Comments on

"InundatEd-v1.0: A Large-scale Flood Risk Modeling System on a Big-data - Discrete Global Grid System Framework"

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The authors have provided detailed responses to reviewers' comments and have made substantial revisions to the paper. The main issue (identified both by myself and the other reviewer) was the lack of novelty of the work. They have clarified the novelty of the proposed approach, which has more to do with managing efficiently big data than with improving large-scale flood modelling per se. Perhaps the title of the paper should be changed to reflect this, i.e. "Dealing more efficiently with big data through the use of Discrete Global Grid System Framework: a case study on flood risk modelling".

There are currently several initiatives in Canada that will result in revised flood maps for very large territories (for example Info-Crue in Quebec which started in 2018 and aims to provide flood maps based on hydraulic modelling for over 25,000 km of rivers by 2023), so it is not clear how this DGGS would be used in practice. Could it serve to store the catalogue of flood simulations that would be produced by each province? HAND flood simulations are useful for visualization purposes, but it is not obvious that they can be described as "reliable flood risk maps" (p. 6, line 153), i.e. the type of maps that can be used in legislation for land-use planning. Furthermore, making flood risk information "more accessible" (p. 6, line 159) is also already achieved in many European countries (e.g. https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) so it is not clear why DGGS is needed to convey this information for the general public. I therefore remain not entirely convinced that there is sufficient novelty to justify a publication.

The Introduction could be shortened by removing detailed information on the impacts of floods and general statements on flood modelling (first two paragraphs). Note that the text specified in the answer to my comments is not the same as what appears in the revised manuscript. For example, on p. 5, line 127, it is stated that "the novelty of this study is twofold", whereas in the response to reviewers, it is stated that "the novelty of this study is threefold". This gives the impression that it was not obvious for the authors to determine what were the novelties in this study…

Detailed comments

p. 4, line 95: Afshari et al. should be 2018, not 2017. The reference (p. 30, line 945) lists this paper incorrectly in the alphabetical order as it starts with the first name (Shahab) instead of the surname (Afshari).

p. 6, line 133: Define acronyms the first time they are used (here, RFFA). It is not entirely clear what you mean by "without sacrificing the consistency of the framework". Why would other types of large-scale modelling approach become "inconsistent" if they used either RFFA or HAND (or alternative models)?

p. 6, line 139: A reference is needed to support the statement that "the IDEAS framework uses an integer-based addressing system which makes it orders of magnitude more efficient than that of other, more traditional spatial data models."

p. 8, line 194: "The vertical accuracy of the DEM is 0.34 m ± 6.22 m, i.e., 10 m at the 90% confidence level". Where do these values come from? A reference is needed, as the reported value appears underestimated since it is significantly smaller than what is stated in other publications on SRTM DEMs (e.g. RMSE of 17.76 m in Mukherjee et al., 2013; 13.25 m in Yap et al. 2019). This is important as later you indicate that the vertical uncertainty is "small enough to not affect our large-scale flood modelling simulations". Since LiDAR data are available in several parts of the Ottawa watershed, it would be straightforward to run tests on slope estimated from the SRTM in certain reaches to see how they compare with LiDAR estimates.

p. 8, line 204: As indicated above, comparing slopes obtained by LiDAR and SRTM DEMs over a few reaches would have been relatively simple to do. In fact, vertical accuracy could have been significantly improved by working with a 30-m aggregated LiDAR DEM (where available).

p. 8, line 215: The reference cited here (Comber and Wulder, 2019) doesn't mention Manning's n and thus does not seem appropriate to justify the statement that each pixel is attributed a Manning's n value based on land use/land cover attributes. Considering the uncertainty with HAND, it is not obvious that using a spatially varied Manning's n in the floodplain provides a major advantage over approaches using constant values (e.g. n = 0.035 in the channel, n = 0.1 in the floodplain, Fleishmann et al., 2019).

p. 19, line 531: Are there really braided rivers in the Ottawa watershed? Do you mean in cases where there are islands, resulting in anabranch channels?

p. 21, line 612: Afshari et al. (2018) instead of Afshari (2017).

p. 24, line 693 : Figure S6 (instead of S7). I don't think a figure is needed for this – the fact you had to add 4 seconds to the DGGS makes this figure particularly confusing. The main interest of the proposed methodology is clearly in its efficiency in managing big data, rather than in modelling accurately flood zones, as was pointed out on p. 23 ("InundatEd model allows for the “swapping” of various flood modelling methods, and thus could easily accommodate, for instance, shallow water equations”).

References

Fleischmann, A., Paiva, R., & Collischonn, W. (2019). Can regional to continental river hydrodynamic models be locally relevant? A cross-scale comparison. Journal of Hydrology X, 3, 100027, 1-19.

Mukherjee, S., Joshi, P.K., Mukherjee, S., Ghosh, A., Garg, R.D., Mukhopadhyay, A. (2013) Evaluation of vertical accuracy of open source Digital Elevation Model (DEM), International Journal of Applied Earth Observation and Geoinformation, 21, 205-217.

Yap, L.; Kandé, L.H.; Nouayou, R.; Kamguia, J.; Ngouh, N.A.; Makuate, M.B. (2019) Vertical accuracy evaluation of freely available latest high-resolution (30 m) global digital elevation models over Cameroon (Central Africa) with GPS/leveling ground control points. Int. J. Digit. Earth, 12, 500–524.