Interactive comment on "Evaluation of impact of climate change and anthropogenic change on regional hydrology" *by* Seungwoo Chang et al.

Anonymous Referee #2

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Summary: The authors present a case study analysis for the Tampa Bay region seeking to clarify the relative influence of climate change and human water use on the region's streamflows and groundwater levels. In particular, key monitored groundwater levels are a source of regulation that can constrain human abstractions for water supply. The paper is not methodologically a significant departure from the authors' prior published work. The claimed primary contribution is a variance decomposition-based global sensitivity analysis to attribute if downscaled climate change scenarios, human use scenarios, or reference evapotranspiration methods are dominant in projected trends or changes in streamflow or groundwater. Also the trends themselves and how they potentially constrain water supply are also discussed.

Major Comments:

1. Downscaling: the authors' prior published BCSA Downscaling Method yields 3,000 precipitation realizations that are constrained to NLDAS-2 daily spatiotemporal statistical structure. It is not clear to me how this approach avoids acting like a low-pass stochastic filter for increasingly extreme temperatures, droughts, or floods. Specifically when contemplating more extreme quantiles that are rarely observed or have not been observed. The GCMs themselves are not strongly capable of capturing extremes. Moreover, limits in the observation record reduce the value for NLDAS-2 daily statistics in capturing extremes. Likewise, bias filtering also often eliminates extreme events. It is not clear to me how well the authors have even captured stationary extremes.

2. Human use scenarios: Although I understand that the authors are managing the computational demands of their work, the experiment being presented lacks a balance in how it treats humans versus climate in a manner that likely pre-ordains their attained results and ultimately may make them poorly representative of the uncertainties and impacts from the human decisions in the system. I found the human scenario justifications to be lacking in clarity and justification for their appropriateness. I suspect had the authors even done a basic parametric uncertainty for the aquifer conductivities that many of their claimed inferences would disappear into neglected parametric uncertainty effects. Moreover, the underlying "off/on"nature of the eight scenarios described in lines 237-271 mix mean behaviors and oddly unlikely human use combinations.

3. Global sensitivity analysis: the authors claim a variance decomposition is being done, but by merit of their experimental design the core potential for generating variance in the model is strongly concentrated within their climate sampling. Variance decomposition is strongly influence by factor ranges and deterministic human scenarios are extreme a priori statistical assumptions that strongly under sample the human component of the work. Additionally, the authors report only 1st order indices, which is tacit to a One-at-a-Time analysis in only highlighting separable single factor effects (e.g., Table 4 clearly indicates that a Total Order index in contrast to the 1st order index should be analyzed).

Minor Comments:

1. Introduction: at several points in the text (see lines 36-39; 49-53; 59-61; 75-80) the authors declaratively enumerate the existence of literature without any analysis for connection to this work and its novel contributions. Simple listing citations is not the same as providing readers with a guided narration of strengths, weaknesses, needs, and clarifying your own contribution.

2. At several points in the Methods it was not clear what was new or novel in this work relative to prior published work.

3. In terms of sensitivity analysis results, I would encourage the authors to improve their work by bootstrapping and reporting the confidence of their reported variance decomposition.

4. I found the figures poorly designed and difficult to interpret. Even Zooming to 200%, many of the claimed insights were not easily interpretable.

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