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The Comparison of Predicted and Measured Hydraulic Conductivities of Soils having Different Physical Properties

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Hydraulic conductivity is one of the most important parameter of earth science related studies such as engineering geology, soil physics, agriculture etc. In order to estimate the ability of soils to transport fluid through particles, field and laboratory tests have been performed since last decades of 19^{th} century. Constant and falling head tests are widely used to directly measure hydraulic conductivity values in laboratory conditions for soils having different particle size distributions. The determination of hydraulic conductivity of soils by performing these methods are time consuming processes and also requires undisturbed samples to reflect in-situ natural condition. Considering these limitations, numerous approaches have been proposed to practically estimate hydraulic conductivity of soils by utilizing empirical equations based on simple physical and index properties such as grain size distribution curves related parameters, porosity, void ratio, etc. Many previous studies show that the hydraulic conductivity values calculated by empirical equations deviate more than two order magnitude than the measured hydraulic conductivity values obtained from convenient permeability tests. In order to investigate the main controlling parameters on hydraulic conductivity of soils, a comprehensive research program was carried out on some disturbed and undisturbed soil samples collected from different locations in Turkey. The hydraulic conductivity values of samples were determined as changing between 10^{-6} and 10^{-9} m/s by using falling head tests. In addition to these tests, basic soil properties such as natural water content, Atterberg limits, specific gravity and grain size analyses of these samples were also defined to be used as an input parameters of empirical equations for prediction hydraulic conductivity values. In addition, data from previous studies were also used for the aim of this study. The measured hydraulic conductivity values were correlated with all physical and index properties of soils by using regression analyses. Furthermore, the results belong to falling head tests were compared with the predicted values obtained from the most commonly utilized empirical equations suggested in previous studies. As a result of this comparison, it can be concluded that the difference between direct measurement and empirically calculated hydraulic conductivity values reaches beyond acceptable limits.