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Modelling infiltration into crusted soils by a modified Horton equation

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The impact of raindrops on soil surfaces can cause surface crusting constraining infiltration and promoting direct runoff. With regard to rainfall-runoff modelling crusting cannot be ignored. Particularly agricultural land is concerned by this phenomenon, because these areas are not protected continuously against the impact of raindrops by a vegetation cover. The effect can be described by a modified Horton equation taking into account effective kinetic energy of rain, soil properties (initial and final infiltration rate, decay constant), the surface cover and the kinetic energy of the precipitation, which increases with duration and intensity. However, in most hydrological models this process is not taken into account because generally applicable parameters of the modified Horton equation are missing. This hampers the quantification of the effect of different land-use and tillage practices and other local measures to reduce sealing-induced runoff in hydrological modelling, which is the main focus of the DFG-project – *Influence of tillage practices on infiltration processes in agricultural catchment areas*.

More than 100 artificial rain experiments from different groups covering a wide variety of soil (e.g., 4...61% clay), land-use (e.g., 0...85% cover) and rain conditions (e.g., 29...99 mm/h) were used to derive universally applicable parameters of the modified Horton equation under arable land use. Initial infiltration rate depended on time since tillage indicating storage loss due to settling. Sand content and median grain diameter determined final infiltration rate. The decay constant depended on time since tillage

indication increasing stabilisation and sand content decreasing stability.