

Interactive comment on “Uncertainty in the impacts of projected climate change on the hydrology of a subarctic environment: Liard River Basin” by R. Thorne

Anonymous Referee #1

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This manuscript presents a study on hydrological impacts of climate change scenarios for a subarctic catchment. The author emphasizes ‘uncertainty’ in the title, which is an important issue. While this study is an interesting case study I have to admit that I had difficulties to see the ‘scientific news’ when reading the manuscript. Especially the limited analyses of the hydrological impacts are a bit disappointing. I think we have to move beyond the point where hydrological impacts are analyzed only as changes in the long-term average seasonal runoff. There are so many other aspects of hydrological change one could, and should, look at, including impacts on extreme flows.

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My major concerns with the manuscript in its current form are the following:

- 1) The manuscript is poorly structured, methods, results and discussions are mixed, which makes it difficult for the reader to follow.
- 2) Limited analysis of the hydrological impacts. As mentioned above, it would have been interesting to also look on impacts of, for instance, high flows or year-to-year variability
- 3) I also miss a more detailed analysis on the reasons for the observed differences in the seasonal runoff. Here it would have been valuable to look on the separate/combined effects of temp and precip as well as their temporal variation (e.g., uniform impact or rather ‘focused’ impact on individual days)
- 4) The author assumes that the calibrated model parameters for the hydrological model for current conditions also can be used for future conditions (p. 3133, 10f). This is a convenient assumption made in many studies, but certainly not always valid. Especially in subarctic regions one has to assume major effects due to land cover changes and even more due to changes in permafrost
- 5) It is interesting to look on the spatial distribution of climate variables and their change (Figs 4-6) but it is surprising that these spatial variations are not followed up with respect to their hydrological impacts and that the hydrological impacts are only analyzed in a lumped way.
- 6) Goodness of model fit: an efficiency of 0.75 (p.3132, 26) sounds ok, but one has to recognize that the high seasonality of the runoff makes it rather easy to achieve high efficiency values and I would, thus, have expected a better fit. Also from Fig 1 it seems that the model performs rather poorly for some years.
- 7) A change in evaporation is mentioned, but I miss the information on how evaporation is calculated
- 8) The potential effects of uncertainties of the hydrological model are not addressed in

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enough detail.

9) Given the active research in the area of hydrological impacts the reference list is surprisingly short.

10) Reading the conclusions, I wonder what we can learn from this study and what the main scientific contribution might be.

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