Hydrology and Earth System Sciences Discussions

Interactive comment on "Quantifying spatial and temporal discharge dynamics of an event in a first order stream, using Distributed Temperature Sensing" *by* M. C. Westhoff et al.

Anonymous Referee #2

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General comments:

This paper shows how a model is used in combination with temperature and stream-flow data to deduce the locations of lateral inflow, infiltration, and hyporheic exchange. The authors lead the reader through their modeling steps. This allows one to see the many steps involved in the process and how models can be used to better understand the study reach/study watershed. However, it is sometimes hard to keep track of the different steps, which parameters are changed and how this influences the objective functions. I therefore suggest that the authors include a table that shows the steps,

the parameter values and model performance for each step. It would be useful if the authors would comment more on whether their final model is just a possible model or if this is indeed the best model and especially whether or not this model will be adequate during wetter conditions when inflow from the hillslopes is more likely to occur as well.

This stream is characterized by significant inflows and losses (infiltration). The authors mention the locations and relative losses and gains but don't describe how (and when) these losses and gains were determined in the field. Since this is a central part of the model, more information on how these losses and gains were determined needs to be given.

More information should also be given on the calibrated model that is used in this study. The reader is referred to a paper that is in review and thus not widely available. More comparison between the conditions during the calibration period and the period of this study should be given as well.

Finally, it would help if a bit more information about the study reach was given.

Specific comments:

1. P2177L21: Other studies have used differential streamflow gauging to study lateral inflows and/or streamflow losses (e.g. Anderson and Burt, 1978: The role of topography in controlling throughflow generation; Hjelmfelt and Burwell, 1984: Spatial variability of runoff). Include references to these types of studies as well.

2. P2178L20, P2179L1: Describe what the bypasses are. Are these side-channels or something else? How big are these bypasses?

3. P2178L25: Give the total precipitation and the average intensity of the event.

4. P2179L7: Give the average slope of the hillslopes as well.

5. P2179L15: More information about the stream should be given. How deep is the sediment in the stream? What is the size of these rock clasts or what was the D84? Is

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this a meandering stream or a stream that is characterized by step-pools and bars or woody debris? How wide is the stream?

6. P2179L20: Give more information about the size (or %contribution) of these lateral inflows and how these lateral inflows and losses were determined. These lateral inflows and losses are a major focus of the remainder of the paper but are not described adequately in the site description section. On P2180L1, salt injection tests are mentioned but no information is given about them. On P2181L11-14, it appears that these inflows are based on model calibrations. Expand on how information on inflows and infiltration losses was obtained (and the uncertainty of these measurements).

7. P2180L1: Was there anything special about the locations where the water infiltrates? Show the locations of these infiltration zones on Figure 1.

8. P2180L2: What was the streamflow during these salt injections? Compare to the flow rates during this study.

9. P2180L5: Give the scale or size of the small scale exchange - what is small?

10. P2181L12: Give more information about how good the water-balance was.

11. P2183L7: How did you determine where hyporheic exchange occurred? This is not described in the methods. Explain.

12. P2183:10: How similar/different was the min, max, and mean streamflow during the calibration period compared to that in this study?

13. P2183L20: It is hard to keep track of what parameters are changed during which step and how it affects all of these objective functions. It would help if a table was included that would show the steps, which parameters were changed (and by how much) and how it changed all objective functions (and whether these are for the whole hydrograph or just the first or second peak). Currently, the effect on only one of these objective functions is given in the text.

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14. P2186L3: This bypass has to be described in more detail. Is this a side channel? Or overland flow over a lower lying section? It is unclear what this bypass flow is or what controls this bypass flow.

15. P2186L12: What are the results for the other objective functions/criteria mentioned on P2183?

16. P2186L22: How is this value of WR different from that used in the calibrated model?

17. P2189L19: Based on what data/field information does the value of 1.7m for WR seem realistic?

18. P2190L24-29: What is the basis for these stream widths? Are these field measurements during this event or is it deduced from the topography and stage data or from the model? Please describe how this information was obtained.

19. P2192L8: Give examples of how sufficient additional energy can be added to the stream.

20. References: It is unclear why the page numbers where these articles are referenced in this paper are included in the references.

21. Figure 1: Show the locations of infiltration as well.

22. Figure 2 and figure 5: The difference between Qd and Qup is hard to see when the figure is printed in black and white. Use a different color scheme or label the lines in the figure. Combine these figures as they are almost the same?

Minor editorial suggestions:

P2176l2: insert "the" before "spatial"

P2176L3-4: move "particularly….rainstorms" between "flood waves" and "can"

P2176L6: replace "catchment" by "stream"?

P2176L10: replace "confront" by "compared"? or validated? Or calibrated?

P2176L13: insert "the" before "spatial"

P2176L14: insert "for the studied stream" before "infiltration"

P2176L15: insert "small" before "rain event"

P2176L18: insert "m" after "250"

P2176L20: insert "conditions" after "low flow"

P2176L24: replace "discharge generation processes" by "runoff generation processes"?

P2177L1: replace "techniques using end-member" by "using the end-member"

P2177L4: insert "the" before "spatial"

P2177L6: insert "the" before "spatial"

P2177L12: replace "researches" by "researchers"

P2178L2: replace comma by "and"

P2178L20: replace "bypasses" by "side channels"?

P2178L26: replace "confront" by "compare" or "validate"

P2179L5: replace "branch" by "reach" or "tributary"?

P2179L17 (and elsewhere in the text): replace "rain on water" by "direct precipitation"

P2179L17: insert "the" before "saturated"

P2179L18: replace "land" by "zone"

P2179L21: replace "wier" by "weir"

P2180L20: move "also" to L21 before "measured"

P2180L21: remove "the" before "TidbiT"

P2182L2: replace "has" by "to have"

P2184L7: replace "influences" by "influence"

P2184L14: replace "parameter" by "parameters"

P2185L8: replace "run of" by "parameter set for"?

P2185L18: insert "The" before "reason"

P2185L20: put "preferential" in parentheses?

P2185L22: insert "be" before "directed"

P2187L7: remove "also"

P2187L18: remove "taken"

P2188L3: replace "encount" by "account"

P2188L19: replace "effect" by "affect"

P2188L19: replace "seconds" by "second"

P2189L8: replace "amount" by "number"

P2190L1: insert "likely" before "not"

P2190L12: rewrite this section. "is less accurate" is not clear. Do you mean "is less certain"

P2191L5: replace "is" by was

P2191L10: replace "influences" by "influenced"

P2191L16: replace "give" by "gave"

P2191L17: replace "hypothesize" by "hypothesized"

P2191L19: replace "means" by "meant"

P2192L1-2: replace "low. . .days" by "a warm low flow period"

P2192L2: remove "too small" and insert on L3 "that were too small" before "to apply"

P2192L25: replace "confronted" by "tested"?

P2193L7: replace "discharge while. . .water" by "discharge. Direct precipitation"

P2193L8: insert "likely" before "the main"

P2193L18: insert "a" before "large"

P2193L19: insert "large" before "enough"

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