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## Soil structure development under treated waste water irrigation

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Irrigation with treated waste water (TWW) is a common practice in arid and semiarid areas as it combines a sustainable, all-season available water recourse and the recycling of nutrients. Previous studies have shown that TWW provides salts and loads of organic material which can affect soil hydraulic properties and may change soil structure mediated by soil biota and sodicity. To investigate the long-term effect of TWW irrigation, we analyzed (i) soil structure alteration via X-ray computer tomography and (ii) changes in soil hydraulic properties in soils irrigated with TWW since more than 7 years.

Undisturbed soil samples were taken from the upper soil layer (0-20 cm) of two orchards in Israel with different soil textures: a loamy sand and a sandy clay loam. For comparison, samples below the drip irrigation and from non-irrigated soil were investigated. For the loamy sand, additional samples irrigated with fresh water were taken. Via image analysis we distinguished the macro-pore system, soil matrix, and organic litter and determined their spatial distributions and the connectivity of the macro-pores at a resolution of 60  $\mu$ m. By subsampling we widened the spatial scale to a resolution of 19  $\mu$ m. Differences in soil texture, organic material, and soil chemical properties (pH, EC, and SAR) were investigated to determine changes in soil environment. Soil hydraulic properties were determined by HYPROP-experiments and supplemented by Multi-Step-Flux experiments.

In this study we show that long term irrigation with TWW alters soil chemical properties and the composition of soil organic matter. Furthermore, it was found that irrigation enhances structural formation independent of water quality. Effects on soil texture and soil hydraulic properties differ with soil parent material, but differences between the treatments were smaller than the variability within the treatments.