



Non-destructive high-resolution X-ray CT as an aid for the quantification of soil compaction

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During a compaction process the internal soil structure changes and soil aggregates are consolidated. This not only increases the soil density by reducing the pore-size, but also the continuity of pores and the size and stability of aggregates are varying. Changes in soil structure are important since they affect the migration of water, air, roots and soil organisms through the soil.

In this study, the extent of soil compaction was quantified in function of depth. From the same soil profile, 3 horizons at a different depth were primarily impregnated with epoxy resin in order to stabilize the non-cohesive soil and to allow 2D-image analysis of the polished blocks. Pieces of the impregnated soil underwent scans by the high-resolution X-ray micro-CT of the UGCT X-ray facility of the Ghent University. The reconstructed images were analysed by the in-house developed 3D-software “ μ CTanalySIS” in order to quantify the internal pore structure of the soil samples. Data derived from 2D-image analysis by optical microscopy, demonstrating that the second horizon turned out to be more compacted than the horizons below and above, was compared with the 3D-data derived from the micro-CT scans. The advantages and limitations of both techniques concerning the quantification of soil compaction will be discussed.