

Interactive comment on “Impacts of spatial resolution and representation of flow connectivity on large-scale simulation of floods” by Cherry May R. Mateo et al.

Anonymous Referee #1

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This paper reports on the application of a new model structure in the CaMa-flood Global River Model (GRM) to the simulation of the Thailand 2011 flood. The new model structure introduces extra connectivity in CaMa-flood to allow better simulation of river flows in cases where the simple assumption of a single downstream drainage path, which is the common drainage structure used in GRMs, does not apply (for example in deltas where there is river bifurcation). The need for improved connectivity and better river representation in GRMs has been identified as an important area of research, therefore this paper is a very timely and important contribution to the evolution of GRMs in general.

The paper is mostly well written and clear except for the few typos listed below. Figures

C1

are also of good quality and informative. Analysis on the whole seems thorough and appropriate. Where I think there are some issues is in the interpretation of the findings and some claims which maybe a bit overconfident, given the evidence. I feel the paper should be published after some minor additional discussion to cover these conceptual issues.

Conceptual issues:

(1) In the abstract (line 24), it is stated that the findings are universal. However I do not think evidence is provided to back up this claim. I agree that, in theory they should be, but without wider testing or evidence, this is an over bold claim. I would suggest, either rewording this to “findings should be universal” or providing a better argument as to why the authors consider them universal, for example through a clear geomorphological explanation as to why the findings here equally apply elsewhere.

(2) The link between the real river system and the model representation of that system is not very well explained or developed. While GRMs will obviously necessitate approximations, as they strive for higher resolution representation and improved physical representation, it is important that these additions/improvements are providing the right results for the right reasons. For example, interconnecting flood flows across floodplains occurs through two main processes, diffusive overland flow and channelized flow. Many of the smaller channels are not explicitly present in the DEMs used in the models and even the finer resolution reach-scale hydrodynamic models struggle to include this complexity. The method to improve connectivity in the CaMa-flood model seems to be a diffusive flow method between cells and will not explicitly capture smaller floodplain channels. Any smaller channels present on the floodplain in the CaMa-flood model will be DEM drainage paths rather than real observed channels, so it is not clear how the extra model connectivity relates to the real river systems. The reason this is important is that there is a danger of introducing too much connectivity. This will have the effect of improving the models ability to capture a flood but at the expense of over prediction. I would suggest that the representation of real observed flood connectivity

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is covered in more detail in the discussion (there are plenty of good papers on this topic – including on the Chao Phraya).

Minor typos and suggested edits:

- (1) Page 1, line 14: “simplified representations” instead of “simplified representation”
- (2) Page 2, line 20: “simplified representations” instead of “simplified representation”
- (3) Page 2, line 31: “flood hazard maps for 1 x 1 km grids” instead “flood hazard maps at 1 x 1 km grids”
- (4) Page 3, line 29: “model has been” instead of “ model have been”
- (5) Page 4, line 18: “This paper assessed”. . . . papers don’t assess, people do. Perhaps “In this paper we assess”. Also “flood in the Chao Phraya River Basin” instead of “flood in Chao Phraya River Basin”
- (6) Page 4, line 30: “flood in recent history” instead of “flood in history” or define the time period of history.
- (7) Page 5, line 5: “based on fine-resolution” instead of “based from fine-resolution”
- (8) Page 5, line 8: “DEM” instead of “DEMs”
- (9) Page 6, line 27: “The simulation” instead of “Simulation” and “The calculation” instead of “Calculation”
- (10) Page 7, line 16: “simulation for different” instead of “simulation at different” and “spatial resolutions” instead of “spatial resolution”
- (11) Page 7, line 21: “explain” instead of “explicate”?
- (12) Page 7, line 22: “dynamics are discussed” instead of “dynamics is discussed”
- (13) Page 7, line 24: there is a missing close bracket “)”
- (14) Page 8, line 10: first mention of dams on the system. Might be good to add a bit

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of info on the dams and their role in section 2

- (15) Page 8, line 16: “relatively high” instead of “relatively higher” and also “govern more than other flood” instead of “govern over other flood”
- (16) Page 9, line 12: “process resulted in an increase” instead of “process resulted to an increase”
- (17) Page 9, line 24: “do not have explicit upstream-downstream channel relationships” instead of “do not have upstream-downstream relationships”
- (18) Page 9, line 29: “shows an increasing number of unit-catchments with backflow” instead of “shows increasing number of unit-catchments in backflow”
- (19) Page 10, line 13: “results in more rivers” instead of “results for more rivers”
- (20) Page 14, line 3: “result in low errors” instead of “result to low errors”

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