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Hydraulic Conductivity Evaluation for a Drainage Simulation Model (DRAINMOD)

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Abstract: The objective of this study was to determine the most suitable saturated hydraulic conductivity (K) values as input into DRAINMOD among a range of K data sets developed for the drainage experiment site in North Central Ohio using seven different K estimation methods. The K methods evaluated were monolith, core, auger-hole, MUUF soil database, and using the Hooghoudt, Kirkham, and van Schilfgaarde equations with water table drawdown and drainage discharge data. Simulations using DRAINMOD (Version 4.6) were conducted for the years 1962-1964 and 1967-1971, and runoff and drain discharge predictions were compared with measured discharges. The analyses showed that none of the K estimation methods provided the smallest deviation in discharges when individual years were considered, except for drain discharge in 1967-1971. For 1967-1971, the simulation results with the van Schilfgaarde equation produced the smallest average deviation. The simulations with the van Schilfgaarde equation also produced the smallest deviation in runoff in three of the five years that also had the smallest drain discharge deviation. Overall, the simulation results with the van Schilfgaarde equation produced the smallest total deviation for both drain discharge and runoff over all eight test-years. The rank order (smallest to largest total deviation) of the K methods for drain discharge was van Schilfgaarde, Hooghoudt, and Kirkham equations, followed by auger-hole, monolith, core methods, and then the MUUF soil database. The rank order of the K methods for runoff was van Schilfgaarde, Hooghoudt, Kirkham, auger-hole, MUUF soil database, core, and monolith. Where drain discharge and water table depth measurements are available or practical to obtain, using the hydraulic conductivity values estimated with the van Schilfgaarde equation in DRAINMOD may provide more reliable modeling results.

Key Words: Hydraulic conductivity, DRAINMOD, runoff, drain discharge