Estimation of Entrapped Air and Pore Tortuosity for Soils Approaching Water Saturation. (S01-mccoy093206-Poster)

Authors:

- E.L.McCoy* Ohio State University
- A.V.Granovsky Ohio State University
- W.D.Shuster Ohio State University

Abstract:

Air permeability (Ka) and air-filled porosity (Ea), at negative heads (h) ranging from 0 to 240 mm, were measured for 106 undisturbed soil cores. The measurement employed an air pressure gradient to compensate for gravity, and imbibition to h = 0 preceded measurements at sequentially increasing h. The presence of trapped air and measurable airflow at h = 0 confounded analysis of permeability and porosity relations. Thus, a K-weighted scaling of experimental heads was conducted, analogous to a characteristic length scale, such that Kr = 0 at $h^* = 0$ where Kr is the relative permeability, Ka/Ka(240), and h^* is the scaled head. Expressing the degree of air saturation, Sf = Ea/Ea(240), as a function of h^{*} provided an estimation of the maximum degree of trapped air observed at $h^* = 0$. The degree of trapped air ranged from 0 to 0.83 (mean = 0.38) indicating that a sizable proportion of air-filled porosity is nonconducting. With these adjustments, a Mualem-type expression for Kr as a function of the degree of conducting air allowed estimation of a tortuosity factor, n. Values of n ranged from 0.27 to 9.1 (mean = 2.9), the interpretation of which will be discussed.

Corresponding Author Information:

Ed McCoy Ohio State Univ. 1680 Madison Ave. Wooster, OH 44691 phone: 330-263-3884 fax: 330-263-3658 e-mail: mccoy.13@osu.edu

Presentation Information:

Presentation Date: Wednesday, November 13, 2002 Presentation Time: 10:00 am-12:00 pm Poster Board Number: 1326

Keywords: pore tortuosity, pore continuity, soil macropores