

Interactive comment on “Characterization of spatial heterogeneity of groundwater-stream water interactions using multiple depth streambed temperature measurements at the reach scale” by C. Schmidt et al.

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The authors would like to thank John Molson for his helpful comments on the initial manuscript. He raised some very interesting questions that are worthwhile to be discussed.

Specific comments:

1. We will indicate in the section 3 that the gradient of the stream is 0.008 m/m and the stream flow is in the range of 0.2 m³/s.
2. Air temperatures and groundwater temperatures were measured in hourly intervals

and will be included in the revised figure, indeed groundwater temperature remains almost constant.

3. Data fits will be provided for recharge zones also.

4. That is right, groundwater discharge may be controlled, to a so far unknown extent, by deeper heterogeneity. We will rephrase our conclusions to clarify this point, however given the measured data, we can not quantify the effect of deeper heterogeneity at this site. To verify the fluxes based on the temperature profiles, we performed slug tests in the streambed for Darcy's law calculations at a few locations. The resulting streambed hydraulic conductivities correspond well with heterogeneity of the estimated fluxes. Our data suggests that the streambed is at least one factor that controls the spatial heterogeneity of water fluxes between the aquifer and the stream. We agree with John Molson that it is likely that heterogeneity of the aquifer is represented in the spatial patterns of stream- groundwater interactions. For the present study we did not obtain data on the heterogeneity of the aquifer adjacent to the stream. We would like to refer to the studies of Conant (Conant et al. 2004; Conant, 2004) who partly addressed this problem. He stated that high groundwater discharges are corresponding to high permeability zones streambed connected to zones of high permeability in the aquifer. The observed patterns and magnitudes of fluxes across the streambed are likely to be a result of the distribution of the permeabilities of both, streambed and underlying aquifer. So far we have no satisfying concept to which degree the observed heterogeneity of fluxes reflects the deeper subsurface permeability distribution.

Technical corrections:

All proposed technical corrections will be included in the revised manuscript.

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Interactive Discussion

Discussion Paper