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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical note: Fourier approach for estimating the thermal attributes of streams" *by* M. Ryo et al.

Anonymous Referee #1

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This manuscript presents a new method that predicts stream temperature at data-poor sites using thermal attributes (e.g., diel, seasonal periodicities and irregularities) from Fourier analysis of a reference site, assuming spatial auto-correlation between sites along the river continuum. Its contribution to understanding stream temperatures lies in its contrast from linear regressions: it provides site-specific weighing of these reference site thermal attributes to infer stochastic behaviors at data-poor sites. The authors present, in the introduction, a solid argument for closing the current gap in research surrounding understanding of stream temperatures, and the proposed method of Fourier analysis in determining stream thermal attributes is very clear. However, the role of the proposed method in filling this gap may need some rewording. I would recommend this article for publications with some edits.

Below is a list of scientific questions and suggestions that arose while reading the

manuscript:

1. Page 2, line 5–6: "Progress in understanding response patterns have been delayed partially because the quantification of thermal attributes is difficult for running waters."
   The introduction stresses that understanding of thermal attributes in lotic ecosystems is hindered by scarce temporal observations, which certainly is a limitation in current research. However, this method hinges on a reference hydrologic station (i.e. a site that is not data-scarce) to elucidate thermal attributes at a data-scarce site. The manuscript's current focus seems to lie in extrapolating within a basin where there is abundant data from at least one location, and it may be helpful to state this explicitly because the description of the limitations in currently available methods/research that are mentioned in the introduction may signal to readers that the proposed method will be rooted solely in spot measurements.

2. Page 3, line 5: The authors consider external factors such as weather conditions as part of the irregularity component. However, in other climates, these meteorological conditions would likely factor into the diel (sun) and seasonal (rain) periodicity patterns as well.

3. Page 6, line 5: Are the r^2 values (0.66 vs. 0.6) significantly different to state that the proposed method works better than linear regression? It might make more sense to first stress that the method can successfully recreate extremes (cf. linear regression), and then state that it is better at estimating temperatures at site A.

4. Page 7, line 16: Is the threshold value specific to the system in question? How was this value chosen, and what implications might this have?

Below is a list of technical corrections:

1. "Thermal attributes" should be explicitly described earlier in the introduction. The full description is currently on page 2, line 21, but "thermal attributes" are first mentioned well before this line.

2. Page 2, line 26–27: “...multiple scales in time-series data, **and** water temperature in particular."

3. Page 2, line 33: “...sites **along** the same stream..."

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