

***Interactive comment on* “Evaluation of the probable annual flood damage influenced by El-Niño in the Kan River Basin, Iran” by Farhad Hooshyaripor et al.**

Anonymous Referee #2

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This study aims to assess the impact of El-Nino on expected flood damages. The idea is relevant and novel, while the execution and documentation currently are not sufficient for publication.

1 Major comments

Reading the paper I noted similar major issues as RC1:

1. In large parts of their methodology the authors jump to simplistic approaches.

C1

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This may in some cases be necessary because no better knowledge is available. However, the authors do not provide any arguments / literature references in this direction and also don't use data analysis to reason for their approach. I included details below.

2. The documentation is incomplete in some parts and it is not always clear what data were used.
3. In addition to the above, I have some difficulty understanding the motivation for this work. Clearly, atmospheric circulation patterns must be expected to impact extreme rain intensities. However, considering sufficiently long rainfall time series, these oscillations should not affect the probability distribution of extreme rainfall and thus also not our estimates of expected flood damages? Why then do we need to know exactly how much damages vary over time?

2 Methodological issues

1. Linking rainfall series and SOI - The references I found describe the AMI as a univariate method and I could not find it in the reference provided by the authors. It is not clear how the joint probabilities are computed from the histograms and the equation for the "optimal number of categories" appears out of the blue. Most importantly, the authors did not provide any evidence that the method gives reasonable results (time series plots of SOI and rainfall indicating the identified lag, scatterplots of lag vs. AMI, cross correlation plots, or similar)
2. Determining increased rainfall during El Nino
 - (a) There is an obvious problem in using change factors derived for annual rainfall to extreme daily/hourly precipitation. No reasoning is provided for why this is done.

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(b) I believe Fig. 3 illustrates the %-changes of rainfall for all years that were identified as "El Nino" in step 1.

i. It is not clear to me why you would pick the 60 and 90% quantiles for the further analysis. The median value, as far as I can see, is 0. My conclusion would be that there is no evidence for an impact of El Nino on annual rainfall? Also the trends identified in Fig.2 look very questionable. Have you tested the significance of parameters?

ii. Are the annual rainfall and %-change values correlated? This would certainly impact the trend estimates in Fig. 2 and pose a challenge for distribution fitting in Fig. 3?

3. Hydrological and hydraulic modelling

(a) The hydrological model was calibrated for a single event only, which is not good practice. Why is only one of the 3 stations used for calibration?

(b) It is not clear for which areas the HEC-RAS simulation is performed (not highlighted in Fig.1), so I cannot evaluate whether the link between hydrological and hydraulic modelling setup makes sense.

4. Damage calculation - It is not clear how the damage calculation was performed. The depth-damage functions are not provided in the paper. In the results section, the authors mention the computation of an "average inundation depth" per landuse class. This seems like a questionable approach, but it is simply not clear what was done here.

3 Minor comments

P1L27: How do you define a flood event? Is it correctly understood that Tehran experienced flooding 12 times in 1951 and 54 times in 1991?

P2L1-23: This part of the introduction cites a lot of studies that measured impacts of atmospheric circulation patterns. However, most of these refer to completely different parts of the world, so I had difficulty seeing the relevance.

P3L10: typo 78.23M cbm/s ?

P4L20-25: What is a natural uniform rainfall?

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