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Winter conditions and their effects on soil properties and spring erosion on agricultural soils – first results and outlook on further work

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In the Scandinavian countries, the highest levels of soil erosion on agricultural land are usually measured during the spring period. During the end of the winter, snowmelt combined with heavy rains often lead to sever erosion on agricultural soils. The severity of erosion is often determined by the winter conditions, which effect certain soil properties (i.e. infiltration capabilities, structure and surface morphology) and the snow pack properties during snow melt. To reduce spring erosion by implementing suitable mitigation measures it is necessary to have a better understanding of these processes that occur during winter at a catchment scale.The first step in this study was to understand the change in infiltration capabilities, frost development and change in soil temperature of the two main soils in the study catchment during soil freezing and thawing. To do that six 50 cm x 20 cm soil cylinders equipped with 4 TDR/temperature probes where installed in the field, three on each soil type. The obtained data together with measured soil water retention characteristics and other soil physical parameters (i.e. bulk density, organic matter content, soil texture) were then used to calibrate and validate a hydrogeological model (Hydrus 1D). The purpose of this was to gain a better process understanding and validate if the model could be used to produce input parameters (e.g. saturated soil hydraulic conductivity) for later applied soil erosion modelling under different winter conditions. The results showed that the two soil types reacted differently to changing winter conditions.We also found that Hydrus model was capable of reproducing the measured values in an acceptable error range and can be further used to calculate input values for different winter conditions for the soil type investigated in this study.To improve our understanding of the processes that lead to spring erosion at a catchment scale further we now aim to use a variety of methods. We intend to investigate; (1) the heterogeneity of the snow pack on a catchments scale during winter and snow melt by use of remote sensing (i.e. airborne photogrammetry) and 35 snow depth measuring poles distributed over the catchment. (2) The effect of slope, aspect and curvature on infiltration processes and frost development during winter using electronically resistivity measurements (ERT). (3) Lateral flow processes in snow packs in a Laboratory experiment and (4) the change in macro pore structure due to freezing and thawing using X-ray computed tomography.