Reply to Reviewer #1

We have replied to all the reviewer's comments in red.

The paper is well structured while the content is very dense and properly concise. The paper gives an important contribute to the analysis of factors affecting the FF curve by performing a deep analysis of the effects produced by models structure, model parameters, interaction between model parameters and model structure, initial conditions (in terms of water content) and precipitation events. In my opinion the paper can be accepted subject to minor revision.

We thank the reviewer for their positive assessment of the manuscript and their helpful specific comments highlighting areas for further improvement. Please see our point by point replies below.

I suggest the authors prepare a flux diagram describing their workflow, i.e. all the steps of their procedure. Indeed, there is a lot of attention on how the available data are used and this, in the end, slightly obscures the logic and the sequence of the steps. In this (or these) diagram(s) the authors should highlight the deep meaning of each step independently of the way the available data are used for their quantification.

We agree with your comment. After reexamining the paper, it is at points too concise and would benefit from at least one workflow diagram, further explanation, and improved terminology. We plan to add at least one detailed workflow diagram to the revised manuscript along with further text description highlighting the meaning of our methodological choices.

It is not completely clear to me how the rainfall events are generated starting from the precipitation frequency curve. I understand that simulations are performed with a time step of one day and thus precipitations are generated with this time step. However, in the case of Island Park, a two-day precipitation event is generated from the frequency curve and I do not understand if the total of precipitation in two days is generated or if the event is scanned at daily level.

We will add more explanation on this point. For Island Park, as you state, the precipitation frequency curve is a two day precipitation event total. Once we generate the precipitation events, we randomly split the events across two time steps so that the FUSE models receive precipitation over two days.

Overall, I prefer continuous simulations than event simulations: in fact, in this way the "natural" combination between rainfall periods and flood periods is obtained without any artificial combination between initial conditions and rainfall events. Instead of using the regional analysis, why don't the authors have set up a rainfall model (Neyman-Scott or Poisson model), performed long simulations and extracted annual maxima from them?

We agree that continuous simulations over many hundred to thousands of years is another way to perform FF estimation and has some possible benefits over event based modeling, although you still have to specify the rainfall model and all associated parameters as the reviewer notes. For this study the underlying motivation is to provide relevant results for the US Bureau of Reclamation, and event based

modeling is the method they use for their flood studies. It would be interesting for someone to examine FF sensitivity in a similar framework to examine the methodological choices in the continuous modeling chain.

Incidentally, Hashimi -> Hashemi

Thank you for catching this typo, we apologize for the mistake.