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Evaluation of Tangential Model Parameters with Respect to Various Soil Types

THIAM, Magatt[1]* ; KOHGO, Yuji[2] ; SAITO, Hirotaka[3]

[1]PhD Student, United Graduate School of Agriculture, Tokyo University of Agriculture and Technology, [2]IEAS, Graduate School of Agriculture, Tokyo University of Agriculture and Technology, [3]Department of Ecoregion Science, Tokyo University of Agriculture and Technology

Usage of Tangential model (Kohgo, 1995) for Soil Water Retention Curves (SWRCs) fitting requires knowing its parameters which are the numerical values of the coordinates of 3 tree points that are selected on the SWRC obtained from an experiment. Performing such an operation might be time consuming and may also lead to errors in the parameter estimation. This study aims to estimate these parameters and investigate possible relations between the parameters and some basic soil properties. SWRCs data and their corresponding hydraulic and physical properties were taken from the Unsaturated Soil Hydraulic Properties Database (UNSODA). The selected data consisted of 458 soils; among them: sand, sandy loams, loamy sands, sandy clay loams, silty loams, silty clay loams and silty clays. These SWRCs were fitted to Tangential model using nonlinear regression analysis with solver, the in-built Microsoft Excel tool. The iteration procedure, in solver, was the Generalized Reduced Gradient method. Results showed that the model performed well. The sum of the squared residuals (SSR) varied between 0.00011 and 0.2114 for sand and sandy soils, while it ranged between 0.021 and 0.00017 for all the others. Highest SSR values were noted with coarse sandy soils while the lower SSR values were noted with materials of finer structure. This suggests that this model is more adapted to fine structured soils. An attempt is being made in order to predict the Tangential model parameters, through multiple linear regression analysis, by using the soil bulk density values, saturated volumetric water content and the soil grain size distribution data.

Keywords: soil water retention curves, simulation, UNSODA, parametric model, fitting