Hydrol. Earth Syst. Sci. Discuss., 5, S927–S930, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S927/2008/

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.

A. E. Anderson et al.

Received and published: 11 August 2008

We thank the reviewer for the comments, and we will incorporate most into the revised manuscript submission. We have added comments following the reviewers major comments.

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.

Author response: The trench was excavated in the summer when no rain events occurred so there is no record of the depth of water in the trench during rain events. However, another paper was submitted that describes the hillslope flow velocities un-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

der natural and steady case conditions. This paper includes NaCl tests using the same flow rate and trench as this experiment. This submitted paper will be referenced and short description of the relevant findings will be included in the revised copy.

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).

Author comment: this discussion will be added to the revised manuscript

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.

Author response: agreed, additional discussion will be added to this section on recommendation of both reviewers.

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?

Author response: The other above-mentioned submitted paper presents flow velocities

HESSD

5, S927–S930, 2008

through these cross-sections of the hillslope. This will be added to the discussion of the revised paper.

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.

Author response: The non-linear change in flow characteristics does correspond to the soil type change and this point will be added to the discussion.

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.

Author response: The dye solution did flow over the till in these cross-sections. Our observations suggest that the subsurface and surface topographies are similar. However, the contributing area of the lower boundary layer is most likely the controlling factor. These points will be noted in the discussion of the revised manuscript

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

HESSD

5, S927–S930, 2008

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.

Author response: In most cases the entire dyed section was excavated; however, at the edge of some photographs there were distortion or obstructions (for example figure 2). When the photographs were rectified, the distorted or obstructed portions were clipped and are not reflected in figure 3. Field observations were used to account for the clipped portions when the values were calculated for table 1. However, we are not positive that we excavated all the dyed soil in cross-sections 17, 18, and 19. It is possible that these cross-sections have flow that “by-passed” these areas causing uncertainty in the values presented in table 1. This will be added to the results and discussion of the revised manuscript.

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

HESSD

5, S927–S930, 2008

Interactive Comment