

Interactive comment on “Shallow groundwater thermal sensitivity to climate change and land cover disturbances: derivation of analytical expressions and implications for stream temperature projections” by B. L. Kurylyk et al.

Anonymous Referee #2

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In my opinion, this is an incredibly well written and well presented paper that is a great addition to the stream temperature literature. Kurylyk et al present a series of equations that can be used to consider the impact of changes to shallow aquifer and groundwater temperature on stream temperatures, presenting many useful examples.

I only have minor comments, but a few broader questions:

1. It seems as though snow or particularly cold weather makes some of these equations more useful or less useful in certain places. Are any of these solutions more

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or less suited to other places based on their physical setting, for instance warmer climates, complex aquifers, aquifers of variable materials, very deep/very shallow aquifers?

2. I found Table 1 to be very helpful. A second table that lists the variables a researcher would need to extract for each equation (beyond the obvious, air temperature, stream temperature, etc) would be very helpful. Data limitations may make some equations more or less useful in certain places. There is still a disconnect in my mind between the equations and the figures, and something to help that translation may be useful for readers.

3. The subsurface is still relatively unmeasured, making some values needed for these equations difficult to estimate or measure (for instance, Darcy velocities for upward and downward movement). How would you propose researchers address these and other subsurface values?

4. Given the inherent uncertainty within the subsurface, would an uncertainty framework (ranges of values) be a more acceptable approach as opposed to choosing just a single value? Is this a way to move beyond limitations regarding homogeneity?

Minor comments:

Throughout: the authors use the term ‘For example’ quite liberally throughout the text! Consider revising. Many times it is used, the sentence could stand alone without it.

P 12599: line 28: illustrate not illustrates

P 12600: line 11: indicate not indicates

Line 15-17: found this sentence a little confusing! Would rise approximately 90% of expected value? So, expected value would only overestimate by a small amount?

p. 12601: line 6: You get at this a little bit later, but I think it might be helpful to define the concept of ‘short term’ here. I think that what you think of as short term is very

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different than what the average person thinks of as short term!

p. 12601: lines 11:14: Feels like this is missing a word: maybe, changes to the thermal sensitivities will still be significant?

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