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Prediction of Soil Water Retention Curve: Sensitivity Analysis and Calibration of *SWRC* Fractal Model

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Soil as one component of the Soil Plant Atmosphere Continuum (*SPAC*) and an effective parameter in agricultural crop production cycle has been paid attention all the time. Soil water retention curve (*SWRC*) is one of the main hydraulic properties of the soil which represents the relationship between two parameters: water content and matric potential. Although, *SWRC* is one of the most important indices for description of hydraulic properties, its direct measurement is time consuming and expensive. In this study, a sensitivity analysis was carried out on Tyler and Wheatcraft (1990) model and the results showed that the most sensitive parameter is the *SWRC* fractal dimension (D_{SWRC}) whereas this model is less sensitive to the saturated water content and air entry value. To estimate *SWRC* for 20 samples with 6 different soil textures, D_{SWRC} was estimated from Huang and Zhang equation (2005) by using soil clay content and h_{min} from literature. Also a calibration method based on two measured points of *SWRC* in the laboratory (3 and 1500 *kPa*) was applied to improve the predicted soil water retention curves. The values of *RMSE*, *RSE* and *RE* ranged from 2.63 to 9.97, 0.07 to 0.5 and 0.05 to 0.56 before calibration and ranged from 0.55 to 3.3, 0.02 to 0.15 and 0.01 to 0.11 respectively after calibration. Comparison of the statistical parameter values, *RMSE*, *RSE* and *RE*, showed that the calibration method is able to modify the soil water retention curve accurately. The values of correlation coefficient for modified *SWRC* as a function of measured one were obtained greater

than 0.97. The results of t-statistic test also showed no significant difference between the modified and the measured soil water retention curves at 10% level. The D_{SWRC} and h_{min} values estimated from Huang and Zhang (2005) equation and literature were modified by using the adjusted values of *SWRC*. The results showed that the calibration method is able to improve the proposed estimated parameters noticeably. After calibration, the line slope and R^2 of the predicted D_{SWRC}as a function of measured ones decreased from 2.218 to 1.147 and increased from 0.65 to 0.94 respectively.