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Structural changes of green roof growing substrate layer studied by X-ray CT

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Increasing interest in green infrastructure linked with newly implemented legislation/rules/laws worldwide opens up research potential for field of soil hydrology. A better understanding of function of engineered soils involved in green infrastructure solutions such as green roofs or rain garden is needed. A soil layer is considered as a highly significant component of the aforesaid systems. In comparison with a natural soil, the engineered soil is assumed to be the more challenging case due to rapid structure changes early stages after its build-up. The green infrastructure efficiency depends on the physical and chemical properties of the soil, which are, in the case of engineered soils, a function of its initial composition and subsequent soil formation processes.
The project presented in this paper is focused on fundamental processes in the relatively thick layer of engineered soil. The initial structure development, during which the pore geometry is altered by the growth of plant roots, water influx, solid particles translocation and other soil formation processes, is investigated with the help of noninvasive imaging technique [U+F02D] X-ray computed tomography.
The soil development has been studied on undisturbed soil samples taken periodically from green roof test system during early stages of its life cycle. Two approaches and sample sizes were employed. In the first approach, undisturbed samples (volume of about 63 cm3) were taken each time from the test site and scanned by X-ray CT. In the second approach, samples (volume of about 630 cm3) were permanently installed at the test site and has been repeatedly removed to perform X-ray CT imaging.
CT-derived macroporosity profiles reveal significant temporal changes of soil structure. Clogging of pores by fine particles and fissures development are two most significant changes that would affect the green roof system efficiency.
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