

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1  
<https://doi.org/10.5194/hess-2022-49-RC1>, 2022  
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## Comment on hess-2022-49

Anonymous Referee #1

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Referee comment on "Present and future thermal regimes of intertidal groundwater springs in a threatened coastal ecosystem" by Jason J. KarisAllen et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-49-RC1>, 2022

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Thermal impacts of springs on coastal waters and the sensitivity of these springs to climate change are not well understood. To address this issue, this study used field study for a threatened coastal lagoon ecosystem in south-eastern Canada by pairing in-situ thermal and drone-based thermal imagery monitoring to estimate the discharge to the lagoon. It also applied a numerical model to relate measured spring temperatures to their respective aquifer depths, and to study long-term groundwater warming. The value of this study lies on providing some insights to coastal ecosystem management. I have some comments that may improve the quality of this article. Please see the detail as follows:

General comments.

- There are two parts of this study: analyzing measurements and numerical modeling. I think the link between the two parts is that the model was employed to match the measurements to locate the aquifer depth that provides the water source to the lagoon. However, this link is not stressed in the text, so it looks like two separate studies. Most importantly, the major aim of the modeling (i.e., studying the sensitivity of groundwater temperature to climate change) is not related to the measurements analysis. I think the authors should work on the text more to link these parts to make them integrated.
- In regards to the hydrological modeling, some necessary uncertainty analyses is missing. Although two data sets of forcings were used, the assumptions and deficits of the hydrological model SHAW were not introduced and the related uncertainties or bias that may be derived from them were not analyzed. The authors need to discuss the uncertainties from many aspects (e.g., model, data, assumptions) and their possible influences to the results in the text to add the value of this manuscript.

Specific comments:

L105, "methods section": Too many words were used to introduce the monitoring software and system in section 3.1 and 3.2 which I think is not very relevant to the scientific topic. Is it possible simplify those sections and move some of the contents to SI?

L230-231, "The conceptual ... heat transport processes.": Please introduce more about the water and heat transport model. What key transport processes the model preserved?

L246-247, "A detailed description...detailed in Flerchinger (2017).": As mentioned above, a bit more about the SHAW model could be introduced in the text, rather than just refering another paper.

L258, "a daily resolution": Most land models use 1800s as the timestep. Is it a daily resolution too coarse for the soil moisture simulation?

L260-261, "The minimum and ... RCP4.5 hindcast model": Why didn't use the historical reanalysis dataset as forcings? It would be more accurate than the model outputs.

L269-270, "(1) CNRM-CM5 ... MRI-CGCM3, RCP8.5": What are the spatial resolutions for these model outputs and reanalysis data?

L279-280, "The paired discharge ... relationship for the lagoon.": I don't think this linear relationship is reliable enough based on only three sites.