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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Winter stream temperature in the rain-on-snow zone of the Pacific northwest: influences of hillslope runoff and transient snow cover" *by* J. A. Leach and R. D. Moore

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We have pasted the comments from the reviewer below. Our responses are inserted to follow each comment.

Comments from Rhett Jackson:

This is an excellent and interesting paper regarding the effects of snow and snowmelt events on winter stream heat budgets. It is a well written and logical presentation of a

well-designed set of stream temperature and energy budget measurements. My only suggestions are aimed at making the findings easier to digest and interpret. One thing that is a little confusing is the use of the term surface energy fluxes relative to the term lateral energy fluxes. The surface fluxes include subsurface fluxes (e.g. bed conduction and friction) and the advective fluxes can include surface inputs of variable source area runoff. It might be clearer to use the term 'vertical energy fluxes' and define what is included therein and the term 'lateral energy fluxes' and define it as advective fluxes from surface runoff and interflow.

RESPONSE:

We thank Professor Jackson for his review and comments.

We agree with the suggestion to clarify our categorization of the energy fluxes. We have added the following text at the beginning of section 3.2 "Note that the term 'surface energy fluxes' is defined as net radiation, sensible and latent heat fluxes occurring at the stream surface; 'vertical energy fluxes' is defined as surface fluxes, bed heat conduction, and stream friction; and 'lateral energy fluxes' is defined as advective fluxes from overland flow and throughflow." We have also changed any related text within the document to be consistent with this terminology.

– Section 3.2.5 Stream Energy Budget would be better named 'Lateral Heat Fluxes Calculated as Residual of Stream Energy Budget'

RESPONSE: We will make this change to the section name.

– Figures 3, 4, and 6. (time series graphs) I suggest spreading the x-axis out so the time series are easier to see and interpret. Consider displaying the discharge data on a log scale so it is easier to see the differences in the low flows.

RESPONSE: We will adjust the axis ratios of the time series figures to display the temporal patterns more clearly, while working within the figure size constraints of Copernicus Publishing and maintaining the ability to compare years side-by-side. We will

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change the discharge plots in figure 3 to log scale, as suggested.

– Figure 4. I suggest adding to the caption something like: 'Note the difference in scales of the total heat fluxes and the vertical components.'

RESPONSE: We will include this suggestion.

– Figure 5 is difficult to interpret. Would it be better to show distributions of the ratios for different ranges of flows? There are so many points crammed near zero that is is hard to make sense of anything other than the fact that the flux ratios are much more variable and more likely to be negative and more likely to have high error at low flows.

RESPONSE: We explored different ways to represent these ratios, such as showing the distributions of the ratios for different flow ranges. We concluded that the most effective and succinct way to display these data is by keeping the figure as is. Fortunately, the comment above suggests that the key points were indeed drawn from the figure.

– Is it possible to show air temperature in Figure 6 along with the groundwater temperatures?

RESPONSE: We explored how we could include these data on Figure 6 to facilitate direct comparisons between air and subsurface temperatures; however, we have chosen not to include air temperature on the subsurface temperature plots, because the air temperature range is greater than the subsurface temperatures and the resulting change in y-axis scale hides some of the variability in subsurface temperatures. We have also decided against adding two additional plots showing air temperature to this figure, since it again results in compaction of the remaining plots, due to the figure dimension limits. In addition, these data are already shown in Figure 3.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12951, 2013.