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Interactive comment on "Ubiquitous increases in flood magnitude in the Columbia River Basin under climate change" *by* Laura E. Queen et al.

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We thank the reviewer for reading our paper and for praising it as well-written. It is unfortunate that the reviewer says it lacks "originality and significance", which we dispute below, and faults us for providing "little or no methodological innovation".
We first point out that the themes addressed in our paper align with the following guidance from the HESS web site:
"HESS encourages and supports fundamental **and applied research that advances the understanding of hydrological systems, their role in providing water for ecosystems and society**, and the role of the water cycle in the functioning of the Earth system." [emphasis added]

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and

"HESS, therefore, aims to serve not only the hydrological science community but all earth and life scientists, **water engineers, and water managers**, who wish to publish original findings on the interactions and feedbacks between the governing processes of the water cycle and processes governing atmospheric circulation and climate, bio-geochemical cycling, dynamics, and resilience of ecosystems and socio-economy.... the study of interactions with human activity of all the processes, budgets, fluxes, and pathways as outlined above, **and the options for influencing them in a sustainable manner, particularly in relation to floods**, droughts, desertification, land degradation, eutrophication, and other aspects of global change." [emphasis added]

We note too that applying methods used previously is not given as grounds for disqualification.
As for the originality of our paper, although there are examples of similar work (cited in our paper), we have not found such a comprehensive study, either for the Columbia Basin or of other large basins, of changing flood risk that accounts for and quantifies key sources of uncertainty (see our ANOVA analysis) and, moreover, describes both the changes in magnitude and seasonality of flood risk and how they change as one travels down a river. Multi-GCM, multi-hydrological model, analyses of changing flood risk across a large area are still very rare (we found one – Thober et al., 2018 – but even they examine only the 1-in-2 year event and they don't explore the hydrological processes that contribute to variability changes in space). If the reviewer is aware of a study that includes the components of our study, we would be grateful to learn of it.

The significance of the paper lies both in its uniqueness and in its generalizability. It is unique in that it provides key numerical input into international treaty negotiations that are currently underway. Many academic papers conclude with a vague admonition to water managers to pay attention to the results. By contrast, most of the authors of

this paper have been deeply involved in developing the key dataset used by the US Entity, and the paper thus has a deep and integral connection to an important policy process. We would be interested to learn whether this critical reviewer has had similar international policy significance arise directly from his/her work.

Second, it is generalizable in that we show how complex the pattern of change (with space and with season) can be in a mixed rain-and-snow basin. Basins of similar size and hydrological response to warming exist on most continents, so our results provide a warning about using that simplistic answers about changing flood risk beyond just the Columbia Basin.

Since the reviewer has offered no suggestions for improving the paper, we await more constructive comments before proposing revisions.

References

Thober, S., Kumar, R., Wanders, N., Marx, A., Pan, M., Rakovec, O., Samaniego, L., Sheffield, J., Wood, E.F. and Zink, M., 2018. Multi-model ensemble projections of European river floods and high flows at 1.5, 2, and 3 degrees global warming. Environmental Research Letters, 13(1), p.014003.

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