Dear Dr. Moftakhari,

Thank for you for the comments and valuable feedback. Please find the attached document addressing each of your points and highlighting any corresponding modifications. We believe these changes greatly enhance the paper.

Regards,

Joshua Green on behalf of all authors

1) L113-115 and 301-312: in various points throughout the article, authors have referred to the fluvial, pluvial, coastal, groundwater, damming/dam failure, and Tsunami sources of flooding as drivers, and in L115 they refer to these as sources. To me, here and in the previous literature, this is one of the unclear points that needs further thought and agreement. To my understanding, these six items are basically the sources or the components of a compound flooding events that are driven by drivers like hydro-meteorological forcing. I think this is a point that authors could put more thought and come up with a good selection that helps the community of CCF to use a homogeneous language in distinguishing between sources/components and drivers.

Thank you for this question. Throughout the paper we use the term 'driver' as to be the direct mechanism that causes the flooding. Yes, the use of 'source' on L115 may be misleading as multiple drivers can have a shared source, for example fluvial and groundwater flooding can both originate from a 'glacial melt' source.

As you say, some might interpret 'source' to be the hydrometeorological forcings that lead to the drivers. For our purposes, we consider these as separate hydrometeorological 'modulators' that shape the occurrence and characteristics of the flood driver. To avoid confusion, we have changed this sentence to use 'driver' as has otherwise been used all throughout the paper.

2) L240-248: better to be consistent with the direct quotations in various points of the article. i.e. here L240-242 with single quotation mark, and in L244-248 with double quotation mark and italic font.

We agree and have removed the quotation from the first instance on L240-242 to remain consistent.

3) L315: large volumes of "excessive rainfall and snowmelt"... this way is more clear

We have modified this sentence as advised.

4) L326: I'd replace "rapid heavy rainfall" with "intense rainfall". The term intense encompass both depth (heavy) and time (rapid) characteristics of a rainstorm.

We have modified this sentence as advised.

5) L376: I'd replace "reservoirs" with "control infrastructure" as not all the examples (levees/dykes) are suitable to be called water reservoirs.

We have modified this sentence as advised.

6) L391: abnormally high or elevated soil moisture conditions?

We have modified this sentence to provide greater clarity.

7) L396-400: Prolonged drought and wildfire yield in vegetation loss that in turn promotes reduced roughness against flood water movement so more intense flooding. Also, the loosened soil after wildfire favors mudflows that are significantly more destructive than freshwater flooding.

We have modified this sentence to provide greater clarity.

8) L403: being close to the end of 2024, and given the fact highlighted in L493-495 and Figure 2 that the CCF literature is growing exponentially, I am curious why 2023 is excluded?

This was a highly demanding and detailed review that began in early 2022 and finished in mid-2023. As papers were continuously being published throughout the year, we limited the scope of the review to only papers from 2022 and earlier. This review was initially planned to be released in 2023, but unfortunately the publication process has been very slow due to matters beyond our control.

While it would be nice to have included 2023/2024, this is sadly not feasible given the substantial amount of resources that would be required and the limited time constraints of the authors. The volume of compound flood literature is beginning to be published at a pace that is faster than our ability to synthesize at the level of detail we wish to uphold in this review. This review captures the key foundational literature whose core discussions, approaches, and findings have shaped the research space. With the exponential growth of literature in years to come, a highly comprehensive and detail review will be a considerable challenge. At some point a threshold must be set to prevent having to continuously add more papers.

We note that this review does reference general papers published in 2023 for the purpose of supporting arguments, however none of these papers are part of the analysis or included in the compound flood literature database.

Going forward, there may be value in creating a collaborative community developed live portal/database to track compound flood literature and findings across the research space. Should anyone wish to collaborate in this type of live product we are open to providing support.

9) L435: Among the terms in Table 2, I am afraid there are few alternative terms that could have been used in the literature that is not included here, which may result in missing published literature. For example, the terms "sequence" or "consecutive" could be used when referring to "cascading" events, or "simultaneous" is suitable alternative and commonly used at places where co-occurrence is the case. Also, while various components of sea level (i.e. tide, surge, wave) are included, the term "sea level" itself is not included.

Thank you for highlighting this. We did in fact use 'consecutive' and 'simultaneous', but it seems these were not added to the table. The table has now been updated to correctly include these terms. However, we did not use 'sequence' or 'sea level' and recognize that this may have led to missing some of the literature.

10) L453: I guess the definition of drivers and precursor events are scale dependant. For example sea level rise can be considered an environmental condition that alter the interaction among various flood drivers (i.e. through altered frictional characteristics). Later SLR is considered among the drivers in L879.

An earlier version of this review considered 'SLR' (also 'wind') as an individual driver. However, we decided that SLR could not be clearly separated from any one coastal component and may cause confusion, so it was removed. To be clear, L879 is not considering SLR as its own driver. It is merely mentioning given it plays a role. This sentence has been slightly rephrased this sentence to avoid any confusion.

11) L606: if possible would be much more impactful if you create a map to summarize the contents under the section 6.1

There isn't a clear approach for graphically collating the combination of qualitative/quantitative information discussed across various papers given the different metrics and approaches used. We believe it is better to point the reader towards the available hotspot and dependence studies that address various driver combinations at global/regional scales.

12) L618: storm surge and intense rainfall which exacerbate pluvial and/or fluvial flooding

We have modified this sentence as advised.

13) L771: the following papers can be useful citations here

Hoitink and Jay (2016), Tidal river dynamics: Implications for deltas, Reviews of Geophysics, https://doi.org/10.1002/2015RG000507.

Lanzoni, S., and G. Seminara (1998), On tide propagation in convergent estuaries, J. Geophys. Res., 103(C13), 30,793–30,812.

Thank you for sharing these papers. We agree they provide support and context to the discussions around dominant drivers and estuary dynamics. These have now been cited in the paper.

14) L852-855: however published after 2022, it can be a good resource for interested readers on this topic

Radfar, S., Mahmoudi, S., Moftakhari, H., Mckelvey, T., Bilskie, M. V., Collini, R., Alizad, K., Cherry, J. A., Moradkhani, H. (2024). Nature-based solutions as buffers against coastal compound flooding:

Exploring potential framework for process-based modeling of hazard mitigation. Science of the Total Environment, 938, 173529, https://doi.org/10.1016/j.scitotenv.2024.173529.

We are aware of this great paper, however, as detailed in the Section 4 methodology, this review only considers papers for analysis and addition to the literature database up to the year 2022. As this paper was published in 2024 it is not considered within the scope of this review.

15) L1032: I believe here is a point that a definition for "hybrid" compound flood modeling must be proposed. Here it says "involving linking numerical and statistical approaches ... can complement each other or focus on multiple aspects of modelling in a way that would not be possible when using numerical or statistical approaches in isolation." These days there is a lack of consistent definition for this term in the community. What constitutes hybrid modeling, that distinguishes from other categories of modeling. I encourage the authors to use this opportunity to clarify this. To me (mostly in line with the descriptions already in the article, hybrid modeling consists reasonable integration of various modeling schemes (process-based and data-driven) with complementary skills, that together can provide a level of understanding/information that cannot be achieved efficiently in isolation.

Yes, to our knowledge there is no current standard definition related to “hybrid flood model”. There are a variety of ways for expressing this concept, however in this review we use “hybrid” to convey some form of analysis that employs a combined statistical and numerous methodology. This is not necessarily an agreed-upon terminology within the Earth systems modelling community, and thus might not align with the views of others. Some literature refers to the combination of multiple linked numerical model components as a “hybrid” model. Others use “hybrid” as a reference to a class of ML based statistical models. We have added further explanation to the beginning of Subsection 6.5.3 to better clarify how we use the term “hybrid” in this review, and how this does not have a consistent meaning across the research space. Thank you for addressing this point. We believe that modifying this section has greatly strengthened the paper.

16) L1151-1180: I am not convinced that this category is significantly different than the "risk assessment", as all the examples mentioned too are common examples for risk assessment, and I think adding a new category here would be more confusing than helpful.

We believe there is value in distinguishing “impact assessment” as being different from “risk assessment” in that it seeks to quantify the realized impact/damage following an event, rather than the potential risk of a theoretical event. Thus, risk assessment focuses on the theoretical pre-event, while impact assessment examines the actual repercussions of a specific observed event.

17) L1226: UNDRR

Thank you. A select few of the acronym citations (i.e. UNDRR, NCEI, NOAA) were in lowercase due to reference manager settings. We have corrected all instances of this throughout the paper.

18) L1224-1252: While published after 2022, could enhance the discussions on the policy challenges regarding CCF

Lewis, M., Moftakhari, H., & Passalacqua, P. (2024). Challenges for compound coastal flood risk management in a warming climate: a case study of the Gulf Coast of the United States. Frontiers in Water, 6, https://doi.org/10.3389/frwa.2024.1405603.

We are aware of this great paper, however, as detailed in the Section 4 methodology, this review only considers papers for analysis and addition to the literature database up to the year 2022. As this paper was published in 2024 it is not considered within the scope of this review.

19) L1332: ASCE-MOP can be another example

https://ui.adsabs.harvard.edu/abs/2023esoar.56062915G/abstract

https://ui.adsabs.harvard.edu/abs/2023AGUFMNH24A..05G/abstract

Yes, this is a good example. We have now included the ASCE-MOP as another instance of ongoing collaborative efforts.

20) L1364: parameter choice and interpretation of outputs.

We have modified this sentence as advised.

21) L1397: further recommendations under section 7 could be:

- strategic data collection for CCF at data sparse regions

Yes, this is a good point. We have now addressed this in part of Recommendation 2.

- curricular development and creating educational materials to train the next generation of scientists and practitioners for CCF

Yes, this is a good point. We have now addressed this in part of Recommendation 3.

22) In the supplementary materials accidentally found that there are two items Bevacqua et al., 2020a, and Bevacqua et al., 2020b, while there is only one Bevacqua et al., 2020 item listed in the reference list. Worth checking the consistency.

Table A1 in the Appendix contains all the papers that were used for analysis and make up the compound flood literature database. Not all of these papers are cited in the review's body text, and therefore are not included in the bibliography. For example, Bevacqua et al., 2020a (10.1038/S43247-020-00044-Z) and Bevacqua et al., 2020b (10.5194/NHESS-20-1765-2020) are both considered in the review analysis, but only the first is cited in the text. Nonetheless, we appreciate your detailed eye and the support in checking for potential errors.

23) In appendix 2: some coupled versions of models or submodules (ADCIRC-SWAN or Delft3D-Wave, or CoSMoS vs Hydro-CoSMoS) are listed as a separate model. I think given the possibility of coupling

between any of the models mentioned in this table better to avoid listing coupled versions as a separate model. In terms of implications, I don't think SWMM and XPSWMM are conceptually different (however the latter offers more features, but one is listed as a hydrologic model and the other as a H&H model.

Yes, we agree that this may at times be unclear. We were initially unsure whether or not to separately list examples of coupled/linked models. As you say, there can be many combinations for coupling the models within this table. We have decided to remove instances of linked model pairs where it is plainly apparent which models are being linked (e.g. ADCIRC-SWAN and sECOM-NYHOPS). However, we will keep entries for 'model systems' with branded name as we believe that the linking of modules in a certain way can define a particular model system. For example, LOOFS is a model system involving the linking of FVCOM and CICE. We are keeping both SWMM and XPSWMM, as while they are similar, they are operated by separate entities and varying differences. Similarly, while ASGS-STORM is built upon ASGS, it is a fundamentally different model system with various other capabilities.