Reviewer comments on „Identification of runoff formation with two dyes in a mid-latitude mountain headwater“ by Lukáš Vlček et al.

Summary

In the manuscript by Lukáš Vlček et al. runoff formation processes at two hillslopes of a headwater catchment in Czech Republic have been investigated. Sprinkling experiments with two different dye tracers were performed at a Podzol site and a Peat Bog site each. Lateral and frontal profiles were excavated, photographed and stained areas were detected by image analysis. The results showed that biomat flow through the upper, organic litter layer and lateral preferential flow along dead trees and roots prevailed at the Peat Bog site. Vertical percolation was the dominant process at the Podzol site, although the presence of lateral preferential flow could be proven as well.

General comments

The study presented in the manuscript is interesting and relevant. The manuscript is well written, the English expression is very good and the readability too but it is rather long for a research paper. The manuscript should be shortened significantly to be more concise (beyond the suggestions in the specific comments). My overall impression is that the work deserves to be published. I recommend publication in HESS after minor revisions.

Specific comments

P3 L12-22: The three points mentioned are comprehensible and interesting descriptions of the two experimental sites. It is, however, not totally clear to me why they are reasons or advantages for selecting the two sites for the experiment (as stated in P3 L12).

P4 L4-13: In the first and third points you stated that you also tried to estimate/quantify infiltration, preferential flow and vertical percolation. I suggest to delete the words “estimate/quantify” here, because you do not provide numbers that really quantify these fluxes.

P5 L28 – P6 L4: The hydrological metrics MQ, MHQ, MNQ and HQ indicate flow rates and, thus, they have the dimension $L^3 T^{-1}$ (e.g. the unit litre per second). In the context of the manuscript it is meaningful to relate these metrics to the catchment area (Dimension: $L^1 T^{-1}$, unit e.g. mm per hour), but they should not be addressed as fluxes and the acronyms MQ, MHQ, MNQ and HQ should not be used. Maybe you can call it “discharge per area” or “unit discharge”.

P6 L12: Please add information about the concentration of tracer solution or the total mass of tracer applied.

P6 L29 – P7 L11: I understood that you took both frontal and lateral profiles from each irrigated plot, right? For me it is difficult to imagine how the frontal profiles (Fig. 4a) could be excavated first without destroying the lateral profiles (Fig. 4b).

P7 L30 – P8 L3: When only an area of 1.5m*1.5m=2.25m^2 is irrigated, the experimental conditions are of course different to a real rain event where the hillslope receives much more water. Thus, we cannot expect that the flow patterns detected in the experiment are simply transferable to real rain events. I am aware that this is not a very innovative comment since we all have to deal with such

issues when performing field experiments. However, I think it should be mentioned and discussed in the discussion section.

P8 L17: This sentence can be omitted because the content is already mentioned in the method section.

I had problems to find the positions of specific profiles (mentioned in the text and shown in the Figures) in Figure 4:

- Please make the reader early aware of the small sketches in the lower right corners of Fig. 5-7 indicating the positions of individual profiles. They are very helpful but it was too late that I took notice of them.
- Figure 4: A north arrow in Fig. 4 might help to orientate when directions are mentioned in the text.
- Please check if the designations of single profiles do always correspond to Figure 4. For example: I cannot find the location of the profile FD1.75 (Fig 7c) in Figure 4. Taking the small sketch in Fig. 7c into account I would guess that profile FD1.25 is shown In Fig. 7c.
- P8 L22-23: Please mention already here that Fig. 5b shows a profile outside (downstream) the sprinkling plot. That information can then be omitted from P8 L30.
- P9 L18-20: Is 10.5 m downslope correct? Was the distance between frontal profiles really 0.5m? From the yellow section in Fig. 4a I would expect 1.5 m downslope and distances of 0.25 m. Please check this.

P10 L15-23: It is an important result that no FLC has been found in springs and in the stream. However, this paragraph contains much methodological information that should be shifted to the Methods section.

P10 L25 – P11 L5: I agree with the content of the section. However, most of it is already mentioned in the Introduction section and can be omitted here.

P13 L32 – P14 L3: This issue is already mentioned in the previous paragraph.

P14 L3-6: Is the colour of Fluorescin that can be detected during daylight with the human eyes also affected by pH? If not, you could not conclude in P14 L5/6 that the dye has not been “affected by pH changes”. I have always thought before that only the fluorescence is pH dependent, but not the colour. However, I am not sure about this point.

P14 L8-28: Is it also possible that the tracer was very strongly diluted before it reached the stream? If yes, it would also be possible that the tracer concentration in the stream was below the detection limit of your analytical method. Could you provide a rough estimation of dilution at the slope? Maybe you are then able to remove my concerns. This comment is related to my comment on P6 L12.

P15 L18 – P16 L18: The conclusion should be shorter and more concise:

- Issues that have exhaustively been discussed before should not be repeated again, e.g. the discussion about a pH effect.
- It would be nice to have a few clear and concise statement about what we can learn from this study.
- Point out a few take home messages related to the four specific points that have been defined on page 4 as the objectives of the study.

Table 1: What is the information about the Otava River used for in this study?

Figure 4: In both sketches positions of horizontal images are indicated. Is that information needed for this manuscript? The horizontal images are not mentioned in the text.

Figures 5 – 7, lateral profiles: Please insert vertical lines indicating boundaries of the sprinkling plot.

Technical corrections

Table1 & 2: Switch the positions of Table 1 and Table 2. Currently Table 2 is mentioned first in the text.

P5 L16: The word “both” should be deleted from the sentence.

P15 L27-28: Use past tense.