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Evaluation of Particle-Size Distribution in Prediction of Soil Moisture Shape Index

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Description of water flow in soils requires knowledge of soil hydraulic properties. The hydraulic properties of unsaturated soil are represented by the water retention characteristic which is a relationship between volumetric soil water content and capillary pressure head and unsaturated hydraulic conductivity function. Unsaturated soil hydraulic functions are important in many hydrological, ecological and agricultural studies as they are critical input parameters in models for variably-saturated flow and contaminant transport. They often serve as integrated indices for soil quality. Direct measurement of these functions is impractical for most applications especially for relatively large-scale problems. For this reason, many applications rely on pedotransfer functions (*PTF*s) for indirect estimation of hydraulic functions from more easily measured or more readily available information, e.g. soil texture, bulk density and particle-size distribution. In this study, 160 soil samples with a wide range of soil textures from *UNSODA* and *GRIZZLY* databases (called database 1) were used to compare Braud et al. (2005) method with Minasny and McBratney (2007) method for estimation of soil moisture shape index (P_m) from the particle-size shape index (P_M) presented by Zatarain et al. (2003). The lower values of statistical parameters *RSE (relative standard error)* and *AIC* (Akaike's information criterion) showed that the empirical relationship presented by Minasny and McBratney (2007) predicts P_m better than Braud et al. (2005) method. By using database 1, an empirical quadratic polynomial equation was found between P_m and P_M with goodness of fit R^2= 0.78.

Database 2 consist of 15 soil samples collected from Karaj, Iran, was used to analyze the presented equation. By plotting the estimated P_m as a function of directly calculated P_m, the line slope was obtained 0.85 for Minasny and McBratney method and 0.57 for presented empirical equation. The results showed that two methods underestimate P_m values but Minasny and McBratney (2007) method predicts soil moisture shape index better than the presented empirical equation.