

## **Review of "Does drought alter hydrological functions in forest soils? An infiltration experiment"**

**hess-2015-255**

### **COMMENTS TO AUTHORS:**

This manuscript, "*Does drought alter hydrological functions in forest soils? An infiltration experiment*", studies the effect of drought events on soil properties through dye tracer experiments. While the manuscript addresses an interesting research topic, which is the correct understanding of drought effects on soils, the paper lacks clarity and organization. The manuscript is suitable for publication in HESS Journal after addressing the both major and minor recommendations provided below.

### **MAJOR COMMENTS:**

1. The manuscript is very hard to read unless the reader is very familiar with dye tracer experiments. This work would make a far greater and more accessible contribution with some major reorganization and explanation of both experimental setup and background information.
2. Until section 2.6 I had no idea the authors were using a soil moisture model. The authors should make clear in the introduction that both dye tracer experiments and simulations were used to address their research question. Furthermore, the soil moisture model is used to state that differences in the infiltration patterns are due to changes in soil properties. This statement is at the basis of the whole work and, in order to infer this from some simulations, the authors should, at least, provide some model validation (even as supplementary information). In section 3.1 the authors say that measurements support the modeling results but this validation is not shown, why? Also, if soil moisture measurements are available, why would the authors use a model?
3. The paper is poorly written: most sentences lack of clarity.

### **OTHER COMMENTS, QUESTIONS AND LINE EDITS:**

1. Pag. 7690, lines 1-3: the climate is expected to change and thus have an effect on the water cycle. The sentence is not clear, please rephrase.
2. Pag. 7690, line 3: "Usually.." When is this assumption usually made? In modeling frameworks? Please be more specific.
3. Pag. 7691, line 27: the manuscript investigates only the impact of drought on soil properties, I would remove "and climate change".
4. Pag. 7692, lines 2-6: the study of drought effects on forest ecosystems is also the study of a single aspect in a particular ecosystem. Please rephrase with something like: "While most studies focus on drought effects on plant growth and seedling activity and focus on grasslands and heather ecosystems, only few..."
5. Pag. 7692, line 7: where often only soil moisture is observed", what does it mean?
6. Pag. 7692, lines 23: "objectives of this study ARE: first, to INVESTIGATE WHETHER droughts"

7. Pag. 7693, lines 19-22: "The underlying... precipitation is 533 mm". Please connect these sentences to show that information regards the same site.
8. Pag. 7694, lines 20-21: the experimental setup is not very clear, unless the reader is very familiar with this type of experiments. For example, why do the authors want an application amount of 20, 40 and 60 mm in the three sub-regions?
9. Figure 1: consider combining this figure with Figure 3.
10. Figure 3a: I would add more details in the figure to make the experimental setup clearer (e.g. write what are the 20, 40, 60 mm; point where the soil profiles were taken in each sublayer and not just in one).
11. Pag. 7606, line 1: "For objective measures to compare the dye patterns...". What does it mean? The sentence is not clear.
12. Pag. 7696, lines 1-12: please move the definition of the abbreviations (sd,vd,SPW) to lines 2 – 4 where volume density, surface density, and stained path width are first defined. Also, I would suggest using uppercase for all abbreviations.
13. Pag. 7696, line 12: "As third variable... was calculated". The authors already said that SPW was calculated. Remove this sentence.
14. Pag. 7696, lines 15-19: since this classification is used in the text, more information should be provided. For example, how are the SPW values related to the different flow processes? Also, please add a quick definition of what homogeneous/heterogeneous matrix flow are and what low, mixed and high interaction with matrix mean. This would make the reading more accessible.
15. Pag. 7697, lines 1-2: "depending on... of the profile". What does this sentence mean? Are the measures made all at the same depths in the different sections? If not, why? What depth, on average, was investigated? I suppose 50-80 cm (looking at the results) but I would make this clear in the figure (both 3a and 3b) and in the text when explaining the experimental set up. Also, I would suggest why different depths were investigated at different sites.
16. Figure 3b: please provide in the figure some explanations (e.g. All the 20 boxes are the locations of the WDPT measures? The small rectangle with 3 boxes inside represents the 3 time repetition of the measure?
17. Pag. 7697, line 5: should be Table 1?
18. Figure 4: what is the green line?
19. Pag. 7697, section 2.6: Only at this point of the paper it is clear that the authors used a soil moisture model. I would suggest explaining this earlier in the text.
20. Pag. 7697, lines 21-22: which parameters were available and which are the assumed ones? A full list of parameters and references for the assumed values (maybe in the supplementary material) would be useful. Also, some model validation should be added (maybe always as supplementary information). How can we assess the ability of the model without any comparison with data?
21. "Results" section: I would suggest following the same structure of the "Methods" – in the results the authors start with soil moisture simulations, which is the last thing explained in the methods. Consider reordering the methods section in order to follow the results.
22. Pag. 7698, lines 1-2: "All soils..during the summer months" - do the authors show any modeling results for year 2011 in Figure 4? Where can we see the drop in soil moisture during 2011?

23. Figure 4: Precipitation measurements are related to what year? 2011 or 2013? More information should be provided in the caption.
24. Pag. 7698, lines 7-8: "soil moisture contents are observed". Are these observations or modeling results?
25. Pag. 7698, lines 12-13: again, why isn't the comparison with data shown? The authors need to validate the modeling results against measurements in order to use those numerical experiments to infer something. Also, if measurements are available, why would they model use a model?
26. Pag. 7698, lines 13-15: I do not understand why the different patterns are due only to soil properties. How can the authors exclude any other effect? In general, this section (3.1) is not very clear to me. What is the soil moisture model used for?
27. Figure 5: write a label for the x-axis (e.g. WDTP).
28. Figure 6: what is on the x-axis of these figures (SPW or VD)? What are the orders of magnitude?
29. Pag. 7700, lines 21-25: I am not very familiar with this type of measurements, but I do not see a strong similarity between pre-drought and control plots.
30. Pag. 7703, lines 23-25: not clear: no differences which can be addressed"?
31. Pag. 7703, line 26: can be assumed to be comparable? Are the results comparable or not? And then "therefore it can be assumed..". This first lines of discussion are not clear.
32. Pag. 7704, line 8: "the tree main species" – not clear.
33. Pag. 7706, lines 12-14: "The authors..repellent agents: not clear.
34. Conclusions are too "fast". I would suggest adding some comments about the different effect of deciduous/coniferous species.