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Temporal changes of topsoil hydraulic conductivity studied by multiple-point tension disk infiltrometer

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Hydraulic conductivity of cultivated soils is strongly affected by agrotechnical procedures, soil compaction, plant growth etc. This contribution is focused on series of measurement of topsoil unsaturated hydraulic conductivity using automated multipoint tension infiltrometer developed at CTU in Prague. The apparatus consists of two triplets of minidisk infiltrometers that are supported by a light aluminum frame. Therefore it allows simultaneous measurement of six tension infiltrations at two different pressure heads.

Experiments were conducted at the experimental agricultural catchment Nučice (Central Bohemia, Czech Republic) as a part of the broader research of rainfall-runoff and soil erosion processes. The soil in the catchment is classified as Cambisol with texture that is ranging from loam to clay loam and is conservatively tilled. Series of ten infiltration campaigns (56 individual infiltration experiments) were carried out on a single experimental plot during period of two years. Dataset involves measurement under various agricultural activities and crop phenophases. The hydraulic conductivities were determined using extended semiempirical estimation procedure of Zhang. Additionally, large undisturbed soil samples were analyzed with use of X-ray computed tomography to assess the soil structure morphology in detail.

Results show that unsaturated hydraulic conductivity was the lowest in early spring and did increase at beginning of summer. Unsaturated soil hydraulic conductivity was higher when the soil bulk density was high. During the summer and autumn the unsaturated hydraulic conductivity remained relatively unchanged. The impact of agricultural procedures was not apparent in the dataset..

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