SSC 107 - LABORATORY EXERCISE 8

Saturated Hydraulic Conductivity

Introduction

The saturated hydraulic conductivity of undisturbed field soil cores will be determined in the laboratory. Laboratory examination of saturated soil hydraulic conductivity is based on the application of the Darcy equation. Water is ponded on a saturated soil column at a constant head, and the resulting steady-state flux and head gradient are measured. The saturated hydraulic conductivity is given by:

$$K_s = \frac{VL}{At(H_2 - H_1)} \qquad \text{[Eqn. 1]}$$

where K_s is the saturated hydraulic conductivity (cm sec^{-1}), V (mL)is the volume of water collected in time t (s), L is the length of the sample (cm), A is the cross-sectional area of the sample (cm^2), and (H_2-H_1) is the difference in head between the top and bottom of the sample (cm).

A 0.01 M $CaCl_2$ solution will be used instead of distilled water to prevent dispersion of soils that have a high sodium content.

Procedure

1. Level both ends of the undisturbed soil cores with a spatula or straight knife.

2. Cover one end of the sample with cheesecloth. Use a rubber band to hold the cheesecloth. Trim the cheesecloth close to the core.

3. Place all samples, with the cheesecloth end down, in a tray and pour $CaCl_2$ solution into the tray until the water is just below the top of the cores. Let the samples sit for at least 12 hours, add more of the solution as necessary.

4. Clean any soil from around the upper surface of the sample cylinder. Connect the acrylic cylinder to the top of each sample. Make sure the O-ring is in the groove to prevent any leaks.

5. Fill the apparatus trough with $CaCl_2$ solution and start the recirculating pump.

6. Place filter paper on top of the sample and pour $CaCl_2$ solution into the acrylic cylinder until it is half filled.

7. Transfer samples onto the apparatus and connect the glass siphons between the trough and each core. You may need two siphons per core.

8. Measure the level of solution in the acrylic cylinder after it has stabilized. After steady-state flux has been attained, measure the volume of solution that passes through the sample in 30 minutes.

9. Calculate the saturated hydraulic conductivity of each sample using Eqn. [1]. Use the bottom of the sample as a reference point, ie. H_1 equals 0 and H_2 is the distance between the base of the core and the surface of the water ponded in the acrylic cylinder.

[Figure 1]

Lab Report Point Distribution

Abstract: 0.5
Materials and Methods: 0.5
Presentation of Results: 2.5
Discussion: 5
Conclusion: 0.5
Overall Composition: 1
TOTAL: 10