

***Interactive comment on “Heat transport of diurnal temperature oscillations upon river-water infiltration investigated by fiber-optic high-resolution temperature profiling” by T. Vogt et al.***

**Anonymous Referee #1**

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The main hypothesis of the paper is that the unsaturated zone influences the diurnal temperature signal. Field data is presented, and a 2d numerical model is constructed to quantify the influence of the unsaturated zone on temperature dynamics. While the paper discusses important subjects, I think it requires a significant amount of work that probably exceeds a major revision. My points of concern are:

- The conceptual model to interpret and model the data seems to be incomplete. 900 mm of rainfall will certainly influence the heat transport in the unsaturated zone but this

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component is not considered. Also, oscillations of the river will cause water to infiltrate to the bank and re-enter the stream as the water table falls, but these fluxes are not discussed.

- The goal of the model is unclear. It incorporates some measurements from the field-site (the temperature of the river), but then assumes a static water table and is based on (hard to defend) assumptions of the velocity profile. As a tool to understand the field data, this model is not suited, given the large amount of (not discussed) simplifications. If it is constructed to understand the general influence of the unsaturated zone, a much more detailed analysis should be carried out, e.g. in the form of a sensitivity analysis and a subsequent interpretation of the results.

- I find the assumptions on flow velocities (uniform and depth-varying) not satisfactory. It is easy to calculate more realistic flow distributions, so why make such an assumption?

- The paper states that the unsaturated zone has an influence on the heat exchange. While I readily believe this, I would like to know how large this influence is, and what the controlling parameters are. When does the influence of the unsaturated zone undermine the available approaches (not considering the unsat zone) used to interpret such data? This question could be answered with a systematic variation of the parameters in a numerical model. I think if the authors can provide a framework on the importance of the unsaturated zone and what the sensitivity to the relevant hydrological parameters is, the paper will make an important contribution. Given that this will still require a significant amount of work, the paper should be returned to the authors for rewriting. The authors have written highly impactful and quality papers previously, and clearly have the tools and skills required to bring this paper to the same high level.

Other comments:

- The title can be much more specific

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- The difference to the Molinea-Giraldo paper should be stated more explicitly
- The paper was hard to read. For example, it was not clear for a long time whether the authors talk about the unsaturated zone in the bank or under the river. The use of the term sediments for the river bank further added to the confusion. In Figure 2 3 DTS are shown, but then in Figure 4, 4sets of data are shown. Is the third one split up into two?
- Is there an upper temperature boundary representing the atmosphere, or is the exchange only one way (from above) as indicated in figure 3?

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