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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "What's streamflow got to do with it? A probabilistic simulation of the competing oceanographic and fluvial processes driving extreme along-river water levels" *by* Katherine A. Serafin et al.

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Anonymous Referee #2 Received and published: 5 March 2019

"The paper overall presents a good contribution, however, it needs some work Some concepts are not clear, and the reader is left 'guessing' about their meaning. for example, in the introduction, a reader is not aware of what 'bivariate or multivariate processes' are, thus they can't understand the challenge in trying to identify them or study them. "

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Discussion paper

Response: We thank the reviewer for pointing out the lack of contextual information in the initial submission. Bivariate and multivariate processes are processes that occur from two or multiple variables, respectively. In coastal environments, multiple processes like waves, tides, storm surge, and river discharge, may combine to drive an extreme flood event. We have improved the clarity of our descriptions of multivariate and bivariate processes by removing the sentence driving confusion (Page 1, Line 21-22 original manuscript) while introducing a formal definition of a compound event in the first line of the introduction, Page 1, Lines 16-21, “Coincident or compound events are a combination of physical processes in which the individual variables may or may not be extreme, however the result is an extreme event with a significant impact (Zscheischler et al., 2018, Bevacqua et al., 2017, Wahl et al., 2015, Leonard et al., 2014). Flooding is often caused by compound events, where multiple factors impact both open coast and estuarine environments. Storm events, for example, often generate concurrently large waves, heavy precipitation driving increased streamflow, and high storm surges, making the relative contribution of the actual drivers of extreme water levels difficult to interpret.” We have also added a brief description to the abstract, Page 1, Lines 1 -2, “Extreme water levels generating flooding in estuarine and coastal environments are often driven by compound events, where many individual processes such as waves, storm surge, streamflow, and tides coincide.” We hope that this revision will help readers to understand the types of events we are focused on understanding.

"My major concerns are related to the method section, that currently needs much improvement. In its present state, it is much too long in some parts, and not enough clear on the overall framework, which is the added value of this work. There is far too much description of known elements, such as HEC-Ras, for example, and not enough clarity on the proposed approach. Also, it is not too clear if chapter 4 is a method or a discussion of results. As a consequence, it is very hard to understand the discussion of the results."

Response: We agree that the amount of detail presented in the original manuscript

may have added unnecessary length and detracted from the main value of the paper and point out that Reviewer 1 had a very similar comment. Therefore, in the revised manuscript, we have moved the sections describing the HEC-RAS model domain setup, validation and calibration to the Supplemental Information. We also have moved the section describing the tide gauge merging and removal of the river-influenced water levels to the Supplemental Information. Section 4 in the original manuscript was difficult to interpret, so we merged the text from this section in with methods, results, and discussion sections in the revised manuscript in a fluid way. We have also added a schematic of the hybrid-modeling framework (Figure 3, revised manuscript and below), to help to clarify and emphasize the overall framework for readers.

References:

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Wahl, T., Jain, S., Bender, J., Meyers, S.D. and Luther, M.E., 2015. Increasing risk of compound flooding from storm surge and rainfall for major US cities. Nature Climate Change, 5(12), p.1093.

Zscheischler, J., Westra, S., Hurk, B.J., Seneviratne, S.I., Ward, P.J., Pitman, A., AghaKouchak, A., Bresch, D.N., Leonard, M., Wahl, T. and Zhang, X., 2018. Future climate risk from compound events. Nature Climate Change, p.1.

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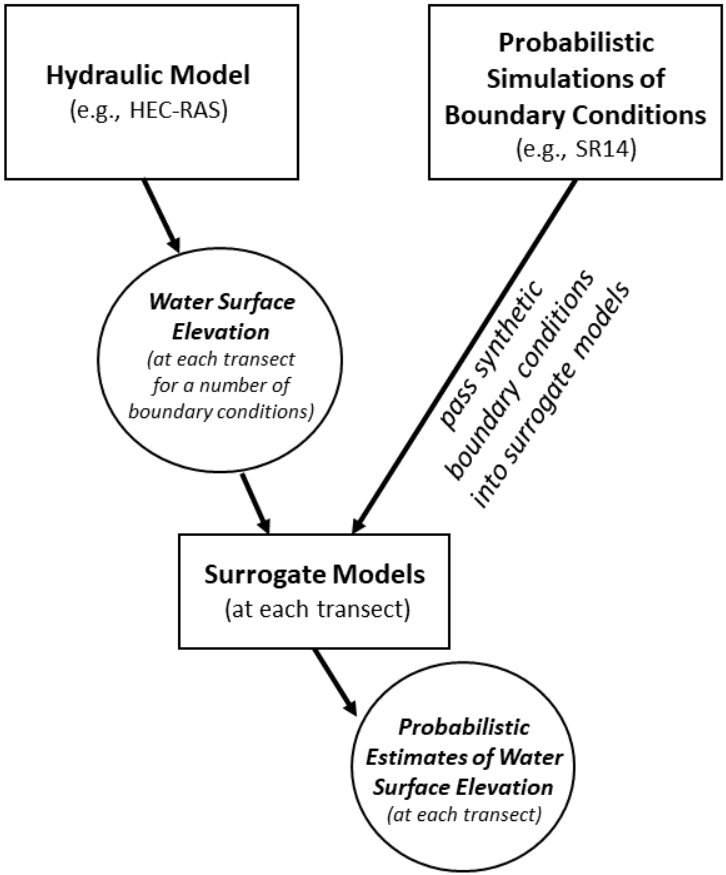

Fig. 1. Schematic of hybrid physical-statistical modeling technique. Models are portrayed as squares, while circles portray model outputs.