Estimation of Field-Scale Variability of Soil Saturated Hydraulic Conductivity: Contending with Uncertainty

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ABSTRACT: Saturated hydraulic conductivity (K_s) is among the important soil properties that influence the partitioning of rainfall into surface and subsurface waters. Field-scale variability of K_s is assessed either by making point-scale measurements, or performing field-scale infiltration experiments under natural or artificial rainfall. However, both data collection techniques have limitations that hinder our ability to properly resolve the spatial variability of K_s over a field. To contend with the resulting uncertainty, a method that employs a field-averaged infiltration model and Monte Carlo simulations was used to obtain the possible range of distributions of K_s that would describe experimental observations over a field. The role of point-scale estimates from common infiltration measurement devices (double-ring infiltrometer, CSIRO tension permeameter, and Guelph constant-head permeameter) in estimation of the field-scale variability of K_s was investigated using a Bayesian framework. Disparate estimates of K_s distribution parameters were obtained from individual instruments. Strategies for leveraging point estimates along with rainfall-runoff experiments for assessing field-scale variability of K_s will be explored.

Bio: Rao S. Govindaraju is the Bowen Engineering Head and the Christopher B. and Susan S. Burke Professor in the School of Civil Engineering at Purdue University. He earned his PhD in civil engineering from the University of California, Davis, in 1989. His primary areas of research include surface and subsurface hydrology, contaminant transport, watershed hydrology, and climatic influences. He is interested in developing algorithms for analyzing and learning from hydrologic data. He specializes in problems dealing with uncertainty and spatial variability. His research work has been supported by various agencies such as NSF, EPA, DOD, and DOE. He has chaired national level committees and has served on the editorial boards of several journals. He is currently the Editor-in-Chief of Journal of Hydrologic Engineering, American Society of Civil Engineers, and served as the President of American Institute of Hydrology (2017-2018). His work has been recognized with numerous national and international awards.

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