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# Controls on soil moisture temporal and spatial variability on a recently forested hill slope

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Soil moisture is a critical hydrological component in various water transport processes and a key state variable in controlling land-atmosphere interaction including evapotranspiration, infiltration and groundwater recharge. At the hillslope scale, interactions with hydrometeorological drivers, environmental factors and hydrological processes result in complex spatial and temporal variations of soil moisture distribution. Various soil moisture monitoring techniques exist, but these do not fully resolve the spatial and temporal variations in soil moisture distribution at scales required for effective process understanding.
In this study, active distributed temperature sensing (A-DTS) has been employed to characterise the soil moisture distribution in multi-layer horizontal surveys along a recently forested hill slope. Data collection at high temporal and spatial scales provided the basis for detailed hill slope (unsaturated flow) modelling (COMSOL) to investigate the relationship between antecedent soil moisture conditions and rainfall duration/intensity, and the occurrence of seasonal trigger events (i.e. events which result in a rapid soil moisture increase at specified depths and locations along the hill slope).
Preliminary results suggest that different mechanisms control the soil moisture distribution and the occurrence of trigger events at different parts of the slope. Beside topographical controls, heterogeneity in the low-permeability glacial till deposits, specifically the development of preferential flow pathways, are found to be a main factor controlling the response to rainfall events and the occurrence of rapid soil moisture increases (i.e. trigger events).
These finding demonstrate the utility of A-DTS technology in soil moisture studies and their potential to contribute to an improved understanding of hydraulic processes and groundwater recharge through low-permeability deposits.