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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Bayesian performance evaluation of evapotranspiration models for an arid region in northwestern China" *by* Guoxiao Wei et al.

Guoxiao Wei et al.

xyzhang099@163.com

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General Comments: 1. Response to comment: Language issues should be fully checked throughout the entire text before publication in HESS. Response: Thanks for the comment, our manuscript will be edited by the specialist of native speaker.

2. Response to comment: Novelty of the paper should be better emphasized rather than "BME has not been used for evaluating the ET models". Response: Thanks for the comments. We will change the original statement to "Most applications of Bayesian methods have focused on the calibration of individual models, while the comparison of alternative models continues to be performed using traditional error metrics. More

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generally, Bayesian approaches to model calibration, comparison, and analysis have been used far less in the evaluation of ET models than in other areas of environmental science.”.

3. Response to comment: Model complexity for each model should be better described. For example, authors can directly introduce number of parameters with uncertainties in their experiment? Response: The SW model with seven parameters is more complex than the PM model with five parameters, and the PT-FC and AA models each with two parameters, which is consistent with the commonly accepted view that including additional parameters increases complexity and improves the model performance. Considering the comments, we will add the explanations in this section. Specific comments: 1. Response to comment: The Abstract is out of organization. It seems to me that you never mention the model complexity but always write “underestimation” or “overestimate” to explain why the SW is the best one. Response: Thanks for the comments. Detailed comparison will be added in the abstract to keep it within the required range. Although the SW model with seven parameters is more complex than the other three models, the BME criterion still selects SW as the best model. A revised abstract will be given for further review.

2. Response to comment: Lines 25-27: unclear, please rephase this sentence. Response: Considering the comments, we will consider to change the original sentence to “The ET model parameters were calibrated using the entitled differential evolution adaptive Metropolis (DREAM) algorithm; the optimal model was selected using Bayesian model evidence (BME), which was implemented using the mathematically rigorous thermodynamic integration method.”.

3. Response to comment: It is unclear for me why ‘SW’ is best one from the abstract. Response: Considering the comments, we added the sentence to explain why SW is the best one in abstract. Although the SW model with seven parameters is more complex than the other three models, the BME criterion still selects SW as the best model. This is because the structure of the SW model is more physically rigorous, its

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parameters have greater impact and their sensitivity is well constrained.

4. Response to comment: Line37: please check the symbol. Response: We will check the corresponding symbols.

5. Response to comment: Simulate ET or estimate ET? Please be very sure of this word. Response: Thanks for the comment, and we will change “simulate ET” to “estimate ET”.

6. Response to comment: Line 41: add a reference. Response: Thanks for the comments, the reference from “Brutsaert, 2005” will be added in the paper.

7. Response to comment: Lines 55-56: unclear, please rephase this sentence. Response: We decided to rephase this sentence as “These ET models are generally complex because of the coupling of the land surface and atmospheric processes and high-dimensional”.

8. Response to comment: Lines 62-63: ‘These quantitative criteria’ refer to what? Response: These quantitative criteria refer to the “ residual-based metrics (such as regression slope and MBE) and squared-residual-based metrics (such as R2, RMSE, IA, and EF)”. This part will be revised to clearer illustrate our discussion.

9. Response to comment: Line 70: performances. Response: We will check it in the manuscript.

10. Response to comment: Line 71: remove ‘the’ from ‘the SW model’ Response: This will be removed from the corresponding sentence.

11. Response to comment: Lines 71-72: please rephase this sentence. Response: The sentence “Ershadi et al. (2014) evaluated the surface energy balance system (SEBS), PM, PT-JPL (a modified Priestley-Taylor model), and AA models” will be better.

12. Response to comment: Line 73: should be model ranking? Please check the terminology. Response: Ye, this should be “model ranking”.

13. Response to comment: Lines 75-76: unclear, significant variability of model performances? Response: Thanks for the comments, we will modify this part in the following process.

14. Response to comment: Lines 92-93: been? Response: We will check the words in the corresponding line.

15. Response to comment: Lines 102-103: add a reference Response: The reference “(Vrugt et al., 2009)” will be added. Once again, thank you very much for your comments and suggestions.

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