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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Incorporation of the equilibrium temperature approach in a Soil and Water Assessment Tool hydroclimatological stream temperature model" *by* Xinzhong Du et al.

Anonymous Referee #1

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Review of "Incorporation of the equilibrium temperature approach in a Soil and Water Assessment Tool Hydroclimatological stream temperature model" by Xinzhong Du et al.

In their work, the authors seek to improve the estimation of stream temperature within the SWAT framework by incorporating a model based on the equilibrium temperature approach. By accounting for air temperature, solar radiation, wind speed, and water depth, the authors obtain a more realistic representation of the heat transfer process than the previously used stream temperature models.

The paper is well written and very easy to follow. The authors did a nice job at dis-

cussing the literature and comparing their contribution to previous work. This helped highlight the novelty in their article.

The research is sound and the results brought about by their model, based on the equilibrium temperature approach, are clear. I therefore suggest "minor revision" and only ask the authors to address my few comments below.

Comments:

-Page 3: I agree that the model introduced by the authors represents a trade-off between complex mechanistic models and simple statistical models. However, because of the simplistic representation of the physics, this is an advantage only in long-term analysis, for which complex models would require "intensive data and calibration effort". On the contrary, for short-term analysis a more realistic representation of the physics, as provided by complex mechanistic models, may be more reliable. I think this needs to be briefly discussed in their introduction. By discussing this, the authors would at the same time provide a range of applicability of their model.

-Regarding the organization of the sections, I suggest moving the description of the study area after the description of the model. This would mark more clearly a distinction between the theory (including the novelty of this work) and the application (which mostly has an illustrative purpose).

-Section 2.2, line 15: Saying that the hydrological cycle is simulated based on the water balance is obvious.

-Page 6, equations (4) and (5): can the authors explain why the coefficient of heat transfer should range from 0 to 1?

-Page 7: if the authors do not want to use a model for the dew point temperature (such as Lawrence, 2005), why not calibrating directly Td rather than equating it to Tair+η and calibrating η?

-Figure 2 is too small and needs a higher resolution.

-Why not Arrhenius equation to calculate the change in the reaction rate with respect to temperature? Also, the equilibrium constant too changes with temperature. A more accurate analysis of the effect of temperature on water chemistry would need to account for this (i.e., Van 't Hoff equation).

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