Reviewer 1:

This paper describes a long-term model simulation that investigates saltwater intrusion along almost the entirety of the United States East Coast over the course of a 20-year long simulation with remarkable spatial resolution using SCHISM. Overall, the paper demonstrates an impressive application of ocean modeling tools to multiple coastal ecosystems, allowing for novel regional comparisons that are not typically simultaneously simulated together with this level of detail. The methods described are appropriate for this task, and most of the model validation presented here supports the use of SCHISM for this application. However, many details could be elaborated upon a bit further, particularly in the discussion section which is quite light and could benefit from a reorganization of section titles with more comprehensive references to other literature and the figures presented in this paper. Some conclusions drawn in the discussion section are difficult for the reader to pick out from the presented results and some may be better supported by other results that are not shown (or are not shown in great detail).

Thank you for your constructive feedback. We have addressed your specific comments as outlined below and clarified the discussion section to more clearly connect the detailed results with broader interpretations.

Specific Comments:

Line 32: small typo, "… has been an effective tool…"

Typo is now fixed at line #32.

Line 116-122: Typos in "… Ocean Observing System…", "… Chesapeake Bay Program…", and "… data from the Neuse…"

Typos are now fixed at lines #128-133.

Line 170 (Figure 3): In panel b, are the light blue bars meant to show the annual mean discharge for each of these rivers? Could use a little more explanation in the caption or text.

Yes, the light blue bars are showing annual mean discharge. Explanation "Light blue bars in panel (b) represent the annual mean discharge for each of these estuaries" has been added to the caption now.

Line 217-219: I'm a little confused by the explanation of the model bias, which mostly just restates the definition of a bias? I'd also add that SCHISM appears to have higher variability on

shorter timescales than DRBC observational data, although I'm not sure if this is just due to temporal sampling limitations of the upper saltwater limit?

Thank you for pointing this out. We agree that the initial presentation lacked clarity. In the revised manuscript, we have clarified that the higher apparent variability in SCHISM output, compared to the DRBC dataset (Fig. 9a), is mainly due to the 7-day averaged daily records provided by DRBC, which smooth out short-term fluctuations. We also added explanation about the relative high reliability of DRBC's upper versus low reliability of lower salt front estimates, and supported the model performance through direct comparison with salinity observations from a USGS station used in DRBC's framework (Fig. 9b).

We rephrase these explanations at lines #243-249.

Line 233-234: I don't find this degraded model skill in temperature in shallow tributaries that surprising, NARR tends to overestimate shortwave/longwave radiation and air temperatures in coastal water bodies when compared to observations and other reanalysis products like ERA5. I don't think that this warrants any major changes to the paper, but it's something that could be considered in the future.

Thank you for the suggestion! We will consider using other products like ERA5 for the future versions of NAAC. We have revised the text in lines #268-271.

Line 247-248: And the model appears to slightly overestimate current velocities at station 'cb1001'? I'd be curious to know if this overestimate and underestimate are temporally correlated or if the bias patterns are unique to the different stations.

Thank you for your thoughtful observation. We have reviewed the velocity comparisons at these stations and confirm a slight overestimation or underestimations in the modeled current magnitudes relative to observations. We found that the bias patterns are largely station-specific rather than temporally correlated. At 'cb0301', the overestimation is more prominent during ebb/flooding tides, whereas at other stations like 'cb3020', the model shows underestimation during similar periods. This station-dependent bias likely reflects local bathymetric complexities or grid resolution limitations, which we plan to improve as needed in future model updates. We have added a brief explanation of this analysis in the revised manuscript in lines #290-294.

Line 272-274: This sentence reads a little awkwardly, I believe that you are saying that water resources on the Delmarva peninsula are at risk from SWI?

This sentence has been rephrased to "One use of this model is to serve as an important supplement for the monitoring and prediction of SWI in the Delaware Bay and the surrounding

Delmarva region, which has been identified as highly vulnerable to SWI over recent decades" at line #319-320.

Line 275-278: Change "as not reached" to "has not reached" and suggest changing second half of sentence to, "… from DRBC may tend to be underestimated by interpolation constraints due to relatively few observational stations."

This sentence has been rephrased accordingly at line #322-324.

Line 282: Suggest rephrasing as "share a drainage source from the same…"

This sentence has been rephrased accordingly at line #327.

Line 289-290: Some awkward phrasing, also seems to suggest that Sanford et al. (1992) was focused on coastal carbon cycling? A better reference for the second clause of the sentence would be something like Najjar et al. (2022) - https://doi.org/10.1002/2017GB005790

We originally intended to cite Sanford et al. (1992) to highlight the importance of tidal flushing. Following your suggestion, we have now included the recommended citation related to carbon cycling. To improve clarity and avoid confusion, we have revised the sentence to read: "Tidal flushing plays a key role in exchanging water between coastal and estuarine zones, offering essential insights for studies on processes like coastal carbon cycling." The revised text is at lines #342-343.

Line 297-300: What figures is this point referencing? I assume a combination of Figures 3 and possibly 8? Same question for the remainder of the paragraph.

We now add a new Fig. 13 to further support this part of discussion. This figure shows tidal fluxes at major coastal water bodies and illustrates the impact of hurricane events on local water exchange patterns.

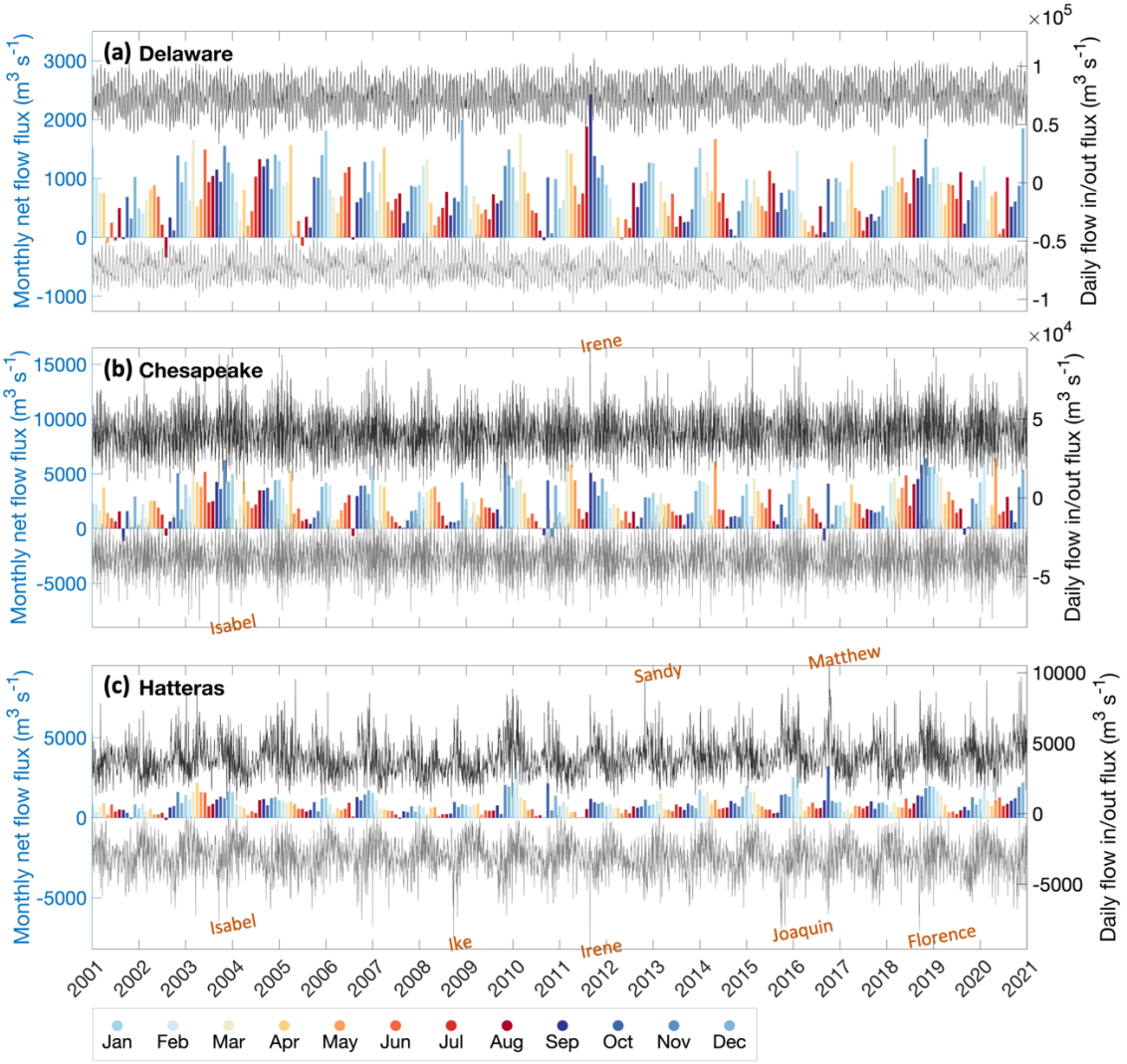


**Figure 13: Tidal fluxes across the mouths of (a) Delaware Bay, (b) Chesapeake Bay, and (c) Hatteras Inlet at APES. Colored bars represent monthly net flow, while black and grey lines show daily inflow and outflow. Notable hurricanes are indicated along the timeline.**

Line 305-314: To me it seems like this wetlands application of the model got significantly more description in the methodology section than is warranted by the relatively brief summary of the results presented here in the discussion section. If there is not much more to add, I would suggest potentially moving this paragraph to the results section or describe some additional implications of highly resolved wetlands processes here.

Thank you for the suggestion! In response to this comment and Reviewer 2's comments, we have re-organized this section to "Resolving tidal wetlands and their connectivity to shelf-scale processes" in order to better highlight tidal wetland application. While the original discussion primarily focused on model refinements within tidal wetland regions, we have now expanded the content by incorporating a tracer study to directly illustrate the connectivity between the coastal

ocean and wetlands. This new tracer visualization is designed to represent generalized transport pathways, emphasizing how large-scale oceanic features—such as the Gulf Stream, Shelf break Jet, and Georges Bank Gyre—influence the movement and exchange of materials between small wetlands, estuaries, and neighboring marine systems. The detailed text can be found from lines #388-413.