In this document, the review comments are in black, our responses is in red and the revised text are in blue.

This paper analyzes two methods for the generation of future flood hazard maps under climat e change, along with a number of related issues. Even though the work focuses on a global-sc ale application of the CamaFLood model, the outcomes are relevant from a general point of vie w, given the importance of the topic. Overall the paper is well structured and generally well wr itten, although some descriptions could be improved (see my comments). The analyses carrie d out are appropriate and well described. I think that the paper could be published after addre ssing a few minor issues that I am listing below.

Reply: We would like to thank the referee for his kind remarks. We will address all the comments in the revised manuscript, and comprehensive explanations are pro vided below.

L25: "...changes in flood risk..." I would correct in "changes in flood hazard"

Reply: As you pointed out, because we use flood risk incorrectrly in the sentence, so we will revise it from risk to hazard.

"On the other hand, we confirmed that the lookup method can produce future-hazar d maps that are consistent with the changes in flood hazard projected by CaMa-Floo d simulations with input of GCMs runoff, indicating the possibility of obtaining reason able inundation-area distribution."

L29 "we discuss future changes at global scale..."

Reply: We will revise the sentence as referee #2 suggested.

L49-50: "To elucidate the potential impacts of flood disasters, a high-resolution map of potenti al disaster impacts must be developed, commonly named a hazard map." This is not fully corr ect. In flood risk literature, hazard is a component of risk but it is not a synonym of disaster i mpact (see for instance Ward et al, 2020). Perhaps you could replace with "To elucidate the p otential impacts of flood disasters, high-resolution maps of disaster impacts must be develope d".

Reply: In order to make an appropriate sentence that leads to the commonly named a hazard map, we will revise the sentence as referee #2 suggested. We will use the t erm "high-resolution inundation-depth maps"

L70-72 "Uses of large-domain flood-hazard maps include estimation of the affected population within an inundation area and determination of the impacts of flooding on GDP and urban area s in the current climate". This sentence should be reworded. In literature, the maps including i mpacts such as population and/or urban areas exposed arew generally called flood risk maps

As you pointed out, the sentence was not clear and was not stated correctly, so we w ill revise as follows to clarify the meaning of "Large-domain flood-hazard maps were used for many purposes such as estimation of risks." Specifically, we will revise it as follows.

"Large-domain flood-hazard maps was used for many purposes such as estimation o f the affected population within an inundation area and determination of the impacts of flooding on GDP and urban areas in the current climate (Ward et al., 2020a)."

L72-74: Bernhofen et al (2018) compared six global flood models against satellite-derived floo d maps, so adding a reference here would be appropriate in my view.

Reply: We agree with your point. We will add Bernhofen et al (2018) to the sentence as referee #2 suggested.

L80-81 this sentence should be modified, because several flood risk assessments have been c arried out at scales from global to local

Reply: We will revise the sentence as follows. We will clarify that in this paper we des cribed a global study. Also, we will clarify that flood risk has been studied, but flood hazard itself has not been sufficiently verified.

"While assessment of climatic and meteorological hazard under climate change (e.g. extreme temperatures, droughts and heavy-rainfall events) has been widely perform ed using direct output variables of general circulation models (GCMs), such as precip itation and temperature (Li et al., 2021, Lu et al., 2019), at present, no global high-r esolution flood hazard (i.e. inundation depth) in a future has been sufficiently verifie d. Even though some studies assessed future flood risks (e.g. affected population an d GDP) at the global scale (Ward et al., 2020b), it is important to analyze global futu re flood-hazard (i.e., inundation depth distributions), and also important to assess u ncertainties such as those caused by different bias corrections."

L147-154: I think that the description of the post-processing method needs more detailing. In particular I have some questions:

- My understanding is that the authors fitted a Gumbel distribution on each pixel of the Camafl ood 6-arcmin grid,correct? Or do you use different areas for the fitting?

Reply: We will revise the sentence as follows to clarify that fitting a Gumbel distributi on on each pixel of the Camaflood 6-arcmin grid.

"We fitted a Gumbel distribution on each of the Camaflood 6-arcmin grid."

- In lines 155-162 you state that water surface elevation is uniform within each 6-min unit cat chment, so I assume that water level in upstream catchment are increased to the same water level of donwstream catchment, right? If yes, please specify this in the text

Reply: Referee #2's understanding is correct. As referee #2 suggested that, we will r evise the sentence as follows.

"To avoid this issue, if a reverse water slope was obtained in the water surface eleva tion distribution, we elevated the water surface elevation of upstream catchments to match those of downstream catchments."

- Can you also explain why this approach was not needed in previous studies based on CamaFl ood?

Reply: We thank referee #2 for question. We would say the risk estimate of the previ ous studies could be improved by applying this reversal-slope modification approach. As described in the introduction, flood depth distribution itself had not been extensiv ely evaluated in previous studies.

In addition, the purpose of applying reverse-slope revision is written more clearly as follows.

"If reverse-slope revision is not conducted, reverse slope occurring through fitting of Gumbel distributions remain and the inundation-depth distribution may not be physi cally reasonable. For this reason, a novel reverse-slope revision method was applied in this study in the purpose of revising the spatial inconstancy that is due to the distr ibution fitting at each unit-catchment scale (grid-scale)."

L218: Alfieri et al (2017) actually employed the lookup method, because they used historical fl ood hazard maps coupled with changes in frequency under future climate scenarios.

Reply: We will add Alfieri et al (2017) as a reference as follows.

"As the lookup method does not use GCM_Runoff_BC and thus avoids the uncertainties associated with bias correction, including questionable results of bias correction for extreme events (Alfieri et al., 2017; Huang et al., 2014), several previous studies have employed this technique (Hirabayashi et al., 2013; Hirabayashi et al., 2021). Alfieri et al., 2017 employed the lookup method, they estimated future affected population and damage by flood using historical flood hazard maps coupled with changes in frequency under future climate scenarios. "

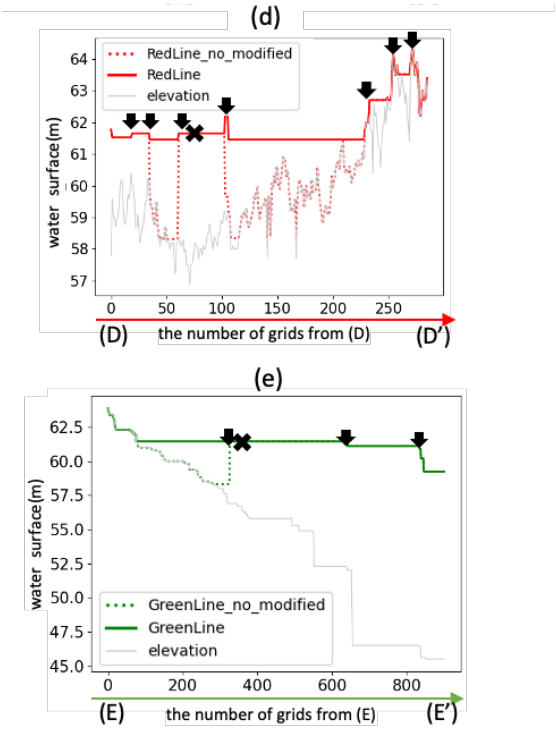
L405-406: Based on the results, the authors could maybe draw the conclusion that standard bias-correction techniques of GCM data are not suitable for use in flood hazard estimation (having been developed for different types of climate studies), and that different bias-correction techniques should be used (i.e. more focused on extreme values)

Reply: We agree with referee #2 suggestion. In response to referee #2' suggestion, we will revise the sentence in the section 4.1 as follows.

"This result implied that simple bias-correction techniques of GCM data, which is additive correction method to monthly mean runoff, may not be suitable for use in flood hazard estimation and that different bias-correction techniques should be tested (i.e. more focused on extreme values)."

Figure 8: Can you specify the unit of measure of the x axis in (d) and (e)?

Reply: We thank referee #2 for comment. We will specify the x axis in (d) and (e).



L488-503: I do not fully understand this analysis. Combining historical hazard maps with futur e flood frequency is basically the lookup method, right? (e.g. assuming that present-day 100-y ear RP will become 50-year RP in the future). Based on the outcome of the paper, I would rat her conclude (here and in Conclusions) that historical hazard maps can be used as an indicatio n of future hazard only if changes in flood frequency are properly accounted for.

Reply:We thank referee #2 for comment. As you pointed out, in general, estimating future flood frequency change and combining it with historical multiple-frequency flo od hazard map is a good solution to construct the future hazard map, and it can be s aid as "lookup method". We added the below sentence in the end of the 1st paragrap h of conclusion section:

"This implies that combining accurate historical hazard maps with information on fut ure frequency changes of floods is considered optimal in general for generating futur e hazard map. Please note that the historical flood hazard map does not have to be r

eanalysis-based simulation using GFM, and the proposed method can be also applica ble to gauge-based or machine-learning based historical hazard map.”

We’d like to note that the proposed look-up method applying extreme-value analysis at catchment-scale is beneficial at global scale studies since the frequency change va ries from basin to basin and sub-basin to sub-basin.