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Hydrology and Earth System Sciences Discussions

Interactive comment on "Temporal variability of subsurface stormflow formation" *by* P. M. Kienzler and F. Naef

A. Bronstert (Referee)

axelbron@uni-potsdam.de

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This is a manuscript reporting on detailed observations on subsurface and surface runoff generation at the hillslope scale. The content of the paper suits well into the scope of Hydrology and Earth System Sciences and is of high novelty.

I suggest to accept the paper after some minor improvements:

I Please explain, why the antecedent moisture values for the second experiments are not much higher than before the first experiments. Is it possible to apply a closed water balance for the period from before the first experiment until the beginning of the second experiment, and ongoing until the end of the second experiment ? This might be a rough calculation, but you could show a summarising table containing the rates

and volumes of the different fluxes and stores of the hillslope scale water balances. This might also explain some losses to the underlying bedrock.

II Fig 3, right pictures: what do you consider “soil drainage” ? What actual process is shown here, in what dimensions ? Does it make sense to put the dynamics of soil moisture, soil suction, piezometric head etc. in the same figure ? Their relation is highly non-linear

III the readability of the paper should be improved. In the present version the results are presented in sections 4 and 5 in a rather descriptive manner by explaining the different observations in detail and discussing possible occurrence and interactions of/between different processes for different antecedent moisture and irrigation intensities. It may already help to insert a sub-sectioning into section 5. In addition, I suggest including some scheme of the conceptual model underlying these processes and their interactions. Fig 7 is partly such a scheme. However, some processes are missing. - e.g. drainage below the hillslope lower boundary (e.g. is water infiltrating into the rock fissures ?) - why does the infiltrated water percolate through the macropores during low-intensity and not during high intensity ? What are the anticipated mechanisms for those observations. This many also help to explain the surprising results of the Schluessberg hillslope (the water almost entirely remains at / near the surface for high intensity sprinkling). Why? - What are the anticipated effects controlling surface infiltrability, resulting in less percolation (and/or bypass flow?) for high intensities? Did the high intensities cause soil siltation effects ?

IV The conclusions ref. possible future applications of the gained knowledge are very limited, e.g. (how) can this knowledge be introduced into catchment scale rainfall runoff analysis ?

V The text within the abstract is a controversially: Lines 11 - 13 say: “Formation of subsurface stormflow was hardly influenced by the increase of precipitation intensity.“ This sound rather opposing to the text in lines 15-17: “This implies that timing and mag-

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nitude of flow response can change substantially at different precipitation intensities." Please reword these statements in an unequivocal manner.

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