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Discussions

Interactive comment on "Towards modelling flood protection investment as a coupled human and natural system" *by* P. E. O'Connell and G. O'Donnell

Anonymous Referee #3

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This is an interesting manuscript providing some basic information on how to couple human and natural systems towards an assessment of the most "beneficial" strategy for flood protection investments. This work is interdisciplinary in nature and presents a roadmap for future developments. I have to admit I have never worked on coupled human and natural systems and the material in the manuscript was rather informative. I think this is a well-written manuscript and that this journal represents a good venue. As detailed below, I only have few comments. The major comment I have is related to the premise of assuming stationarity. While this is a convenient working assumption, there is growing evidence that data related to the recent past may not be representative

of the future. This is not just due to climate change but also to human modifications of the watersheds. I would like to see more discussion on how to potentially incorporate non-stationarity in the proposed framework.

- Pg. 8281, line 4: please explain the acronym "GCM/RCM". See also "OST" on pg. 8284 (line 15).

- Pg. 8283, line 21: I would add the reference to Barredo (2009; "Normalised flood losses in Europe: 1970–2006", HESS)

- Pg. 8291, line 24: should it be "However, there is evidence"?

- Pg. 8282, first paragraph: I would reference Mauget et al. (2003a, b; Journal of Climate; "Multidecadal Regime Shifts in U.S. Streamflow, Precipitation, and Temperature at the End of the Twentieth Century" and "Intra- to Multidecadal Climate Variability over the Continental United States: 1932–99").

- Pg. 8292, second paragraph: I would reference the work by Villarini et al. (2013; IJC, "On the temporal clustering of US floods and its relationship to climate teleconnection patterns") related to temporal clustering and climate controls.

- Section 4.2: could the authors please show us some exemplary time series of the flood peaks for these locations based on the model described in this section? It would be good to have some results for the three "persistence" levels.

- One of the premises of the work is the establishments of cost and damage functions (Figure 2). As a reader, I was left wondering how different the results would be for different combinations of cost-damage functions. Can the authors provide some sort of sensitivity of the results in Figure 3 to the choice of the cost-damage functions?

- The authors assume a 3.5% discount rate. I would like to see the sensitivity of the results to setting a higher and lower value.

- Based on my read of Section 6, it appears that this modeling framework is still not

ready to be fully coupled, and the focus is still mostly on the "hazard" side. As discussed in Section 7, I hope that future work will be able to couple the natural and human systems.