

Interactive comment on “The artificial water catchment “Chicken Creek” as an observatory for critical zone processes and structures” by W. Gerwin et al.

Anonymous Referee #3

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General: I believe this is a relevant paper for the special issue to which it was submitted. The paper reports the construction of an artificial catchment in Germany, called Chicken Creek. However, in order to be published I believe the manuscript needs to be improved significantly to make this a scientific contribution to the topic of the use of artificial catchments in hydrology and critical zone observatories. I suggest that the authors do one of the 2 following options:

1. They provide much more detailed information about the initial structure of the subsurface, in terms of soil properties and soil profiles. For instance the textural and chemical properties of the soils should be given, as well as initial data on soil structure

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and profiles, including information about porosity, bulk density, hydraulic conductivity, etc and how these vary with depth. Info on initial soil depth across the catchment should be provided, and they should also indicate how the initial surface was observed (e.g. do they have lidar measurements of the surface in order to follow changes in microtopography due to surface erosion).

2. The authors focus on the initial observation that significant amounts of surface runoff was produced and try to give a detailed explanation for this observation. What are the dominant processes controlling surface runoff? Was it purely infiltration excess or did the soil profile saturate during these storms? When they saturated, was it due to some impeding layer close to the surface or did flow convergence enhance the flow to certain areas that subsequently completely saturated? Or were there other processes (such as soil crusting or hydrophobicity) that played a dominant role? Given that many detailed measurements are possible the catchment offers the unique opportunity to discuss in detail the mechanisms that led to this massive surface runoff observation.

Detailed comments:

Here are a few comments I have that can strengthen the presentation:

- the argument to use artificial catchments in critical zone observatories is undersold. Not only is it important to know the boundaries of the control volume under study (for detailed mass balance studies) but also the initial structure in the subsurface should be archived, and the rest of the experiment should be used to observe changes to this structure (increase in heterogeneity due to packing, sorting, weathering, bioturbation, etc) and their causes should be investigated. Also, the observed changes in structure should be related to changes in hydrological partitioning. I don't see enough info in this paper that suggest that the people involved have actually archived the initial state of the system, beyond 'knowing' what the boundaries are. Who will guarantee that there is no significant leakage through the clay layers (some piezometer reading suggest indeed there are leakages). All this should be more carefully discussed.

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- The phrasing throughout the entire paper needs polishing, and should be corrected by a more experienced author.
- more detailed info on the type of instrumentation, their location and the positioning within the soil profile should be given. Now the only thing the reader has is a (not so clear) figure.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 1769, 2009.