Hydrol. Earth Syst. Sci. Discuss., 5, S531–S534, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S531/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on “Dye staining and excavation of a lateral preferential flow network” *by* A. E. Anderson et al.

Anonymous Referee #1

Received and published: 26 June 2008

The authors conducted dye tracer experiments (that are usually done at the plot scale) at the hillslope scale to look at preferential flow paths and the connectivity of these preferential flow paths at the hillslope scale. They also determined the relation between contributing area and preferential flow and the velocity through each section. The authors show that sections with larger contributing areas corresponded with highly connected and developed preferential flow features and faster velocities.

This is a great paper that is certainly of interest to the readers of HESS. The experiments are very novel and the manuscript is well written. Figure 3 is a great figure that clearly shows the different preferential flow paths and their connectivity. This contribution certainly improves our understanding of hillslope hydrology, and preferential flow pathways in particular. I highly recommend this manuscript for publication after some

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

corrections have been made. Please see my detailed comments below.

Detailed comments:

1. Section 2.2: How high was the water table in this trench? Was it comparable to water levels during rainfall events? If not, discuss how this changed the results? Did this cause water to flow through surface preferential flow paths / organic layers near the surface that would otherwise not transmit water? Please discuss.

2. Section 4.1: You show that the sections with high contributing areas are also the areas with the most connected preferential flow features, the smallest cross sectional area of flow, and the highest velocities. On P1054L8-10, you state that soils with small contributing areas simply may not receive flow rates large enough to modify and maintain large preferential flow features. This seems fully plausible. However on P1047 you describe that the hollow has a different soil type than the remainder of the hillslope (more clayey and organic). Couldn't it be that it is the difference in soil type that explains part of these differences? You should at least discuss the influence of the differences in soil type on the preferential flow features in the discussion section. I realize that this could be partly a chicken and egg question and that the soil type may be different in the hollow because of the higher contributing area. However, you should at least discuss this issue. (see also point 5 below).

3. Section 4.2. This section needs to be expanded. You should discuss (in more detail) how your results are similar and/or different to Sidle et al. and other people that have looked at hillslope scale preferential flow paths.

4. Section 4.2. If you would have applied the tracer closer to the road cut, e.g. section 6 would it have moved only through these preferential flow features or also through the organic horizons because the dye in the trench was in contact with these organic horizons? Can you speculate on this in the discussion?

5. Table 1: the relation between contributing area and velocity seems to be highly non-

linear with the velocity increasing sharply for sections with a contributing area larger than 1200 m2. Downslope from section 10, there is a rapid increase in contributing area, rapid increase in velocity and a rapid decrease in stained area. Does this transition correspond to the change in soil type (see also point 2)? Also, mention in the text that the relationship between contributing area and velocity is highly non-linear.

6. Figure 3: This is a great figure. It is clear and clearly shows the dye stains and connectivity of the preferential flow paths. It seems that the dye in sections 1-6 is mainly located in the deepest soil sections. I can't really see it. If it is, then it means that water is flowing preferentially along/over the lowest points in the till topography and that these are channels of dye over the till surface. If this is indeed the case you should mention this in the text. Also, if it is the case, does the till topography mimic the surface topography? In that case it could be that preferential flow is related to the contributing area based on bedrock topography rather than surface topography.

7. Methods/Figure 3/Table 1: It seems that it is very well possible that dyed water flowed to the left of the excavated sections (especially for cross sections 7, 13, 14, 15, 16, 19). Did you excavate outside of the sections shown in the figures as well? If not, you have to state explicitly in section 2.3 that you assume that there was no water flow (dye) outside of the excavated areas. On the other hand the discharge calculated from Table 1 (vxA) is close to the application rate but slightly different for each section. This seems to suggest that you did take measurements outside of the transects as well (or is this just do to rounding errors?). If you did take measurements/observations outside the transects, you have to make this clearer in the methods section.

Minor comments:

*) P1047L8: on how many years of data are these precipitation averages based?

*) P1052L15: the description of these smaller hillslopes is not very clear. Rewrite this sentence.

Technical/Editorial comments:

*) P1044L20: Replace -these types of- by -preferential flow dominated-

*) P1044L23: change -especially in…..watersheds- to -especially in steep forested watersheds in humid climates-

*) P1047L13: replace -is similar- by -are similar-

*) P1051L11: -generous- does not seem to be a good word here.

*) P1053L2: replace -was also- by -was also found-

*) P1058L4: replace -the contributing area was linked to the preferential flow network- to - the preferential flow network was linked to the contributing area-

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1043, 2008.

HESSD

5, S531–S534, 2008

Interactive Comment