estimation especially for the fine-textured soils.

ii: regardless good performance of proposed model, SSA is used to develop model and SSA measurement is very difficult, thus it must be estimated. The proposed model is an estimation method that needs to estimate its input parameters. It is a disadvantage of proposed model.

The authors noted that the results illustrated that the improved method here applied well to a wide range of soils, while the scaling approach performed better for fine- and medium-textured soils. The validation results illustrate that the SMC predicted using the proposed method

provided the best predictions of the SMC, closely followed by the scaling approach, and the traditional method performed worst. Did the authors do any statistical analysis between the performances of three models? Is there any significant difference between three models? The authors could perform a paired T-test analysis between proposed and Meskini-Vishkaee models for mean model performance in different soil textural classes.

Even if there was a significant difference between two desired models, the proposed model is a complex model with some input parameters that is need to estimate from some difficult properties such as SSA. It is correct that the assumption of pore space geometry containing slit-shaped spaces may be affected on the accuracy of the estimation, but on the other hand, this assumption could be increased the model inputs and complexity.

I think that the authors have to add some more discussion to explain the advantage and disadvantages of proposed model. Moreover, performing statistical analysis between model performances is necessary and must be added to the manuscript text.

Minor revision:
The authors provided detailed information of both validation and calibration data sets in two table in response to reviewers. I think these tables have to add in main text of manuscript. Note: offering of the statistical criteria for each soil textural classes is not necessary. Presenting of the mean, max and min of all data for both dataset is enough.