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Influence of root and root channels distributions on the lateral subsurface flow of homogeneous soils

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Is it recognized that vegetation influences different hydrological processes at different temporal and spatial scales. In fact, there is a wide controversial discussion on the quantification of flood risk mitigation through vegetation and forest management strategies. Nearby numerous empirical and theoretical studies at the catchment/hillslope scale there are many studies at the soil profile scale that characterize the influence of vegetation on the hydrological processes. However, the link between the different scales still be difficult. Studies at the catchment/hillslope scale emphasize the importance of lateral subsurface flow in regulating the formation of floods events. Other studies formulate the hypothesis that root distribution and root turnover influence processes such as infiltration and water retention. However, no studies could show systematically the influence of root or root channels distribution on lateral subsurface flow for different soil types and slope inclinations. In this study we used a inclined box (0.25 x 0.4 x 0.4 m) in order to measure the relation between the amount of shallow lateral subsurface flow (0-0.1 m), the deeper lateral subsurface flow (0.1 – 0.4 m), and the vertical percolation in function of factors such density of roots, diameter distribution of roots, density of root channels, diameter distribution of root channels, soil type, and slope inclination. Roots were embedded in the soil at regular depth and oriented parallel to the slope surface. The sprinkling experiments were carried out with a rainfall intensity of about 80 mm/h for duration of 10 minutes. The results show that the lateral subsurface flow is strongly influenced by both root and root channels density/distribution. Further work will aim to combine physical approaches validated for the description of the here presented laboratory results with root distribution modeling at the hillslope scale in order to quantify the lateral hydrological connectivity and the runoff coefficients of forested slopes.