Response to Referee 1

Dear Professor Pringle:
Thank you very much for your careful review and valuable comments. We have studied your comments carefully and tried our best to revise the manuscript. The point to point responses to your comments are listed as following:

Question 1. The authors are very liberal with their use of acronyms making some parts hard to follow. Only need to use acronym if the word is repeated many times and is long. I recommend to just use an acronym for the Liao River Estuary (LRE) and the vegetation (P.a. and S.h.), and spell everything else out.

Response 1: Thank you for your kind suggestion on use of acronyms. We have corrected acronyms in the manuscript and only used an acronym for the Liao River Estuary (LRE) and vegetation types (*Suaeda heteroptera*, *Phragmites australis*).

Question 2. Page 3, Line 14: What types of models are "ELCIRC and COAWST"?
Response 2: Sorry for the carelessness, these questions have been revised.
Gong (2011, 2018) employed the Environmental Fluid Dynamics Code (EFDC) and the Coupled-Ocean-Atmosphere-Wave-Sediment Transport (COAWST) to investigate the effects of local and remote winds and wind waves on salt intrusion in the Modaomen and Pearl River estuaries, respectively, with conclusions having an applicability to other partially mixed estuaries under the threat of salt intrusion.

Question 3. Page 4, Lines 5-8: "Estuarine salinity has a significant effect on the growth of coastal wetland plants plays an important role in maintaining the ecological health of estuarine wetlands. Despite this, studies on the spatial and temporal distribution of salinity in estuarine wetlands are limited, with most work generally focusing on salinity transport and saltwater intrusion mechanisms along the estuaries". These two sentences seem to come out of nowhere and do not have any references to back up the statements. Please expand on these sentences and provide details of the previous studies and their limitations.
Response 3: Thank you for your valuable advice. We have expanded the content between those sentences and added some references to back up our statements.
Estuarine salinity has a significant effect on the growth of coastal wetland plants and plays an important role in maintaining the ecological health of estuarine wetlands (Song et al. 2009). Despite this, studies on the spatial and temporal distribution of salinity in estuarine wetlands are limited, with most work generally focusing on salinity transport and saltwater intrusion mechanisms along the estuaries (Ralston et al., 2008; Haralambidou et al., 2010; Veerapaga et al, 2019; Wang et al., 2019).

Question 4. Page 4, Lines 11-12: "According to satellite images and on-site surveys, the wetlands in the LRE have experienced severe degradation over the past decade". What surveys and satellite images are these? Are these from the authors' own studies? Provide more details.

Response 4: We have added reference including the satellite images of the past decade to show the degradation of wetlands in the LRE.
According to satellite images and on-site observations, the wetlands in the LRE have experienced severe degradation over the past decade, particularly in the Pink Beach Wetland (PBW) close to the northwest of Panjin Port (Wang et al., 2020). We have made a series of field surveys for wetland degradation and carried out studies about remote sensing image interpretation in LRE.

Question 5: Page 4, Lines 14-15: "Studies have revealed that salinity increases in water and soil can result in the death of S.h. vegetation." What studies are these? Please provide references. Furthermore, what about P.a. vegetation? No details on P.a. are provided in this paragraph.
Response 5: Thanks for reminding. We have added some references of studies about salinity increase in soil and water can result in death of *Suaeda heteroptera* seedlings. The expression of S.h. and P.a. plants has been improved in the manuscript.
Experiments implemented by Li et al (2018) have revealed that high salinity can significantly restrain the growth of salt mash vegetations (*Suaeda heteroptera* and *Phragmites australis*).

Question 6: Page 5, Line 4: "(2) explore the internal mechanisms of these effects". What does internal mechanisms mean here exactly?
Response 6: The original statement in the paragraph was inaccurate. We want to explore the potential influence of these variations (runoff decrease resulting from river closure projects and shoreline changes resulting from the port construction) on growth of *Suaeda heteroptera* in tidal wetlands in the LRE. We have corrected the description in the manuscript.
(2) explore the potential influence of these variations on growth of *Suaeda heteroptera* in tidal wetlands in the LRE;

Question 7: Page 6, Lines 16-17: "The application of terrain-following coordinates results in an improved capacity to solve complex bathymetric conditions compared to other existing models." This is not a correct statement. Many other models use terrain-following coordinates (e.g., ADCIRC, SELFE/SCHISM, ROMS) and they have a well-known issue associated the computation of the pressure gradient term in high gradient regions (Haney, 1990) that other researchers have attempted to alleviate (e.g., SELFE/SCHISM uses hybrid coordinates (Zhang et al., 2015).
Response 7: Thank you for your correction. It was an improper description, we have corrected it in the manuscript.

Question 8: Page 7, Lines 6-10. How did the coastlines from Google Earth differ from the coastlines from Landsat Images? Please explain in more detail about the coastline extraction process (what tools?). Where were the Landsat images used and where were the Google Earth images used?
Response 8: The satellite image of LRE region in 1995 showed in Google Earth was blurred, so we chosen the Landsat Image downloaded from Geospatial Data Cloud (http://www.gscloud.cn/sources/?cdataid=263&pdataid=10) to obtain the coastline data of the LRE in 1995. The shoreline of 1995 was manually extracted by adding points on Landsat image

using the ArcGIS software. The remaining coastline of the LRE in 2019 was manually extracted from Google Earth (with higher spatial resolution).

Question 9: Page 7, Lines 10-11. "available DEM datasets" does not explain anything. Provide the source.
Response 9: The bathymetry of the computation domain was derived from the Navigation Guarantee Department of the Chinese Navy Headquarters (China Navigation Publications Press) and from the topographic survey data in the upstream of LRE by us.

Question 10: Page 7, Lines 14-15. Does the spatial resolution model grid vary only with distance between the open boundary and the wetland? Or is there some bathymetry depth function involved as well?
Response 10: In our work, the spatial resolution of model grid varies only with distance between the open boundary and the wetland coastline. It is not related to the bathymetry depth, and the mesh number of this area is large, and the precision can meet the calculation requirements.

Question 11: Page 7, Lines 16-17. Says the internal mode time step is 2 s and external mode time step is 10 s. I think this should this be reversed. (the external mode is the fast barotropic mode and should have a smaller time step).
REPONSE 11: Thank you for your correction. The internal mode time step is 10 s and external mode time step is 2 s.

Question 12: Page 7, Line 18. What is the "validated Bohai Sea Parent Model grid"? Any reference? Explain in more detail please.
Response 12: The part has been revised in this manuscript. We established a Bohai Sea tidal model (covers the whole LRE region) using the MIKE 21 hydrodynamic model. The tidal model was validated with observed tide level data. Then we calculated the water elevation time series of each open boundary node using the validated Bohai Sea model (unpublished) and applied as open boundary condition in the FVCOM model.

Question 13: Page 7, lines 18-19. What do you mean by "salinity was set to 34 PSU at the sea surface and interpolated along the sigma layers"? Interpolated between 34 PSU and what other value?
Response 13: Thanks for reminding. The open boundary for salinity was set to 34 PSU at the sea surface and interpolated between 34 and 32 PSU along the sigma layers.

Question 14: Page 8, Lines 12-13 & Line 16. Are the open boundary water level conditions inaccurate? Why open boundary conditions may be inaccurate for certain periods? You should be able to quantify this from the "validated Bohai Sea Parent Model grid".
Response 14: Thank you for your advice. In fact, we have validated the computational accuracy for the Bohai Sea Large Model by available field data. Due to the large calculation area, there may be some errors in the results of the large model. Generally, the simulation error is acceptable.

Question 15: Page 12, Lines 11-12. I don't really see that much evidence in Figures 8 and 9 that

“during the spring tide period, saltwater intrusion distance in the estuary increases compared to that during the neap tide period.” Can you be more specific about where you see that? Including a panel showing the differences may help.

Response 15: Thanks for your suggestion. We have modified the figures you mentioned for a clearer description. See figs 7 and 8.

Question 16: Page 12, Line 24 – Page 13 Lines 1-2. It’s unclear to me how the Popescu et al. (2015) reference relates to this sentence. I searched for keywords “salinity” and “salt” in their article and nothing comes up. Furthermore, this sentence implies that increasing salinity definitely inhibits growth of S.h. and P.a. vegetation, but the introduction on Page 4 lines 10-11 says that the “S.h and P.a. are the most common pioneer salt-tolerant plant in the LRE wetlands”. Of course this does not mean that a very high level of salinity can’t inhibit their growth, but this ties back to my earlier specific comment 5) where I think you need to be more clear and careful about the statements relating to how both S.h. and P.a. are thought to be influenced by salinity, and make the correct citations.

Response 16: Sorry for the carelessness. We made a mistake that the Popescu et al., (2015) reference was unrelated to the sentence. We have corrected our statement and made correct citations.

Furthermore, the main factor limiting the growth of *S. heteroptera* is water salinity, and the most suitable salinity for its growth is about 15 psu. If salinity is lower or higher than 15 psu, its growth will be degraded or inhibited. We think that the change of salinity caused by port construction has a potential effect lead to the degradation of estuarine wetland communities.

Question 17: Most of the beginning of Section 4.2 (page 14) should be in the introduction and methods section. The first ~5 lines of Section 4.1 and 4.3 are the same. Please only focus on including results in Section 4.

Response 17: Thank you for your advice, we have adjusted the structure of Section 4.

Question 18: Page 15 Line 7: “This indicates the intensification of the shoreline change with the intrusion of salt water”. This needs to be reworded, do you mean that the shoreline change increases the intrusion of salt water onto the wetlands?

REPONSE 18: We have reworded the sentence that the shoreline change increases the intrusion of salt water onto the wetlands.

This indicates the intensification of the shoreline change with the intrusion of salt water.

Question 19: Page 17, Line 10: says both tidal flow and residual flow were analyzed but only results for the residual flow are presented.

Response 19: Sorry for the negligence. We have revised flow analysis in the manuscript, we mainly focus on tidal flow analysis has been deleted.

Question 20: It would be nice to use colormaps that are more physically intuitive and unbiased instead of the rainbow ones adopted; refer to Thyng et al. (2016) for colors design to be used for salinity and depths etc.

Response 20: Thanks for suggestion on using colormaps. We have redrawn the figures in the

manuscript and changed their colormaps.

Technical Corrections:
Question 1: Page 15 Line 5: Figure 12 should be Figure 13.
Response 1: this problem has been revised in this manuscript.

Question 2: Page 15, Line 14: Fig. 13 should be Fig. 14.
Response 1: this problem has been revised in this manuscript.

References
Haney, R.L., 1990. On the Pressure Gradient Force over Steep Topography in Sigma Coordinate Ocean Models. J. Phys. Oceanogr. 21, 610–619.
Thyng, K.M., Greene, C.A., Hetland, R.D., Zimmerle, H.M., DiMarco, S.F., 2016. True colors of oceanography: Guidelines for effective and accurate colormap selection. Oceanography 29, 9–13. doi:10.5670/oceanog.2016.66

Response: The reference has been added in this manuscript.
Haney, R.L., 1990. On the Pressure Gradient Force over Steep Topography in Sigma Coordinate Ocean Models. J. Phys. Oceanogr. 21, 610–619.

Thank you for your evaluation of the manuscript.

The authors would like to revise this manuscript if reviewers have any other questions.
Sincerely
authors