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Interactive Comment

Interactive comment on "A distributed stream temperature model using high resolution temperature observations" *by* M. C. Westhoff et al.

M. C. Westhoff et al.

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We would like to thank the referee for his/her comment on our paper. We consider the comment as very useful. Below we provide the answers to the comments and questions raised.

The intention of the paper is to show the impact of lateral inflow on the temperature of a stream. These flows can be quantified by measuring temperature. With the quote "to identify runoff components" we mean the different spatial runoff components (in this case the four sources of lateral inflow). The aim is ultimately to achieve hydrograph separations and to identify the occurrence of connectivity in runoff generation. We will make this clearer in the final version of the paper.

The major difference with the work of Selker et al. [2006] is that we compare the method with an energy balance model which describes the physical processes driving temperature variation. Selker et al. only quantified the lateral inflow with method 1 (P136L1). We present a method which is able to quantify lateral inflow in periods when the temperature of the inflows is never the same as the receiving stream water. We make clear that both methods give similar results.

Reply on the specific comments:

1: We will take this comment into account in the final version of the paper.

2: More or less constant discharge is 1.2 l/s with a standard deviation of 0.14 l/s.

3: As stated on P128L24 and P139L24 no wind velocity was measured. During the days in the field no wind was noticed. Because the stream lies sheltered a wind velocity of 0.1 m/s seems a reasonable assumption. A raise of 1 m/s only adds 5 W.m(ˆ-2) extra energy to the latent heat component which makes low wind velocities of minor influence.

4: The grid size of the finite difference scheme is 2m. The temporal resolution is 10s. This differs from the temperature measurements because the Courant number should be below 1.

5: The temperature of the alluvium is assumed constant over the whole reach. We recognize that the temperature of the sources slightly differs from each other, which implies different alluvial temperatures. Because the temperature stays in a small range (ca 1 degree C), we consider it as a valid assumption. A porosity of 0.3 is taken for the whole reach. This value will be added to table 2.

The streambed conduction is not constant over the reach because it is dependent on the stream water temperature which is not constant.

6: The comment is right that independent data would improve the paper. But the investigated catchment consists of schist. The lateral inflow is groundwater which flows through cracks, which makes it not possible to measure the temperature in the ground.

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At the points where it enters the stream it is not clear where exactly the water comes from and if it is already (partly) mixed with stream water.

7: We agree that a sensitivity analyses is a good comment, which we will include in the final paper.

8: The minimum amount of inflow depends highly on the temperature differences upstream and downstream of an inflow point. Eq. (41) on P136 can be used as a check if the calculated relative discharge is accurate. This will be discussed in more detail in the final paper.

9: We tried to make this clear, but apparently not enough. In the final paper we will point this out more explicitly.

10: The figure will be replaced by a better one.

11: Indeed it is hard to distinguish between the graphs if the graphs are in black and white. Online the graphs are in color to overcome this problem.

12: We totally agree with this comment and we will change it in the final version.

We consider the technical comments as useful and they will be taken into account in the final version.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 125, 2007.