Pore Scale Modeling and Measurement of the Dielectric Properties of Unsaturated Porous Media. (S01-robinson194458-Oral)

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Abstract:

Topp's seminal paper published in 1980 presented an excellent set of measurements of the permittivity of porous media and soils as a function of their water content. The time domain reflectometry method has now become established and is widely applied in soil science. During this period a remarkable number of sample scale calibration measurements and models have been presented. However, these models tend to be limited as they often fail to capture the relevant pore-scale physics of the system. In this work we describe a modeling and measurement approach which builds from the pore/grain scale to predict measured effective properties. The modeling can be used to take into account the effects of electrical field interactions between close packed grains, different particle shapes and different particle size distributions. When combined with a sample scale model describing layering effects, data for simple systems of glass beads and quartz sand which were wetted and dried were successfully modeled.

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