

A fully-automated apparatus for constant flux, constant head, and falling head hydraulic conductivity measurements

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Abstract. Knowledge of hydraulic properties, such as hydraulic conductivity and soil moisture retention, is crucial for understanding flow and contaminant transport in the subsurface. Hydraulic properties are often important input parameters for numerical simulation of flow and transport. Unfortunately, acquisition of these properties is usually time consuming and costly because of the manual labor associated with the currently available laboratory techniques. Lately, there has been increased interest in automating hydraulic conductivity laboratory techniques to reduce analysis time and improve data consistency. The newly designed fully automated Hydraulic Properties Apparatus (HPA), located in the Environmental Molecular Sciences Laboratory at Pacific Northwest National Laboratory, provides enhanced capabilities. The HPA is unique in that it can determine a consistent set of hydraulic properties for a single packing or core using multiple techniques (i.e., falling-head, constant-head, constant flux, multistep, and soil moisture retention relations). This paper demonstrates the new apparatus and presents hydraulic conductivity data sets for standard laboratory Accusand and a Hanford Site porous media.