

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

Anonymous Referee #2

Received and published: 21 June 2016

Key Points:

Temperature is an important determinant of physical and biogeochemical patterns and processes in ecosystems. Temperature models that predict “thermal attributes” (diel and seasonal periodicity and irregular extremes) at sites with spot temperature measurements are poorly developed. The authors present a new temperature modelling method based on Fourier analysis to determine these “thermal attributes” at data poor sites. The authors’ method is dependent on having highly resolved temperature data at a reference site and on the assumption that there is spatial autocorrelation between the reference site and data poor site. The authors’ model performs similarly to a linear regression method with the exception that the authors’ model is better equipped at recognizing extreme thermal pulses and their probability. I recommend this manuscript for publication with edits.

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Scientific questions and suggestions:

Page 1, line 16-17: “The results confirm that the developed method can infer stochastic behaviors in stream thermal attributes at spot-measured sites.” It would be beneficial to the reader to reword this sentence so that it reflects the requirement of having highly resolved temperature data at a reference site and the assumption of spatial autocorrelation between the reference site and data poor site that this method relies on.

Page 2, line 3-13: The introduction correctly stresses the importance of knowing “thermal attributes” at a given site with regards to an ecosystem. The authors go on to describe that determining “thermal attributes” can be difficult and unrealistic because of the need for highly resolved temperature data. They present a strong argument for the need for improved modeling that can rely on sparsely collected temperature data. The introduction makes it sound as if the temperature modelling method presented in this manuscript does just that. However, the authors’ model is dependent on having two years’ worth of hourly temperature data at a reference site. In addition, it relies on the assumption that there is spatial autocorrelation between the reference site and the data poor site. It would be beneficial to reword the introduction so that this information is more explicit.

Page 4, line 9-10: The authors do not include discharge and air temperature data in their methods for simplicity. Would adding this information to the Fourier analysis method improve its performance when compared to the linear regression method?

Page 6, line 3-5: It appears that the method performs comparably to a linear regression with the exception that the presented method captures extreme thermal pulses and their probability. The linear regression method does not do this. It would be beneficial to emphasize this result and include it in the Abstract.

Technical, spelling, and grammatical edits:

Page 1, line 10: It would be beneficial to define explicitly what “thermal attributes” are

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earlier in the manuscript. The authors do so on Page 2, line 21-22. However, the term is used several instances before this definition.

Page 1, line 11: “Based on Fourier analysis, this study developed. . .” Misplaced modifier

Page 1, line 12-13: “We first quantified. . .Stream temperature was accurately decomposed. . .” The first sentence is active voice while the second sentence is passive voice. The introduction should remain in active voice.

Page 2, line 5: Progress in understanding response patterns has been delayed. . .” Subject verb agreement

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-238, 2016.