

Interactive comment on “Potential surface temperature and shallow groundwater temperature response to climate change: an example from a small forested catchment in east-central New Brunswick (Canada)” by B. L. Kurylyk et al.

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We are appreciative of the efforts you have made to review and comment on our HESSD contribution. We trust that you will find our responses (bold) to your original comments satisfactory.

Kurylyk et al. is a well written and concise paper which clearly outlines possible responses in GWT to various climate scenarios. Most important is the separation of the impact of changes in air temperature to seasonal changes in GWT and snowpack.

C2107

In addition how these effects are translated with depth is analyzed. The paper is a valuable contribution to the literature, and while focused on one watershed in Eastern Canada, the approach and analysis methods are transferable to any regions especially where snowpack influences subsurface hydrology. All my comments below are minor editorial comments.

We appreciate your interest in the topic and your positive comments. We also agree that the seasonality of the air, surface and groundwater temperature is important, particularly for riverine ecology. In many previous studies of the impact of climate change on groundwater temperatures, only mean annual changes have been reported.

p. 3291 line 23 – not sure from the text itself if the stated rise 0.4-3.9C is over the period 2046 to 2065 or from present day (or observed 1961 to 2000) to 2065?

This difference is the average MAAT in the future period (2046-2065) compared to the average MAAT in the observed (1961-2000) period. This will be rewritten to remove any confusion.

Fig. 3 – and partly related to above comment – Are you taking the period 1961-2000 to represent one baseline time period and the period 2046 to 2065 to represent one baseline period – each then with their own set of statistics. This is not clear in the paper; neither is why these periods were chosen.

Yes, these two periods were taken as separate baseline periods. As we have also noted to the other reviewer, the future period (2046-2065) was selected because multiple downscaled climate series were available for this time frame. Our research is related to a broader collaborative study that is focused on Atlantic salmon and brook trout thermal refugia. Collaborating climatologists produced these data series for our location. The reference period (1961-2000) data from Environment Canada was selected as these data have been utilised to down-scale two of the climate series in this study (CGCM3-A1B and A2). We will be

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more explicit about our rationale for selecting the future period in our revision.

p. 3291 lines 26-28 – I am very glad to see you made the statement “Thus, the intent is to examine the sensitivity of GST and GWT to external forcing rather than to make an assessment of the accuracy of predictions regarding the future state of surface and subsurface thermal regimes.” All modellers – especially groundwater modellers – should know and emphasize the accuracy of their predictions or input data.

Thank you for this comment and your insight.

Fig. 6 7 – Again not clear that the period 2046 to 2065 is actually represented by a mean and variance (i.e. one point). Simply putting “(2046-2065)” will clarify. Note the presentations in these figures are very insightful. Separating out temperature variations seasonally is important and different from many publications.

Thank you for your positive comment and suggestion. We will include the future period (2046-2065) in our revision.

p. 3294 line 19 – no comma after Although.

Thank you for noticing this error. We will remove the comma.

p. 3299 line 7 – Personally I dislike the use of “etc.” in a sentence. To me it states one is too lazy to continue on the list. I prefer the use of (e.g. the list of examples). Then it is clear you are just giving some of the possible phenomena.

We agree that your suggestion is preferable, and it will be incorporated into the revision.

p. 3301 – Again clearly stating the limitations of the work is something that is not often done and is always needed to place ones work in context and allow for the use of the work by others.

Thank you for this comment.

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p. 3303 lines 11 to 13 – This sentence is not clear and is fragmented. Revise.

This sentence will be revised to: “We have also demonstrated that baseflow-dominated streams may exhibit more sensitivity to climate change than previous contributions have indicated.”

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 3283, 2013.

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