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## Improving the Predictive Capability of Popular SWCCs by Incorporating Maximum Possible Suction

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### ABSTRACT

Soil-water characteristic curve (SWCC) that represents the relationship between the soil moisture and matric suction is one of the important constitutive models required for numerical modeling of unsaturated soils. An effective SWCC model should be capable of calculating the moisture-suction variation for the entire range of degree of saturation. Applicability of popular SWCC models such as Brooks and Corey, van Genuchten, and Fredlund and Xing is limited, especially in low (< 20%) degree of saturation range. In this study, all these models are modified by incorporating maximum suction as one of the model parameters, so that these models can be effectively used over the entire range of degree of saturation. The Fredlund et al (1994) permeability function is also modified based on the modification to the Fredlund and Xing SWCC model. The applicability of the improved models is investigated by calibrating the SWCC of various types of soil and presented in this paper. Based on this study it can be concluded that the modified models are flexible enough to fit the experimental data for the entire range of degree of saturation.

### KEYWORDS

Unsaturated Soils, Soil Water Characteristic Curve, Permeability Function, Relative Permeability of Unsaturated Soils, Relative Permeability Using Soil Water Characteristic Curve

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### References

- [1] W. Gardner, "Mathematics of Isothermal Water Conduction in Unsaturated Soils," Highway Research Board Special Report 40, International Symposium on Physico-Chemical Phenomenon in Soils, Washington DC, 1956, pp. 78-87.
- [2] R. H. Brooks and A. T. Corey, "Hydraulic Properties of Porous Media," Hydrology Paper, Colorado State University, Fort Collins, Vol. 27, No. 3, 1964, pp. 22-27.
- [3] M. Th. van Genuchten, "A Closed Form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils," Soil Science Society of America Journal, Vol. 44, No. 5, 1980, pp. 892-898. doi:10.2136/sssaj1980.03615995004400050002x
- [4] K. Kosugi, "The Parameter Lognormal Distribution Model for Soil Water Retention," Water Resource Research, Vol. 30, No. 4, 1994, pp. 891-901. doi:10.1029/93WR02931
- [5] D. G. Fredlund and A. Xing, "Equations for the Soil-Water Characteristic Curve," Canadian Geotechnical Journal, Vol. 31, No. 4, 1994, pp. 521-532. doi:10.1139/t94-062
- [6] D. G. Fredlund, A. Xing and S. Huang, "Predicting the Permeability Function for Unsaturated Soils Using the Soil-Water Characteristic Curve," Canadian Geotechnical Journal, Vol. 31, No. 4, 1994, pp. 533-546. doi:10.1139/t94-062
- [7] E. C. Leong, and H. Rahardjo, "Review of Soil-Water Characteristic Curve Equations," Journal of

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Geotechnical and Geoenvironmental Engineering, Vol. 123, No. 12, 1997, pp. 1106-1117.  
doi:10.1061/(ASCE)1090-0241(1997)123:12(1106)

- [8] S. K. Vanapalli, D. E. Pufahl and D. G. Fredlund, " The Influence of Soil Structure and Stress History on the Soil-Water Characteristic of a Compacted Till," Geotechnique, Vol. 49, No. 2, 1999, pp. 143-159. doi: 10.1680/geot.1999.49.2.143
- [9] L. A. Richards, " Water Conducting and Retaining Properties of Soils in Relation to Irrigation," Proceedings of International Symposium on Desert Research, Jerusalem, 1952, pp. 523-546.
- [10] R. E. Moore, " Water Conduction from Shallow Water Tables," Hilgardia, Vol. 1, 1939, pp. 383-426.