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# Soil structure development of anthropogenic soils used in bioretention cell

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Engineered soils play an important role in urban hydrology e.g. in the functioning of green roofs and stormwater bioretention cells. Water infiltration, colloid transport, and heat transport are affected by changes in pore system geometry particularly due to the development of macropores and clogging by particles. The aim is to elucidate changes in bioretention cell performance by studying the structural changes of soils at the microscale by invasive and noninvasive methods. Noninvasive visualization methods such as computed microtomography (CT), are an effective mean of soil structure assessment. X-ray CT is capable to investigate soil in terms of structure development, pore-clogging and pore geometry deformations.

Two identical bioretention cells were established in December 2017. The first bioretention cell (BC1) collects the stormwater from the roof of the nearby experimental building (roof area 38 m2). The second bioretention cell BC2 is supplied from a tank using a controlled pump system for simulating artificial rainfall. The 30 cm thick biofilter soil mixture is composed of 50% sand, 30% compost, and 20% topsoil. Bioretention cells are isolated from the surrounding soil by a waterproof membrane. The regular soil sampling program was initiated in 2018 in order to visualize and quantify the soil structure and internal pore geometry of samples. Undistributed samples were collected from the surface of the filter layer twice a year from each BC. The aluminum sampling cylinders had an internal diameter and height of 29 mm. Three batches of samples were taken during three years. The first set of 24 undisturbed samples was collected upon planting in June 2018, while the second set of 24 samples was taken after the end of the first vegetation period in November 2018. The second and third batches, each of 48 samples, were taken in 2019 and 2020 in the same period as in the first year. Those collected samples were scanned by (CT) imaging.

The analysis performed by SoilJ package shows the initial decrease of macroporosity during the first season as a result of soil consolidation and subsequent further development of the soil's pore system.