

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

Anonymous Referee #1

Received and published: 23 February 2007

General comments:

This interesting and well written paper presents an energy balance based stream temperature model and comparison of the model results with data obtained from fiber optic temperature measurements. The fiber optic measurement technique is very new and allows for measurements at spatial and temporal scales that were previously impossible. This paper is therefore of great interest to the hydrologic community. The authors show how this technique can be used to identify groundwater inflows and how important these inflows are for an accurate stream temperature model.

The comparison of the observed data with the modeled results for a location upstream and downstream of an inflow is good. Unfortunately, the authors do not show observed

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and modeled longitudinal temperature profiles. Since the fiber optic measurements allow for longitudinal temperature measurements it would have been most interesting to see the longitudinal observed and modeled temperatures profiles rather than the 'old fashioned' observed and modeled temperatures at a single point. While the longitudinal temperature profile is influenced by the diffuse inflows and outflows, which are not taken into account in the model, this would still be the most interesting and novel comparison and would also show the importance of the diffuse inflows and outflows. In the abstract (LI0-12) the authors write that this was done but they do not show these results in this paper. The authors have this amazing temperature dataset and the model but unfortunately only show 1 figure with the temperature vs. time at two locations.

The authors should also discuss the sensitivity of the model parameters in more detail. In general sections 4 and 5 seem too short and should be expanded to include 1) more information about what else was learned from the data from the fiber optic system (besides the locations and temperatures of the 4 inflows) that could not have been learned from regular temperature measurements or a couple of synoptic temperature measurements along the stream and 2) the sensitivity of the model parameters. Including a discussion of these points would make the paper even more interesting and useful for a wider audience.

Specific comments:

P128L11: 'more or less constant' does not seem to be the best wording. Give the range of measured discharge (1.2 +/- xxx l/s). Similarly on L12 quantify 'negligible precipitation (< xxx mm)'.

P129L4: what was the grid spacing?

P131L8: what is the precision/accuracy of the LandSaf solar radiation measurements? Write something about this either here or in the discussion.

P131L18: it is not clear how these angles are used to calculate the Cs factor. Expand

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on this.

P137: Prior to section 3.4 or after section 3.4 insert a new section where you discuss which parameters were optimized and how sensitive the model was to these parameters. The section on P138L18-22 is too short and appears too late in the paper. Parameter identification, values and sensitivity warrants its own section (just like you do for the assumptions).

P137L18: give values for the variation and the average.

P138: insert a new figure showing the longitudinal profile of observed and modeled temperature at a few different times. This is the most novel and interesting part of the study. In addition in the abstract (P 126L10-12) it is mentioned that this is what was done but the results are not shown. See also the general comments above.

P138L22 and Table 2: give the references for the constants in the table. And/or include another column in the table to (more clearly) show which parameters you optimized and which parameters you took from the literature.

Figure 2: this figure is not necessary. All readers should be familiar with the energy balance concept. If you want to keep this figure, you will have to include the lateral inflows for completeness.

Minor comments:

P126L2: insert 'energy balance based' between 'a' and 'temperature'

P126L9: insert 'stream' before 'temperature models'

P127L17: replace 'inflow' by 'inflows'

P128L5 and P128L9: insert 'weir' after 'V-notch'

P128L6: 'the schist comes to the surface' does not seem to be the best wording. Replace by 'the schist is exposed at the surface' - or something else

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Section 2.2: This section started in the past tense but changed half way to the present tense. Change to one consistent tense for the verbs?

P128L15: mention the time of the hand measurements

P128L20: insert 'of the DTS' between 'description' and 'see'.

P128L23: replace 'services techniques' by 'Services Techniques'

P129L7: remove 'In this way numerical dispersion is minimized'. You already mention this on L5.

P129L16: replace 'give' by 'gives'

P130L22: 'thus is important to know' does not seem to be the best English. Possibly replace by 'and are thus important' - or something else.

P132L20 (eq. 16): is it correct that the 0.96 factor occurs twice in this formula? Double check!

P133L6: replace 'It' by 'Conduction'

P137L8: insert a reference to Table 2 here

P138L27: insert 'minimum' between 'the' and 'stream temperature'

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

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