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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.

Philip M. Orton et al.

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The authors thank the reviewers for a very detailed reading of the paper and substantive comments that have clearly improved the research and its presentation. Below are the original comments followed by our responses below them, and a supplemental PDF gives them with better differentiation (italics vs plain text).

Carmine Donatelli (Referee) c.donatelli@liverpool.ac.uk Received and published: 20 April 2020 I have read with great interest the paper entitled: 'Storm Tide Amplification and Habitat Changes due to Urbanization of a Lagoonal Estuary', by Orton et al.

The manuscript is very well written and organized, the used methodology is robust and supported by the clearness of the presented data. Previous works are referenced

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Discussion paper

appropriately.

I think this study represents an important contribution to our understanding of the mechanisms by which geomorphic changes alter the physical response of back-barrier estuaries to tides and low frequency actions. I recommend publication with minor revisions.

My minor comments/suggestions are listed below.

Pages 10-11: 'The most dramatic land cover change is from large areas of fringing wetlands (light blue) to urbanized areas (red), but also the center of the bay has shifted from marshes to open waters (1 dark blue)'.

The influence of marsh loss on water levels is strongly related to the setting: marsh loss associated with lateral erosion vs. marsh loss associated with reclamation projects. Reductions in the basin planform area (wetland reclamation) increase water levels, while marsh retreat due to lateral erosion may have the opposite effect (in agreement with the analytical model of Keulegan, 1967 and 3D numerical modelling investigations, Picado et al., 2010; Donatelli et al., 2018). I would highlight/expand this point in the text.

Text was added to address this useful point – These results are also consistent with prior studies that showed that the influence of lagoonal wetland loss on water levels is different when it comes to lateral erosion versus landfill reclamation. Reductions in the tidally-wetted area through wetland reclamation increase storm tides, while wetland retreat due to lateral erosion has the opposite effect (e.g., Donatelli et al., 2018; Picado et al., 2010).

Page 15: 'It was previously established that the bay's tide ranges have grown substantially (Swanson and Wilson, 2008), and we find similar results. Averaging high and low waters for daytime minima and maxima in 1878 over 37 days gives an observed tide range of 1.35 m, while observations for the entire year 2015 show a tide range of 1.73 m. This increase of 28% is smaller than the prior estimate of the tide range

change from 1899 to 2000 from Swanson and Wilson (2007), which was 1.16 m to 1.64 m or 41%. However, the 1878 measurements are for a location at mid-bay (Holland House), whereas the 1899 measurements are for the easternmost end of the bay (Inwood or Norton Point), where tide attenuation (e.g. due to narrow, shallow channels and wetlands) was likely more pronounced.'

I would move these lines into the Discussion section.

This paragraph actually gives results – it is the first time tide range changes are presented. Moreover, the discussion and primary paper focus is on the topic of storm tides. Thus, we have not made this change.

Page 16 (lines 11-14): I would expand these lines. Are the results for Jamaica Bay translatable to other systems? What systems?

Text was added to address this suggestion: "Systems with likely impacts include those with substantial changes to inlets, mean estuary depths, or wetland landfill/reclamation, and may be detected by long-term changes to tides (Talke and Jay, 2020)."

Page 18 (lines 1-19): I would move the description of the idealized numerical experiments into the Methods section.

Change made – I kept hearing this and capitulated – see Section 2.4. The results were also moved to the results section (Section 3.3).

Page 21: I would mention Englebright [1975] and Harting et al., [2002], who show how inlet modifications have reduced the movement of offshore sediments into the backbarrier basin.

This suggested change was not made, as these studies were speculative about changes to the inlet's role in sediment import to the bay. I'd rather not further the speculation, because there is a study of sediment fluxes into the bay that I hear is in review.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-343/nhess-2019-343-AC2-supplement.pdf

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