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Evaluation of soil structural changes through macroscopic and microscopic measurement

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The heterogeneity of soil structure and pore size distribution are highly influenced by external factors like tillage systems and other agricultural management practices. However, changes in soil hydrodynamic behavior are not fully understood and are still under research. Also, researchers have explained the impact of tillage practices on soil hydraulic properties related to pore size distribution, connectivity and orientation are involved but the characterization of these modifications and consequences remains a challenge. Furthermore, the relation between macroscopic measurements and microscopic investigation of the soil structure remains scarce. Recently, X-ray tomography (X- μCT) has been used in order to characterize changes in soil pore size distribution in various contexts and the method is able to link microtomography information to hydrodynamic measurement. In our study, X-μCT has been used in order to characterize changes in soil pore system. Since, tomography does not count most of the micropores, Richards' pressure plate and evaporation method was also combined to get complete range of pore size distribution. We found good match between evaporation data with X-μCT at the macropore scale and evaporation data with pressure plate method at micropore scale. X-μCT data refines retention and hydraulic curves near saturation where Richards' data alone can lead to numerous sets of fitted parameters. On the otherhand, evaporation data (Hyprop apparatus ©) provide comparable datasets with X-μCT. Combining micro and macroscopic measurements allows us to validate X-μCT information, which is otherwise not so obvious.