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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assimilation of probabilistic flood maps from SAR data into ahydrologic-hydraulic forecasting model: a proof of concept" *by* Concetta Di Mauro et al.

Anonymous Referee #2

Received and published: 11 January 2021

This is a highly technical manuscript focused on assimilation of many different data sources using multiple techniques to predict flood extent and depth. I think this is an interesting study, but I overall I think it needs major improvements before it can be published. The science is sound and interesting, but the manuscript could be clarified and revised throughout to make this easier for the reader to understand. I summarize my major comments and minor comments below.

Major points: My main recommendation to the authors is to clearly clarify the contribution of this study to the literature. The manuscript incorporates many technical methodological assessments, but it is not always clear why these assessments are be-

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ing conducted, and what they help us learn about flood modeling. The authors should clearly state their contributions in the introduction, and clarify in a discussion section how their findings advance those conducted by other studies.

The introduction should be revised and reorganized. At current, the introduction is very technical, and describes a lot of the existing literature. However, I had a hard time following the common threads and major points being made across the arc of the introduction. Many individual references are described, but aren't necessarily connected to the bigger picture of flood modeling. More synthesis is needed across these references and paragraphs to highlight the major knowledge gaps. Furthermore, I'd recommend shortening the introduction. Finally, the introduction section normally concludes with a statement about the novelty of the study, the scope, and the objectives. These are instead first introduced on line 75, then again later in the introduction. I'd recommend consolidating these statements into a coherent paragraph at the end of the introduction.

At the end of the introduction, I am left unsure of the scope and objectives of the manuscript (for instance, nothing about SAR or flooding is mentioned). These three concluding sentences could benefit from more specifics as to what will be tested and explored in this particular article. Specifics, such as types of model used, data resolution, etc could be specified here, to more clearly articulate to the reader the framing of your particular work.

The methods section is very detailed (which I appreciate). Yet, I had a hard time understanding the major comparisons to be made in the results/discussion section. Could you more clearly summarize these and why you are comparing these methods at the start of this section? The workflow is helpful, but with the number of methods and acronyms, I had a hard time following this.

The Study Area section comes after the methods section – this was a little confusing to me, because the nuances of this are discussed in the methods section. Is it worth switching the order of these?

This may be my own personal preference, but I've been taught a paragraph should be 3 or more sentences. There are many cases where there are paragraphs of one or two sentences (e.g., line 285). Please ensure that all paragraphs are 3+ sentences, and ensure that these are appropriately combined throughout the text.

I would recommend relabeling sub-sections within the results to separate out the different comparisons and techniques you are making – organizing these headings would help me connect what you do to your methods section. For instance, I had a hard time connecting these results to the stated objective of detecting uncertainty in precipitation, and then to the conclusions section. It could also help to start each sub-section by describing what methods/approaches you are testing and why, given there are many comparisons.

At current, the conclusions section is quite long and there is no discussion section. This may be a personal preference, but I would recommend shortening the conclusions section, and moving much of what is in there now to a discussion section. Within this discussion section, the main piece I don't see is a discussion of the limitations of this approach – for instance, you consider one event – is there a reason to think that this approach is transferable? Why or why not? In what scenarios is this approach most useful (ie., at what scale)? Given rainfall is the main source of uncertainty, what does this mean for future work? Can this work improve forecasting?

Minor points: Line 42 – "used" is repeated Line 48-49 – I had trouble understanding this sentence – could you rephrase? It was not clear to me what 'the latter' referred to Line 42 – I am missing the connection from this paragraph to the next - why would one want to use a KP, 4DVar, or PF technique for assimilation of flood information? Can you connect these thoughts to the previous sentence? Line 52 – is there a reason to have a whole paragraph focused on this particular article? Is it most similar to what is done in this study? Do you improve on their work? If not, I'd recommend shortening the description of this article. Lines 76 – 90 – this is very detailed, to the point where I am unsure if this is helpful in the introduction. Would you be able to shorten this section

and distill a few key messages? Could this be moved to the methods section? Line 178: “supposed to be uniform” – do you mean assumed to be uniform? Sampled as uniform? Please clarify. Section 2.3 – please weave the equations into the text, instead of listing them after the text here Section 2.4 – please do a thorough read to ensure that all variables in the contained equations are clearly defined in this section Lines 228 – 232 – this reads as ‘results’ – should this be moved to the results section? Section 3.0 – please capitalize ‘area’ Line 276: The plots in this section show four time points – why did you select these time points? Please introduce the time points in this section. Line 285: You show a sub-section of the result area multiple times – please introduce this area and why you selected it in the text. Also – are you computing results for just this section of the river or the entire watershed? I wasn’t sure from the methods and study area section. Please clarify. Line 274 – 284 – should this be in methods? Line 279 – 281 – what is the significance of this? Could you explain more why you mention this here? This again seems like ‘methods’ – should this be moved to the methods section, or is it a ‘result’ of your investigation? Line 284 – Figure 3 and Figure 5 are mentioned – figures should be listed in order. Figure 4 is not cited in the text. Should this be removed or moved to Supporting Information? Line 315 – Please do not start a sentence with a number Line 387 – 399 – could you rephrase this sentence? I don’t understand what it is saying.

Figure 2: Could you highlight on this figure the places you select for Figure 3 and Figure 4? Figure 3 & 4: The legend is hard to see, and there is no label of what ‘value’ is being shown (and its associated units). Figure 3 & 4: What are the four assimilation time steps? Please label these figures as (a)-(d) or on the figure to indicate this. Figure 3 & 4: Should these be combined to enable comparison? It is not entirely clear from the results text what these images show and how these connect to the workflow.

Table 1 & Table 2: Please direct readers to Figure 6 in the captions for these.

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