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

Anonymous Referee #1

Received and published: 29 March 2018

This ms compared results from simulations of RHESS (authors renamed it to CHESS) model among four different flow routing algorithms. The authors showed that results from different algorithms differ at the individual cells but that the results for the whole watershed are the same. In my view, this is a trivial result, as – by definition – all cells of the watershed are drained through the same point, the results at the watershed scale should be the same regardless flow routing algorithm used. Many previous studies also showed that the results largely differ among flow routing algorithms at the individual cell. Therefore, this is also not novel finding. For me, the most novel finding presented

in the ms is proposed modification to MDinf algorithm of Seibert and McGlynn (2007). However, to be useful, the authors should show its utility by comparing it both to the field measured data and simulated data with known properties.

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.

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 SFM differ from MFD algorithm, but it is often unclear which particular algorithm authors really mean.

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.

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?

Minor comments:

Suggestion for the title: I would recommend to replace "direction simulations based on" by "routing algorithms used in"

page 15, line 14: wrong formatting of the Reference Costa-Cabral & Burges

page 25, line 4: "A conceptual map . . ." – I think that "A conceptual figure. . ." would be better

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

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-47, 2018.