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Hydrology and Earth System Sciences Discussions

Interactive comment on "Using an inverse modelling approach to evaluate the water retention in a simple water harvesting technique" *by* K. Verbist et al.

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This paper is interesting to be discussed, since field measurements and simulation of such water harvesting technique are rare. I also realized that the modeling part of rainfall-runoff to ponding in Hydrus is limited to reflect the reality. Nevertheless, some remarks below need to be considered as well. The age of the infiltration trench should be explained. If the measurements were conÂňducted directly after the construction, it would be different to the trenches which are already developed after 1 and more rainfall

events due sedimentation at the bottom of the trench. This condition will then affect the long term run.

AC-Although the construction year was mentioned, the age of the trenches at the time of measuring was lacking and was added to the text. The present study determined the water balance on the trench under present conditions, independent of its prior or future erosion-sedimentation processes. These do become important when simulating over longer time periods and for multiple variable intensity rainfall events, but were not considered in this paper, due to the short time periods considered.

Page 4274, line 20-21: This explains the water level is assigned as variable head. HowÂňever, how were the direct rainfall into the trench and the runoff that already infiltrated before the filling up assigned in the model?

AC-Hydrus does not allow the application of different boundary conditions at the same node, making it impossible to assign a variable pressure head and an atmospheric boundary condition at the same time. Nevertheless, since direct measurements of water heights were available, the rainfall addition to this pressure head is immediately considered, eliminating the need to account for it separately.

Page 4282, line 21-26: The calculation seems not clear. 56% turns into runoff, but 0.09 m3 captured by the trench?

AC-The water balance of the trench can be expressed in terms of its boundary conditions. The source fluxes in the soil domain are given by the rainfall amount and the variable pressure head, with values of 0.46 m3 and 0.09 m3 respectively. The sinks are the total runoff (0.25 m3) over the whole slope, the accumulation in water content in the soil domain (0.28 m3) and the drainage (0.02 m3).

AC- In the manuscript, these results were summarized. Runoff was given as the runoff coefficient, dividing total runoff over total rainfall (56%). The runoff generated on the impluvium was only a part of the total runoff, 0.18 m3 , of which 48% was infiltrated into the domain by means of the variable pressure head (0.09m3). For clarification, additional information about the fluxes was added to the manuscript.

Page 4284, line 21: I would prefer to consider this statement since the water levels in the infiltration trenches should still be used as a calibration parameter, due to the fact that the response of the water levels determine the dominant input to the subsurface.

AC- The water levels could indeed still be used to calibrate the model when using fully integrated hydrologic surface-subsurface models, but these measurements are difficult to obtain under natural conditions. A correct calibration of the surface runoff process can be done, however, by means of rainfall simulations and subsequently be used in the simulations with natural rainfall events when using these models. The statement was reformulated to express this possibility.

Page 4305, figure 10: The most fluctuated data are seen on point 11-17, but the mis-sÂňing points are 12 and 14. Could these points be included in this graph since both are quite affected by the infiltration?

AC-They were added to Fig.10A and B respectively.

And from fig. 2, the depth of point 1 and 7 should more or less the same. However, please explain why the peak of the simulated line are slightly different.

AC-The Hydrus model uses the the Galerkin finite element method to obtain a solution of the flow equation, requiring a discretization of the subsurface domain in elements and nodes. As a result the wetting front is not perfectly parallel with the slope, but shows some small variation, which produces small differences for probes at the same depth.

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