

# ***Interactive comment on “Similarity and dissimilarity in model-results between single and multiple flow direction simulations based on a distributed ecohydrological model” by Zhenwu Xu and Guoping Tang***

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Dear Referee #1:

We greatly appreciate your valuable comments on our manuscript (#hess-2018-47). We have carefully addressed all of your comments and our responses are listed below one by one following each of your comments!

Specific Comments:

(1)I do not agree with the authors that Dinf algorithm of Tarboton (1997) is single flow algorithm (see e.g. page 2, line 9, and page 3, line 22). Dinf rout water to one or two downslope cells. This is even shown on Figure 7 in the ms where the authors rightly show that Dinf often rout water to two downslope cells. Therefore it is misleading to call it single flow routing algorithm.

Response:

Thanks for your good comments! Yes, D\_inf is an specific case of MFD algorithms. Following Referee #2 's advices, we used "SD" instead of "SFD" and "MD" instead of "MFD" to describe these routing algorithms. The definition will be added in Introduction section of the revised manuscript. These terminologies are consistent throughout our manuscript. Besides, we have considered the advices from Dr. Qin (SC) to add a new algorithm MFD-md to the revised manuscript and now a total of five algorithms are kept (D8, D-Infinity, MD8, RMD-Infinity, MFD-md) in the revised manuscript.

(2)Overall, I think that the ms would benefit from moving from the dichotomy of SFD and MFD algorithms (especially given the fact that Dinf is not SFD algorithm). In my view, authors should compare and discuss the model results among all four algorithms. In the present version of the ms, authors usually state that results from SFD differ from MFD algorithm, but it is often unclear which particular algorithm authors really mean.

Response:

Thanks for your good comments! The dichotomy of SFD and MFD algorithms are now removed from the title and we only refer to SD and MD to distinguish their differences in dispersion of modeled data (see Section 3,4, 4.2 in the revised manuscript) while we define D\_Inf is a case of MD under special circumstance.

Specially, four pairs of algorithms (D8/RMD\_inf, D\_inf/RMD\_inf, D8/MD8, RMD\_inf/MFD-md) are selected for comparisons in section 3.4 and 3.5 (Fig. S2 in the supplement of this reply). The cell-level DR averaged for the watershed ranges

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from 2.6% to 6.4% under these four representative pairs of algorithms (Table S4.). Correspondingly, more details have been added to Fig. 7 and Fig 8 to demonstrate the comparisons between the four paired algorithms (see Fig. S3 in supplementary materials). For Fig. 9, we added the relationships between leaf area index (LAI) and “distance to stream” (panel a, b) as well as relationship between SSD and LAI (c) under five algorithms. Nevertheless, an representative example of D8 vs RMD\_inf will be remained in our revised manuscript for distribution of SSD and LAI in Fig. 3 and Fig. 5 because it’s hard and also redundant to show all groups of compared algorithms. We believe that these changes in the selection of algorithms and comparisons of model results as well as consequent Figures and Tables will offer more details for readers to understand our results.

(3)I do not understand why authors renamed well know RHESS model to CHESS (see page 3, line 3). As far as I can see from the text, these two models are the same. To use the different name for the same model is therefore misleading.

Response:

Thanks for your good comments! Actually, we renamed “R-RHESSys (note: instead of RHESSys)” to CHESS, which is short for “Coupled Hydrology and Ecology Simulation Systems”. Tang et al. (2014, 2016) developed R-RHESSys based on RHESSys modelĀĀĀAs discussed in Tang et al. (2014), we have removed the hierarchical structure of the original RHESSys model and also excluded the top-model embedded in the original RHESSys. In addition, we have redesigned the model-user interface for R-RHESSys and modified model codes much. We renamed “R-RHESSys” to CHESS for the purpose of its future development and usage. We have revised relevant text in the revised manuscript for clarification.

(4)Figure 4: Figure caption is incomplete as there is no explanation what shows individual panels. Which panel is for D8 and which for MD8? Why authors showed only two of four algorithms compared in the ms?

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Response: Thanks for your good comments! As our responses to the Specific Comments (2), four pairs of algorithms are compared, respectively, in the revised manuscript.

Minor comments:

(1) Suggestion for the title: I would recommend to replace “direction simulations based on by “routing algorithms used in”.

Response:

Thanks for your advices. The title has been changed to “Similarity and dissimilarity in model-results among flow routing algorithms used in a distributed ecohydrological model”

(2) page 15, line 14: wrong formatting of the Reference Costa-Gabral & Burges

Response:

We have revised it.

(3) page 25, line 4: “A conceptual map : : :” – I think that “A conceptual figure: : :” would be better

Response:

Thanks for your good comments! We changed it to “a conceptual figure”.

(4) page 25, line 4: Figure caption is clearly not complete and something is missing at the end.

Response:

Thanks for your good comments! We revised relevant figure captions in our revised manuscript .

Overall, we benefited much from your comments and hope that our responses to each

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of your comments are satisfactory. Again, we greatly appreciate your valuable comments.

Yours Sincerely,

Zhenwu Xu

2018/5/3

Please also note the supplement to this comment:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-47/hess-2018-47-AC3-supplement.pdf>

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