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# Estimating hydraulic properties of the soil aggregates and their clay coatings from water retention and cumulative capillary rise data

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A modified method for measuring hydraulic properties of organomineral coatings, which occur in some soils, is presented in this article. Knowledge of coating occurrence, structure and hydraulic properties are required for more precise description of a preferential flow and contaminant transport in soils (Kodesova et al., 2008, 2009, 2010, 2011; Leue et al., 2010). Hydraulic properties of soil aggregate coatings are usually estimated base on an available literature or optimized together with other soil hydraulic properties from a transient flow data measured in the field or laboratory on the entire undisturbed soil specimen. The aim of this study was to measure hydraulic properties of soil aggregates and their clay coatings in the iluvial horizon of Haplic Luvisol in Hněvčeves (Hradec Králové, Czech Republic) directly. Larger aggregates were taken from the Bt2 horizon.
First, soil water retention curve was measured on all soil aggregates. Parameters of soil water retention curve were obtained using the RETC program. Then capillary rise from the saturation pan into the aggregates without (clay coatings were removed) and with clay coatings was measured similarly to Gerke and Kohne (2002). Cumulative infiltration in time measured for aggregates without clay coatings and parameters of the retention curve were used as input data for a numerical optimization of the saturated hydraulic conductivity, KS, of investigated aggregates using the HYDRUS-1D program. Program HYDRUS-1D was also applied for optimizing saturated hydraulic conductivity, KSA, of clay coatings. In this case, the cumulative infiltration in time, measured for aggregates with coatings, were analyzed. Parameters obtained using the RETC code characterized retention curves of both, aggregates and clay coatings. Saturated hydraulic conductivity, KS, of aggregates from previous optimization was assumed.
Results confirmed hypothesis that organomineral coatings slow down water flow into the soil aggregates. Water infiltrated into the soil aggregates without clay coatings faster than into the aggregates with coatings. The saturated hydraulic conductivities, KSA, of clay coatings were one order of magnitude lower than the saturated hydraulic conductivities, KS, of aggregates. Decreased water infiltration into the soil aggregates usually increases preferential flow intensity (Kodesova et al., 2010).

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