Dear Editor and Reviewers

We are very pleased to have your comments concerning our manuscript entitled “Statistical analysis of dynamic behavior of continental shelf wave motions in the northern South China Sea” (egusphere-2023-1274). Thank the editor and reviewers for taking time out of your busy schedule to review our paper and provide constructive comments on it.

We have read and dealt with all the comments carefully. The revised manuscript with all comments highlighted with blue fronts has been uploaded, and point-to-point responses to the reviewer’s comments are present following.

Response to Comments of Reviewer 2 （magenta font in the manuscript）

[Comment 1] Line 108-111, there are two types of along-track SLA, i.e., SLA_unfiltered and SLA_filtered. Please clarify which kind of data in this submission has been used.

Response: Thanks for your comment. We have described the data more clearly.

Line 119: The along-track SLA is low pass filtered using 7-point moving average.

[Comment 2] Line 112, it is very important to discuss the availability of along-track SLA in the coastal zones. References: Birol F et al.. 2021 The X-TRACK/ALES multi-mission processing system: new advances in altimetry towards the coast. Adv. Space Res. 67, 2398-2415 Vignudelli S, Birol F, Benveniste J, Fu LL, Picot N, Raynal M, Roinard H. 2019 Satellite altimetry measurements of sea level in the coastal zone. Surv. Geophys. 40, 1319-1349.

Response: We appreciate for Reviewers’ warm suggestion.

Line 122: Satellite altimetry provides a unique sea level data to the coastal sea level research. A few recent studies have stressed the importance of small-scale coastal processed on coastal sea-level variance (Cazenave and Moreira, 2022; Vignudelli et al., 2019). The along-track SLA has been successfully validated and applied to the coast zone by Birol et al. (2021). These studies present the availability of along-track SLA in the coastal zones.

References:

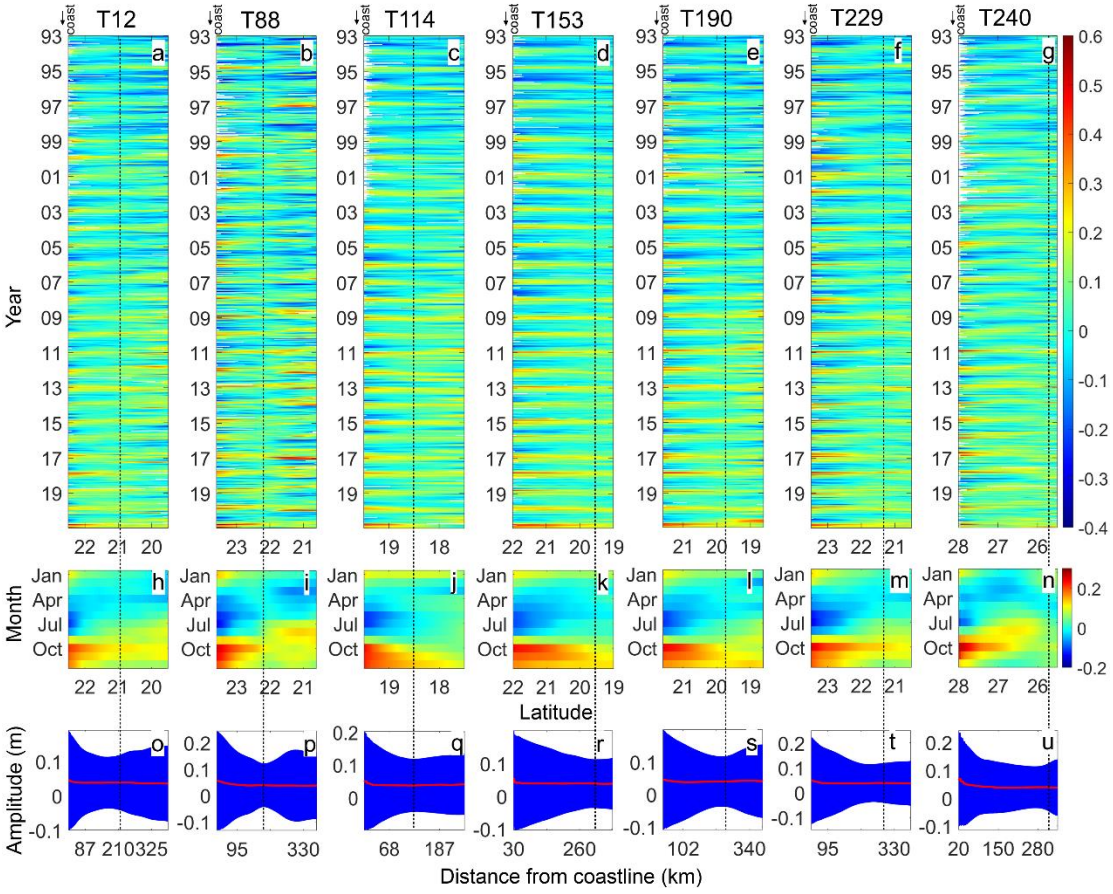
Birol, F., Léger, F., Passaro, M., Cazenave, A., Niño, F., Calafat, F.M., Shaw, A., Legeais, J.-F., Gouzenes, Y., Schwatke, C., Benveniste, J., 2021. The X-TRACK/ALES multi-mission processing system: New advances in altimetry towards the coast. Adv. Space Res. 67, 2398-2415.

Cazenave, A., Moreira, L., 2022. Contemporary sea-level changes from global to local scales: a review. Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences 478, 20220049.

Vignudelli, S., Birol, F., Benveniste, J., Fu, L.-L., Picot, N., Raynal, M., Roinard, H., 2019. Satellite Altimetry Measurements of Sea Level in the Coastal Zone. Surv. Geophys. 40, 1319-1349.

[Comment 3] Fig. 3, give cross-shelf scales consistently in km instead of degree.

Response: Thanks for your valuable comment. The cross-shelf scales have been added into Fig. 6o-u.



[Comment 4] Line 273, add Robinson (1964) shelf wave theory.

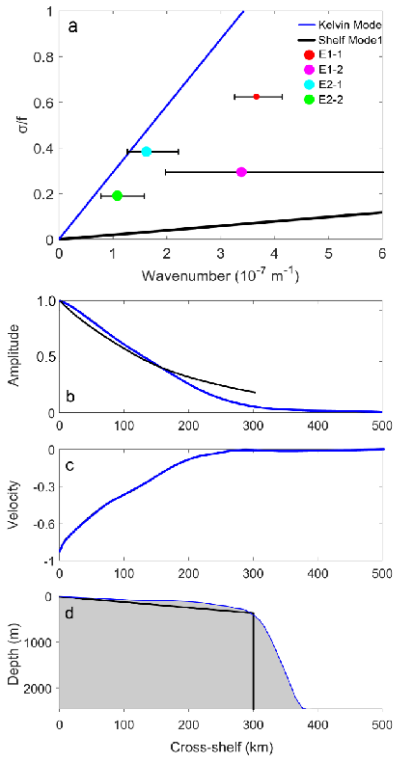
Response: Thanks for your valuable comment. The reference has been added into the manuscript.

Line 205: The solution to Eq. (8) is expressed as the sum of the first and second kinds of Bessel functions (Robinson, 1964; Schulz et al., 2011)

[Comment 5] Line 279, the simplified bathymetry in the analytical model is not very realistic in the bathymetry of the SCS, especially in the deep ocean part. Why not use more complicated bathymetry, or realistic bathymetry by using a tool from Brink and Chapman (1985).

Brink, K. H., & Chapman, D. C. (1985). Programs for computing properties of coastal-trapped waves and wind-driven motions over the continental shelf and slope. Woods Hole Oceanographic Institution.

Response: We feel great thanks for your professional review work on our article. The simplified bathymetry is enough to the analysis of CSW in this study. There are two ways for the analysis. Firstly, it is using the tool from Brink and Chapman (1985). In the previous study (Li et al., 2023), the theoretical cross-shelf fluctuation of CSW (black curve) on the shelf agrees with the blue curve calculated from the tool. Secondly, Yin et al., (2014) used a polyline to fit the bathymetry. Both the results (in this study and Yin) are similar on the shelf. In the open sea side, the fluctuation of CSW approaches zero. The main difference between ours and theirs occurs in the shelf edge. The amplitude of CSW shown in Yin et al., (2014) is a little larger (only ~10%) than ours. Therefore, we think using a simplified bathymetry is enough.



Resp_Fig. 1 (a) Comparison of dispersion relation derived from this study with the Kelvin mode and the lowest mode of CSW. (b) Amplitude of sea level in cross-shelf direction. Blue curve shows the amplitude of sea level306calculated from the toolbox, black curve represents that of Kelvin mode. (c) Along-shelf velocity component in cross-shelf direction. (d) Mean depth profile. Blue curve represents mean depth profile. Black curve represents the idealized depth profile. (Cited from Li et al., 2023)

References:

Brink, K. H., & Chapman, D. C. (1985). Programs for computing properties of coastal-trapped waves and wind-driven motions over the continental shelf and slope. Woods Hole Oceanographic Institution.

Li, J., Zhou, C., Li, M., Zheng, Q., Li, M., Xie, L., 2023b. A case study of continental shelf waves in the northwestern South China Sea. Acta Ocean. Sin. Accepted.

Yin, L., Qiao, F., Zheng, Q., 2014. Coastal-trapped waves in the East China Sea observed by a mooring array in winter 2006. J. Phys. Oceanogr. 44, 576-590.

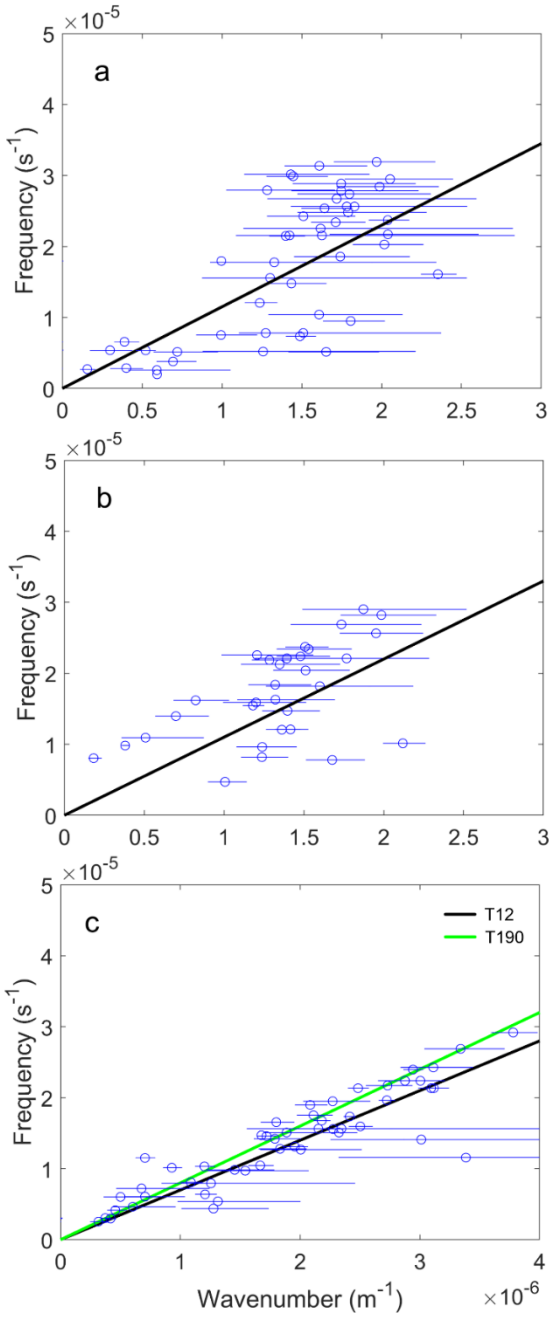
[Comment 6] Fig. 6, add a decay scale of the Rossby radius of deformation.

Response: Thanks for your valuable comment. As Rossby radius of deformation changing with the latitude and bathymetry, we have added the Rossby radius of deformation into the manuscript.

Line 282: The ATW amplitude decays offshore with a scale equal to the deformation radius, and L = ~100 km in the study area, which is much less than the Rossby radius of deformation (~600 km).

[Comment 7] Fig. 7, lacks error bars.

Response: Thank you for your reminder. We have revised the figure.



[Comment 8] Data in station Kanmen was not discussed in this manuscript.

Response: We sincerely thank the reviewer for careful reading. The phase speed of CSW between Kanmen and Xiamen has been calculated using the tidal gauge data as shown in 4.1 and Fig. 7a. We have added the discussion for track 240 near Kanmen into the manuscript.

Line 339: While in track 240, climatological monthly mean of along-track SLA on the shelf is smaller than that in track 88 especially in July.

Line 465: The along-track SLA for tracks 153 and 229 show similar characteristics (not shown). That for track 240 (as shown in Fig. 6n) presents a differentiated pattern in the coast side and shelf edge during May-July. The main reason should be the cold eddy in the north of Taiwan Island.