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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Identification of runoff formation with two dyes in a mid-latitude mountain headwater" *by* Lukáš Vlček et al.

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We would like to thank the referee for his review and the helpful comments.

General comments: The manuscript should be shortened C1 HESSD Interactive comment Printer-friendly version Discussion paper 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.

Authors agree, text will be shorten.

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).

Authors agree, it will be clarified.

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.

Autrhors agree, it will be deleted.

P5 L28 – P6 L4: The hydrological metrics MQ, MHQ, MNQ and HQ indicate flow rates and, thus, they have the dimension L3 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: L1 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".

Authors agree, it will be clarified.

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

Authors agree, information will be changed.

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).

Authors: Profiles were excavated stepwise in 0.5 m-wide segments. The pictures were first taken in squares of 0.5 m x 0.5 m of a profile section, and later processed, analyzed, and joined in the software and finally displayed in our figures in 1.5m-wide profiles.

P7 L30 – P8 L3: When only an area of 1.5m*1.5m=2.25m2 is irrigated, the experimen-

tal 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.

Authors: We agree to include the issue in the discussion. However, we believe that the detected preferential flow patterns give valuable insights into active preferential flowpaths during natural rain events. The flow patterns are likely intensified and additional flow processes might occur, but our experimentally detected dominant flowpaths will very likely play a crucial role. Moreover, we applied our experiments in a dimension [1.5 m-scale] which is well established in the dye experiment literature.

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: âAËŸ c Please make the reader early aware ′ of the small sketches in the lower right corners of Fig. 5-7 indicating the positions of C2 HESSD Interactive comment Printer-friendly version Discussion paper individual profiles. They are very helpful but it was too late that I took notice of them. âAËŸ c Figure 4: A north arrow in Fig. 4 might help to orientate when directions are ′ mentioned in the text. âAËŸ c 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. âAËŸ c P8

Authors agree, it will be changed.

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. âAËŸ c 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.

Authors agree, text will be changed accordingly.

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. Authors agree, it will be changed. 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. Authors agree, text will be shortened.

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

Authors agree, text will be shortened.

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.

Authors: This statement will be clarified. Background info: The pH value slightly influences the visible (= ”eyeball-detectable”) color of FLC solutions, as it changes from neon greenish-yellow to a dull goldish-yellow depending on pH. This is because when FLC is in its ionized (= deprotonated) form at pH > ∼6, it has significantly different fluorescence behavior/characteristics than when it is at or below pH ∼6 (below pH ∼6 it is mostly protonated, H+ group adds to COO–). The fluorescence of FLC is due to the photo-physical characteristics of the fluorescein anion at pH > ∼6. Its color (visible absorbance) is influenced by its concentration. The most intense neon greenish-yellow color (visible absorbance) occurs at concentrations of 0.1 to 1 g L-1. The most intense fluorescence occurs when the salt Sodium-Fluorescein (= Uranine) is fully dissociated,

according to Käss (1998). Absorbance and fluorescence are both observed in the same spectral range (∼450-550 nm).

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.

Authors: This point is answered together with point 14.

P15 L18 – P16 L18: The conclusion should be shorter and more concise: âAËŸ c Issues that have exhaustively been discussed before ′ should not be repeated again, e.g. the discussion about a pH effect. âAËŸ c It would be ′ nice to have a few clear and concise statement about what we can learn from this study. âAËŸ c 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.

Authors agree, text will be modified and shortened.

Table 1: What is the information C3 HESSD Interactive comment Printer-friendly version Discussion paper about the Otava River used for in this study?

Authors: This table shows a comparison of the headwaters of the upper Otava River – which consists of many small headwaters and forms one of the most prominent catchments in the Šumava Mts. region. Our experimental catchment “Rokytka Headwater” is a sub-catchment of the upper Otava River. The Otava River catchment is the reference & target area, e.g for scaling up of runoff formation processes and for the implementation of flood protection measures etc.

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.

Authors agreed, information about horizontal images will be removed.

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.

Authors agreed, will be changed.

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

Authors agree.

P15 L27-28: Use past tense.

Authors agree.

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