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Investigating the vectors of subsurface storm flow in a hillslope

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The infiltration of water is mainly dominated by vertical direction, but subsurface storm flow is mostly oriented parallel to the slopes. In this poster we focus on the transition from vertical to lateral flow in a layered hillslope. Transient flow is assumed to move as a wetting front although we consider both preferential flow and matrix flow.

Three time-domain reflectometry (TDR) wave-guides, each 0,15 m long, were arranged with a 90˚ angle between the three axis respectively the wave-guides itself. This setup forms a truncated tetrahedron with its peak pointing down. Each wave-guide focuses the increase of soil moisture along its axis and though front velocity. The three front-velocity vectors are decomposed into their x, y and z components, which are then assembled to a final resultant velocity vector. The product of the front velocity and the mobile water content results in the volume flux density, whose vector is determined similarly to the velocity vector.

This experimental approach was applied across a hillslope using a spatially distributed arrangement of TDR-triplets. The slope consisted of a sandy loam with a sandstone bedrock interface at 50 cm depth. The site was artificially rained on with an intensity of 20mm/h. In the poster, we present the vectors of flow and relate then to capillary potential, timing of subsurface flow as well as initial boundary conditions. We also deal with spatial correlation of the vectors throughout triplets located at different locations and depths.