# Methodological limits for characterizing the hydrostructural behavior of a saline clayey soil (Kairouan region, Central Tunisia)

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In the laboratory, the hydrostructural characterization of a given soil sample consists in measuring the variation of its volume as a function of its mass water content. Firstly, the sample is saturated per ascencum with deionized water, by placing it on a calibrated sand column under a low hydraulic head pressure ranging from -100 mm to -20 mm. Once saturation is reached, the sample is dried in an oven at 30°C. During the desiccation phase, its volume and mass are automatically recorded at a regular time step. The final sample is dried at 105°C, weighted and its final volume measured using the vacuum plastic bag method. The acquired data make it possible to obtain the shrinkage curve of the sample. The approach is based on the implicit assumption that we reproduce the soil moistening by a weakly mineralized rainwater and a soil drying. The same methodology applied to a saline clayey soil of Tunisia shows some singularities. During the moistening phase reaching the most complete water saturation of the soil, it is found that the salinity of the soil solution varies. The 1/5 electrical conductivity measurements ($EC_{1/5}$) made on the initial sample (air-dried before moistening) and the final sample (oven-dried at 105°C) show a significant decrease. In contrast, the $EC_{1/5}$ measurements in the sand column and the EC of the deionized water indicate an increase in values. The continuous changes in the salinity of the soil solution are due to the mineral dissolution of salts precipitated in the porosity and to cationic desorption by the clay minerals. The change in soil salinity will influence the soil structure and, consequently, the shrinkage curve. The interpretation of shrinkage curves, relating to soils with variable salinity, will be more debatable. In conclusion, it would be wise to adapt the saturation method with deionized water when applied to saline soils. The ideal would be to saturate the soil with a water of a salinity and chemical composition identical to the salinity and chemical facies of the soil solution. As soil salinity is usually very variable, there is the question of finding the "ideal" saturation water. A saline groundwater directly supplying a given soil could be suitable. Reconstituting in the laboratory a water of a given salinity and chemical composition is also feasible, but would greatly extend the experimental protocol. In any case, normalization is necessary to compare the hydrostructural behavior of a soil with various salinities.

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