Title: Inundation mapping based on reach-scale effective geometry

General comments

This paper introduces the development of a novel conceptual inundation mapping procedure based on the well-known DEM-based HAND concept and standard hydraulic geometry functions coupled with 1-D steady-state flow equations. The paper, which is well organized and written, deals with a current subject matter that has been covered lately in an increasing number of papers published primarily in *Journal of Hydrology, Natural Hazards, and Journal of the American Water Resources Association*, to name a few.

The procedure known as MHYST is not meant to be a surrogate to physics-based hydrodynamic modelling of flood inundation mapping, but it may turn out to be a valuable alternative to computationally-intensive models and in data-poor regions. MHYST has the potential to be applied under different reach-scale and flood plain conditions; that is from natural to urban river corridors. The procedure was validated using an extreme flood event in France. That being mentioned, the procedure has yet to be tested under these aforementioned conditions and, more importantly, to prove it can be useful for a wider range of flooding events. Furthermore, I would argue there is a need to:

(i)   conduct formal sensitivity and uncertainty analyses (*e.g.*, Morris and Sobol) of key parameters (*e.g.*, K_{fp}, K_{ch}, α, β, ω, δ) and

(ii)   include in the paper a comparison between an actual and a predicted inundation mapping of several continuous reaches (*i.e.*, flooding extent) for one, two or three days; that is the information required by key stakeholders and elected officials.

At this point, I feel the authors should be given a fair chance to respond to the above comments and those introduced in the next section since I feel the paper has the potential to be a valuable contribution to *Hydrology and Earth System Sciences*. Thus, for the time being, I would say that revisions are necessary and required before the paper could be considered as a good technological contribution to the hydrological community.

Specific comments

P.3, L.28 Please specify the algorithm behind the flow direction function available in ESRI ArcGIS? Which software version?

P.8, L19   What is the vertical resolution of the 5-m DEM?

P.15   Given Fig. 11, is there any general observations about why and where MHYST performed either poorly or satisfactorily? Furthermore, the performance accounts for how many days? Is it only the flood mapping associated with the peak flow?

Editorial suggestions

P.2, L.5   Please insert « to » between « need » and « have »

P.3, L.5   I suggest adding the following reference: McGrath *et al*. (2018). A comparison of simplified conceptual models for rapid web-based flood inundation mapping. *Natural Hazards* https://doi.org/10.1007/s11069-018-3331-y

P.3, L.21   Please replace « relations » by « relationships » or « functions » and do so throughout the text (e.g., P.3, L.22, P.3, L23, P.4, L.10, P4. L13…so on so forth)

P.8, L.4   The complete citation is: Zheng, X., D.G. Tarboton, D.R. Maidment, Y.Y. Liu, and P. Passalacqua. 2018. "River Channel Geometry and Rating Curve Estimation Using Height above the Nearest Drainage." *Journal of the American Water Resources Association* 1–22. https://doi.org/10.1111/1752-1688.12661.

Figures

Fig.3   For completeness sake, please identify A_b, A_{ch} and A_{fp}, I know it is trivial, but the figure might as well be as explicit as it can be.

Fig. 4   Please hyphenate: « 5-m depressionless DEM »

Fig. 11   The resolution of this map could be improved, perhaps one image per page.

Tables

Answer to traditional questions

Is the paper free of errors in logic?

- Yes

Do the conclusions follow from the evidence?

- Yes.

Are alternative explanations explored as appropriate?

- Yes.

Are biases, limitations, and assumptions clearly stated, and uncertainty quantified?

- Yes.

Is methodology explained in sufficient detail so that the paper's scientific conclusions could be tested by others?

- Yes

Is previous work and current understanding cited and represented correctly?

- Yes.

Is information conveyed clearly enough to be understood by the typical reader?

- Yes

Are all figures and tables necessary, appropriate, legible, and annotated (as appropriate)?

- Yes.