Estimating Mass Fractal Dimension of Soil Water Retention Curve using Neural Networks

B. Ghanbarian-Alavijeh (1), G. Huang (2), A.M. Liaghat (1), and R. Taghizadeh-Mehrjerdi (3)

(1) Dept. of Irrigation and Reclamation Eng., Faculty of Water and Soil, Agriculture and Natural Resources Campus, University of Tehran, Karaj 31587-77871 Iran, (2) Dept. of Irrigation and Drainage, China Agriculture University, Beijing 100083 China (ghuang@cau.edu.cn, Tel: +86-10-62737154), (3) Dept. of Soil Science Eng., Faculty of Water and Soil, Agriculture and Natural Resources Campus, University of Tehran, Karaj 31587-77871 Iran

Soil water retention curve (SWRC) representing the relationship between soil water content and matric potential, is one of the most important soil hydraulic properties which its direct measurement is time consuming and expensive. The objective of this study was to develop an Artificial Neural Networks (ANNs) model to estimate the mass fractal dimension of SWRC from readily available parameters such as clay and sand contents, geometric standard deviation, total porosity and fractal dimension of particle-size distribution. Also, a sensitivity analysis was carried out on the Rieu and Sposito model. The results showed that the most sensitive parameter of the model is the fractal dimension of SWRC whereas this model is less sensitive to air entry value and porosity. To evaluate the developed ANNs model, the estimated mass fractal dimension and measured soil porosity and air entry value were used to determine the water content for each matric potential using Rieu and Sposito model. The calculated RMSE=0.044 showed that the developed ANNs model estimates the mass fractal dimension of SWRC well.