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Complementary experiments to understand rapid flow in periglacial slope deposits

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In structured soils we face limits of the porous-media assumptions for our measurements. Not only spatial heterogeneity and structures but also the large spread of process velocity impose considerable ambiguity to point observations and singular experiments.

We present insights from complementary sprinkler experiments at the plot and hillslope scale on highly structured young soils on periglacial slope deposits. On the plot scale of 1 m2 we combined different tracers (Brilliant Blue and Bromide) with soil moisture monitoring and 3D time-lapse GPR (Ground Penetrating Radar) with an sprinkling intensity of 50 mm for 1 h. At the hillslope scale we combined a soil moisture monitoring network (TDR boreholes) with four 2D time-lapse GPR profiles (GPR inferred trenches) for an irrigation of some 120m2 with about 100mm for 4.5 h. At both scales rapid flow in structures dominates in vertical as well as lateral direction with high spatial variability. The combination of methods chosen for the experiments turned out to be very useful to complement the respective assumptions and limitations of each single technique.

As such we will present the main findings from the experiments and highlight the possibilities arising from GPR applications and how the observation of the same process with different techniques can be used to limit uncertainty and ambiguity.