Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-415-RC1, 2020

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief communication: The role of using precipitation or river discharge data when assessing global coastal compound flooding" *by* Emanuele Bevacqua et al.

Anonymous Referee #1

Received and published: 6 February 2020

This manuscript evaluates the risk of coastal compound flooding at the global scale by using different combinations of drivers (surge vs precip and surge vs discharge) and assess the differences in the results. The analysis is purely based on modelled data. I think the exercise is interesting and provides some important insights that can guide future large-scale assessments of compound flooding risk. The paper is very well written and pleasant to read. I provide some critical comments below which should be addresses before publishing the manuscript. One general comment is that a CF analysis usually starts with assessing dependence between the drivers of interest, in the context of copulas often based on Kendall's rank correlation. This step is completely skipped in the analysis, but a simple comparison of the rank correlation between variable pairs

would already provide useful information, before moving on to the more complex statistical analysis. It would also show where correlation is small/negligible and a complex joint probability analysis possibly not warranted.

L. 94 The threshold of having at least 20 values seems quite low and I suspect the rank correlation that feeds into the copula analysis to be quite sensitive to individual extreme event combinations when the number of pairs is so low. This alone could lead to large differences between the CF estimates for the different variable pairs. It would be interesting to see if there is a relationship between the differences in CF estimates and the data availability, i.e., CF ratio vs sample size. I was also surprised by the short decluster time of only 3 days, given that discharge data is involved in the analysis; the authors actually discuss the aspect of discharge events often lasting longer later on in the manuscript. In many cases discharge can exceed a high threshold for several weeks or even months, and the way the analysis is setup here multiple extreme values are sampled from these events. On the one hand, of course, every time a surge occurs during the high discharge event there could be compound flooding, but on the other hand basic extreme value theory assumptions are violated. I am not saying the entire analysis has to be changed, but would like to hear the authors opinion on this issue, and it might also be worth touching on in the manuscript. What is the lowest threshold that has to be used in order to get to 20 events?

L. 100 Is the same copula always used when the different variable pairs are analyzed (i.e., get the best fit copula for, e.g., surge vs precip and force the same copula to be used for surge vs discharge) or can it change? If the copula is free to change, it might be interesting to test how the results look like wen the same copula is forced (as long as it passes the goodness of fit test(s)).

When displaying the results it would be interesting to see the relationship between CF ratio and absolute CF risk (in relation, for example, to the independence assumption), i.e., are differences between the CF risk relatively larger/smaller in areas where the joint return periods are closer/more different to the independence assumption.

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