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Title: The thermal peak: A simple stream temperature metric at regional scale
Author(s): Aurélien Beaufort et al.
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Responses to Referees

<u>Anonymous Referee #2:</u>

We thank Referee #2 for their detailed review of our manuscript. We have broken out your individual comments, which are numbered, and responded to each accordingly in blue. We hope that our comments address and clarify any issues or concerns that they may have.

<u>Comments</u>

I was disappointed to find that the authors did not respond with an itemized response to the last review and instead only provided a track-changed document. I found this extremely disrespectful of my time as a volunteer reviewer. Minor changes are suggested, see attached.

We apologize for any time we may have wasted for the reviewer and thank them again for their effort.

1. Line 42-43: …, in reaches with strong local controls …and in reaches with large environmental heterogeneity … Unnecessary to include the "in" in each element of the list

   Sentence revised accordingly.

2. Line 45: "Hence, while air temperature has clear utility for understanding stream temperature, …"

   The entire paragraph up until this point was spent convincing the reader that air temperature was a poor surrogate for stream temperature, however, in this sentence they are saying air temperature it has clear utility for understanding stream temperature. I think the author's point about air temperature having clear utility should be clarified because it does not make sense given what was explained in the previous sentences of this paragraph.

   Sentence revised accordingly.

3. Line 51: "As streams increase in size, their surface area increases…"

Referring the stream size is ambiguous here because I am left to wonder if you are referring the stream order or to the stream's width or volume. I believe it is only necessary to talk about the stream's surface area in this sentence.

Sentence revised accordingly.

4. Line 69: "…countries lack ~~such~~ the …"

    Sentence revised accordingly.

5. Line 72-78: "…our objectives are -> were twofold …"; capture -> captured; define -> defined; term -> termed; estimate -> estimated; test -> tested

    Verbs should be past tense

    Revised accordingly.

6. Line 75: extremes -> maximums

    As suggested in my last review "stream temperature extremes" should be "stream temperature maximums" because this paper is only talking about annual maximum temperatures and not minimums. I noticed the terminology had been changed from "temperature extreme" to "temperature maximum" in other areas of the paper, I assume it was just overlooked here.

    Revised accordingly.

7. Line 91: times -> time

    Revised accordingly.

8. Line 186: climate -> climactic, hydrology -> hydrological

    Use the adjective version of the words because they are describing categories

    Revised accordingly (with "hydrologic" instead of "hydrological", and "climatic" instead of "climactic", as reviewer suggested).

9. Line 380: demonstrate -> demonstrated

    Revised accordingly.

10. Line 449-451: I don't see how the second sentence (starting w/ "The importance of") is different from the first. In both sentences the authors are saying that the relevance of mean summer air temperature is consistent with other studies. The Moore cites could be added to the first and the second sentence deleted.

    Revised accordingly.

11. Lines 455-456 & 458: "water travel times" & "residence time"

Terminology changed from "travel time" to "residence time". I would suggest choosing one and using the one term in both places for clarity

Revised accordingly.

Responses to Referees

Anonymous Referee #3:

We thank Referee #3 for their detailed review of our manuscript. We have broken out your individual comments, which are numbered, and responded to each accordingly in blue. We hope that our comments address and clarify any issues or concerns that they may have.

Comments

I generally agree with the previous two reviewers in that it is a worthwhile study and dataset. I would recommend the paper to be accepted for publication subject to these few minor revisions. Overall, the authors took into account the vast majority of the reviewers' comments. I pointed to comments by R1 and R2, which have not been addressed (or if they were, it was not obvious). Line numbers refer to the revised version of the manuscript.

1. Lines 36-39: Add a mention of water quality studies too (one reference would suffice).
   We inserted line 27 van vliet and Zwolsman work on summer droughts on the water quality of the Meuse river
   "Water temperature extremes, like summer maxima, are particularly strong drivers of aquatic biota behavior,habitat selection (Carlson et al., 2007; Xu et al., 2010), and water quality (van Vliet and Zwolsman, 2008)."

2. Lines 45-46: Add reference to back up statement.

References are provided throughout the paragraph to support this paragraph-concluding sentence. We also modified this sentence a bit based on the other Referee comment.

3. Line 98: Space missing after parenthesis in "power thermal effluent)were excluded".
Sentence revised accordingly.

4. Lines 99-105: Clarify where the daily mean temperature (Tair) data comes from. Note that R2 made a comment asking to clarify what was meant by "mean daily stream temperature", but it is not obvious if that comment has been addressed (R2 review, comment 3.b re line 99 of original manuscript).
The following text was removed from lines 179–183 and added on line 106: T_{air} was provided by the 8 km gridded SAFRAN (Système d'Analyse Fournissant des Renseignements Atmosphériques à la Neige) atmospheric reanalysis data released by Meteo-France over 2009-2017 period (Vidal et al., 2010). It was extracted from SAFRAN meshes overlapping the station location. Mean daily stream temperature was indeed clarified in the previous version on Lines 97–103.

5. Line 113: Clarify "oriented hydrographic network" (do you mean flow direction information are built-in?)
We used common-language for hydrographic networks, but for clarity have also now added the parenthetical: "(i.e., built-in upstream-downstream dependencies)" on L118.

6. Lines 133-138: Clarify paragraph:
R1 commented re section 2.2 (Line 118 in original version). R1 suggested the metric could have been much simpler. R2 also commented on that section, specifically the second paragraph about the definition of the metric. The authors edited that section to clarify the metric, and added a paragraph to explain why they designed it as it is (lines 133-138 in new version). I would say the addressed R1 and R2 comments. However, I find that new paragraph is not very clear. In particular, it is hard to visualise what this paragraph means in practical terms were you to collate data and calculate the metric. I would suggest revising that paragraph.
Indeed, we revised this based on original Referee comments. It is not easy to revise this paragraph as requested by you (Referee 3) without some more concrete or specific suggestions. We have elected to leave it as is because the metric is actually defined on

liens 128–137, not in this paragraph. This paragraph simply serves to provide rationale for not *a priori* using the maximum of say, August, data.

7. Line 181: replace "fit" with "fitted".

   Either are fine, technically; US speakers tend to use "fit".

8. Table 3: In Reference, just repeat Sauquet et al (2008) and Sauquet and Catalogne (2011) for HR and CI rather than send reader back to text.

   The Reference in this case is referring to the Hypothesized Effect, not the variable, itself, so the References are correctly stated. Left as is.

9. Line 203: spell out SYRAH-CE.

   Revised accordingly.

10. Lines 210-237, Sections 2.4.3 and 2.4.4: Was text revised to address R1's comment?

    R1 commented on sections 2.4.2 to 2.4.4 (his comment refers to "Methods, lines 197-215") requesting that more details should be included "that a knowledgeable reader could replicate the analysis". I can see that section 2.4.2 was edited accordingly and is fine, but sections 2.4.3 and 2.4.4 are the same as in the original version; I am not very familiar with ANN or random forest so maybe these sections are detailed enough but they look rather sparse, especially 2.4.4. Could the authros confirmed the text has been revised and left unedited on purpose?

    We confirm that we revised this text, but we have provided additional detail as requested. For ANN and RF, there are standard methods that we follow and already cite, and it is not within the scope of this paper to describe their inner-workings in their entirety.

11. Lines 253 and 265 the section number is 2.4.4 for both; it should be 2.4.6 and 2.4.7

    Revised accordingly.

12. Line 447 section 4.3: see R2 review comment 2.b; could you re-check that comment and confirm you addressed it, and how, because it is not immediately obvious (I appreciate the authors amended the intro and added hypotheses, thus addressing R2 comment 2.a so possibly addressed 2.b implicitly).

    It is not clear what is meant by comment 2b from the R2 review…did the Referee mean comment 1b? Regardless, we confirm that we addressed all comments from that reviewer, including formalizing hypotheses and providing support for q_{min} and area as predictors.

13. Line 463: R2 suggested to change "greater" with "more" but text was not amended; confirm it is intentional.

    Revised.

14. Line 437: correct sentence "We tested s SSN model was tested".

    Revised.