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_Infinity 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
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-RHESys (note: instead
of RHESSys)” to CHESS, which is short for “Coupled Hydrology and Ecology Simula-
tion Systems”. Tang et al. (2014, 2016) developed R-RHESys based on RHESSys
modelâ€”As discussed in Tang et al. (2014), we have removed the hierarchical struc-
ture 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-RHESys and modified model codes much. We renamed “R-RHESys” 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 indi-
vidual panels. Which panel is for D8 and which for MD8? Why authors showed only
two of four algorithms compared in the ms?
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-Cabral & Burges
Response:
We have revised it.

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