



Effects of the soil pore network architecture on the soil's physical functionalities

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The soil fluid movement's prediction is of major interest within an agricultural or environmental scope because many processes depend ultimately on the soil fluids dynamic. It is common knowledge that the soil microscopic pore network structure governs the inner-soil convective fluids flow. There isn't, however, a general method that consider the pore network structure as a variable in the prediction of the core scale soil's physical functionalities. There are various possible representations of the microscopic pore network: sample scale averaged structural parameters, extrapolation of theoretic pore network, or use of all the information available by modeling within the observed pore network. Different representations imply different analyzing methodologies. To our knowledge, few studies have compared the micro-and macroscopic soil's characteristics for the same soil core sample. The objective of our study is to explore the relationship between macroscopic physical properties and microscopic pore network structure.

The saturated hydraulic conductivity, the air permeability, the retention curve, and others classical physical parameters were measured for ten soil samples from an agricultural field. The pore network characteristics were quantified through the analyses of X-ray micro-computed tomographic images (micro-CT system Skyscan-1172) with a voxel size of $22 \mu\text{m}^3$.

Some of the first results confirmed what others studies had reported. Then, the comparison between macroscopic properties and microscopic parameters suggested that the air movements depended mostly on the pore connectivity and tortuosity than on the total porosity volume. We have also found that the fractal dimension calculated from the X-ray images and the fractal dimension calculated from the retention curve were significantly different. Our communication will detail those results and discuss the methodology: would the results be similar with a different voxel size? What are the calculated and measured parameters uncertainties?

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