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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Storm Tide Amplification and Habitat Changes due to Urbanization of a Lagoonal Estuary" *by* Philip M. Orton et al.

Anonymous Referee #3

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General comments: The paper entitled "Storm Tide Amplification and Habitat Changes due to Urbanization of a Lagoonal Estuary" by Philip M. Orton et al. analyzes the impacts of historic landscape changes within the 20th century in Jamaica Bay, New York City on present-day storm tide water levels. The results of this study reveal considerable effects of especially channel deepening on storm tide peak water levels within the bay, which is comparable to, and even exceeding, global mean sea level rise during the same period. The work carried out by Orton et al. is scientifically solid, well written and the presented results are highly relevant not only to Jamaica Bay, New York City, but also to many other highly populated and developed coastal areas around the globe. The methods are generally sound (some issues are listed below) and the conclusions are supported by the presented data. I recommend publication of this article with minor

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revisions.

My detailed comments are listed below:

Page 7, lines 15 – 19: I think this part needs some clarification. I would doubt that the landward edge of a saltmarsh equals the extent of high tide flooding. This would mean that the marsh gets completely flooded during most of the tides, which should not be the case. The upper edge of the high salt marsh is usually only flooded during storm tides or the highest spring tides. What are the implications of this approach to the validity of the results? Something, which could also be taken up in the discussion.

Page 7, line 29: How was the digitized bathymetric and topographic data resampled in order to meet the named 30 m grid resolution (line 2 page 6)? Which resampling technique was used (e.g. bilinear, nearest or cubic etc.)?

Page 8, lines 7 – 9: Briefly outlining the methodology used to simulate the ensemble of storm tides would help the reader. You could still write that a detailed description is given in Orton et al. 2016b.

Page 8, lines 9-12: I would appreciate some more information on the functioning and structure of the model sECOM. What exactly does accurate mean? Can you provide an estimate of the error associated with it?

Page 8, lines 39-42: Does this mean you have assigned a single Manning n coefficient to both eelgrass and saltmarsh vegetation? In the literature there are many studies suggesting Manning n coefficients of 0.07 (Lawrence et al. 2004) or up to 0.08 for salt-marsh surfaces (Stark et al. 2016, 2017; Temmerman et al. 2012) and I assume that the roughness of seagrass beds should be considerably less. What was the decision to take a value of 0.045 based on? What is the sensitivity of your model to variations in these coefficients? I think answering these questions is important, since you state that the “most dramatic land cover change is from large areas of fringing wetlands (light blue) to urbanized areas (red)” (page 10, lines 43 – 44) and because artificially

recovering the wetlands in your model has only resulted in a reduction of peak storm surge heights of -2% (page 18 lines 26-28). On the other hand, increasing Manning n coefficients to 0.025 for scattered areas of lost eelgrass resulted in a peak reduction of 3%. This needs some further explanations.

Page 14, lines 17-20: Please consider moving this sentence to the discussion section, as you start interpreting your results here.

Page 15, lines 25 – 33: This part should be moved into the discussion too.

Page 20, lines 40-41: I suggest rephrasing this sentence to make it a little clearer: It is not the sunlight that is reduced but due to increased turbidity, the light penetration into the water column is reduced.

Figure 4: Perhaps it is just due to the system that created the pdf file, but the legends of both maps are very hard to read. Please check and increase the size of the key.

Literature

Lawrence, D.S.L.; Allen, J.R.L.; Havelock, G. M. (2004): Salt Marsh Morphodynamics: an Investigation of Tidal Flows and Marsh Channel Equilibrium. In: Journal of Coastal Research 20 (1); p. 301-316

Stark, Jeroen; Plancke, Yves; Ides, Stefaan; Meire, Patrick; Temmerman, Stijn (2016): Coastal flood protection by a combined nature-based and engineering approach. Modeling the effects of marsh geometry and surrounding dikes. In: Estuarine, Coastal and Shelf Science 175; p. 34-54.

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