Manuscript number: nhess- 2022-253

My co-authors and I would like to express our gratitude to the reviewers for their constructive feedback and suggestions for strengthening our research. The changes we have made to the attached file in response to such feedback and suggestions have been highlighted in blue to facilitate their identification. I would also like to offer my apologies for the length of time it took us to prepare this response. We also record our deep appreciation for the efficient handling of the manuscript.

Response to Reviewer#2

General remarks

I found the article interesting, I think it makes important contribution in terms of disaster management caused by coastal erosion. In this study, the results were mapped using various models and index to analyze shoreline and coastal morphodynamics according to typhoons. It has been observed that typhoon-induced suspended sediment concentration influences shoreline and coastal morphology. This paper contributes to understanding natural disasters and their consequences in terms of scientific significance. I have a few comments (general and specific comments) and suggestions for improvements.

We greatly appreciate the critical review of the manuscript and the constructive suggestions put forth by the reviewer that will help improve the quality of the manuscript. We have responded point by point to all the comments and suggestions raised by Reviwer#2 as follows:

Comment 1: Figure 1(a) Is there a reason for showing the population above the basemap? If so, please comment on the difference between the color of the basemap in Figure 1(a) and the color of the basemap in Figure 1(b).

Response: Figure 1(a) is intended to illustrate the population density of the affected area, which is an important factor in understanding the impact of the typhoon on the affected region. On the other hand, the color of the basemap in Figure 1(a) represents the true color image (retrieved from ESRI World Imagery basemap), whereas the color of the basemap in Figure 1(b) represents the post-typhoon standard false-color composite image of the Mokpo coastal region (Sentinel-2 MSI data downloaded from https://scihub.copernicus.eu/dhus/). Both images (Figs. 1(a) and 1(b)) represent the extensive tidal flat region of the Mokpo coast. However, in the revised manuscript, we updated Figure 1 with more scientific exposition, such as province-wise recorded damage and loss distribution (Member Report, 2018), topography variation of the region (NGII, 2018), and variation of significant wave height and wind speed from August 20 to 25, 2018 recorded by Chilbaldo Buoy Station (located near the landfall area) during the typhoon Soulik passage.

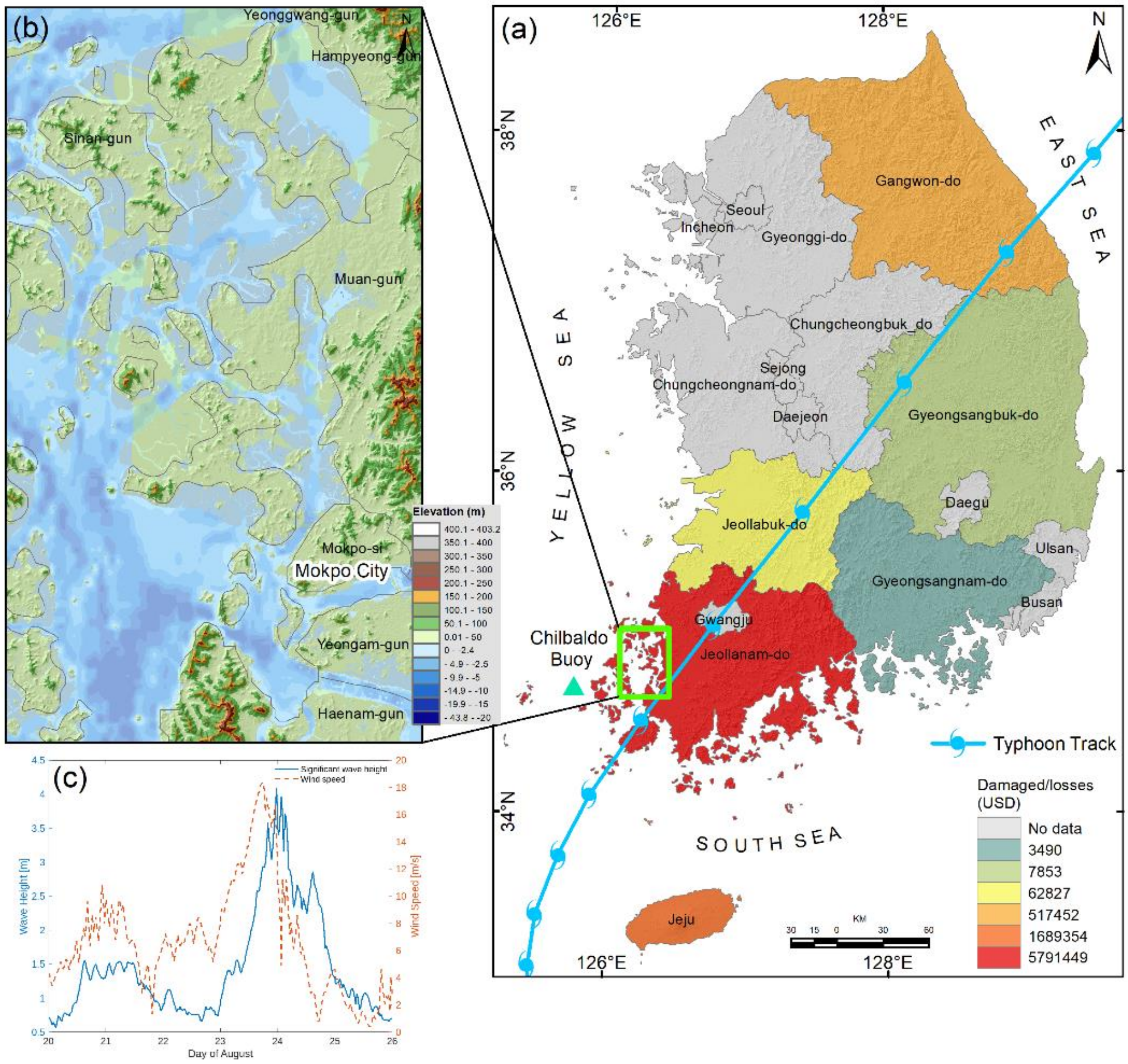

Figure 1. (a) Typhoon Soulik passage passed through the Mokpo coastal region on 23rd August 2018 (Typhon track data were downloaded from https://www.ncdc.noaa.gov/ibtracs/), while the background shades represent province-wise recorded damaged/loss distribution reported by Member Report (2018), (b) Topography variation of the Mokpo coastal region (elevation data acquired from NGII (2018), https://www.ngii.go.kr/, and bathymetry data downloaded from GMRT, https://www.gmrt.org), and (c) Variation of significant wave height and wind speed from August 20 to 25, 2018 recorded by Chilbaldo Buoy Station (located near the landfall area) during the typhoon Soulik (Data source: http://wink.kiost.ac.kr/map/map.do#).

Comment 2: It would be better to add images to better understand the data in 3.1 Data Sources.

Response: As suggested, the pre-and post-typhoon standard false color composite images were incorporated in section 3.1 in the revised manuscript as,

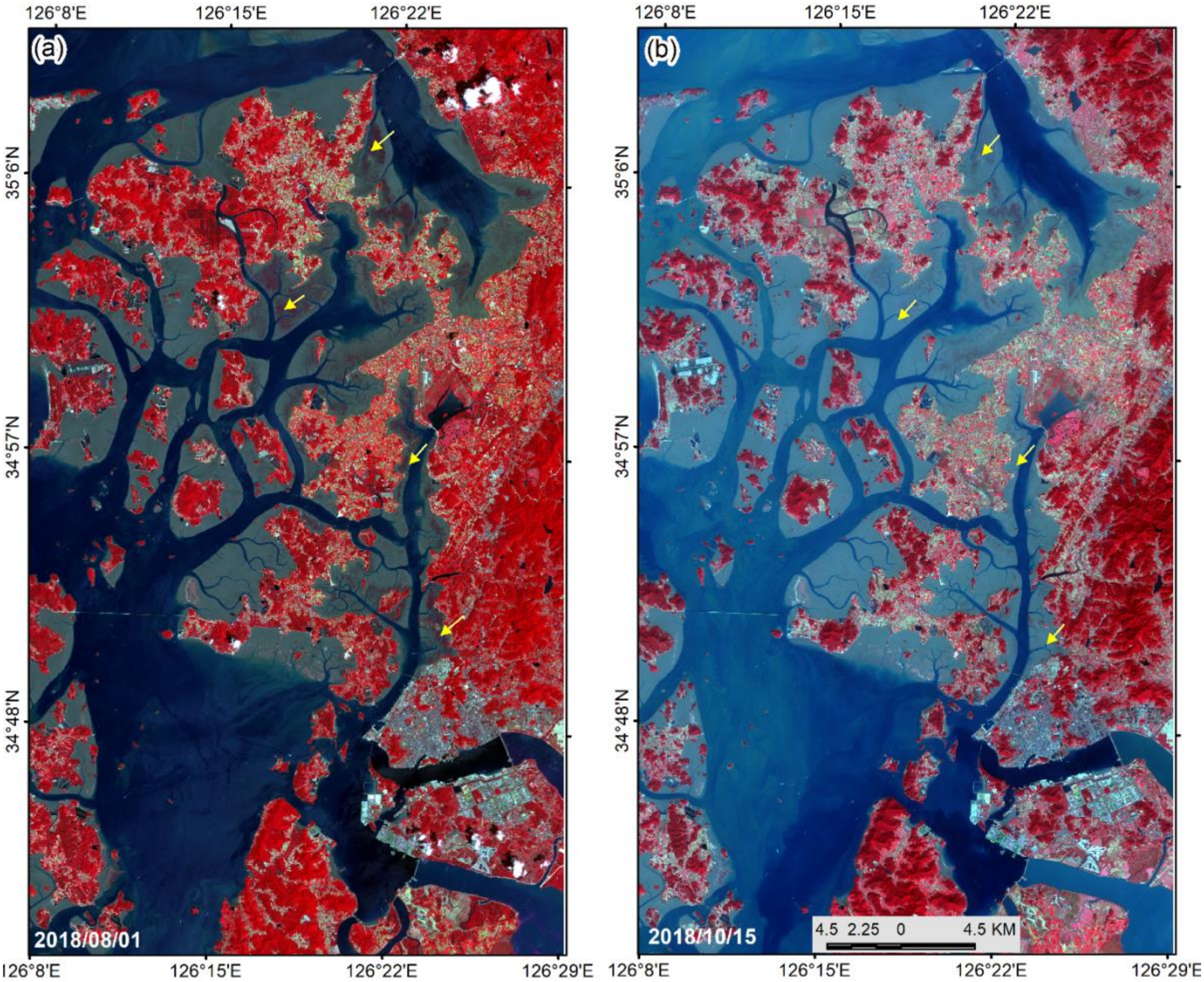

Figure 2. Pre (a) and post-typhoon (b) standard false color composite of reflectance image of the Mokpo coastal region (Sentinel-2 MSI level 1C satellite images are downloaded from https://scihub.copernicus.eu/dhus/). The arrows indicate extensive vegetation damage due to Typhoon Soulik.

Comment 3: Short-term erosion caused by typhoons should be considered for recovery. It is necessary to confirm that the models (net shoreline movement (NSM) and coastal landform change) can predict the recovery of the shoreline and topography after a typhoon. and confidence in the model utilized (comparison with monitoring results, etc.) should also be mentioned.

Response: Thank you for your insightful comment. The recovery status of the Mopko coastal region after typhoon Soulik has been analyzed using the NSM and coastal landform change model. For this purpose, another Sentinel-2 MSI level 1C satellite image was downloaded for October 2019 (one year after the typhoon), as listed in Table 1. After that, the coastal landform change model and NSM were performed based on the Sentinel-2 MSI images of October 2018 and 2019 (both images taken during the post-typhoon period) to understand the recovery status of the coastal morphometry.

The coastal landform change model exhibits that the wetland vegetation increased drastically after one year of typhoon Soulik, as depicted in Figure 16. Table 9 indicates that approximately 16.52% of the land area has accreted over the wetland and water, whereas 39.71% of the wetland vegetation area has accreted over the wetland and water after the typhoon. Further, the outcome of the coastal recovery status was visually compared with the high-resolution aerial imagery downloaded from the National Land Information Platform web portal (https://map.ngii.go.kr/), indicating good consistency. Thus, the coastal landform change model successfully determined the longer-term recovery status in the topography and landforms of the Mopko coastal area after the typhoon.

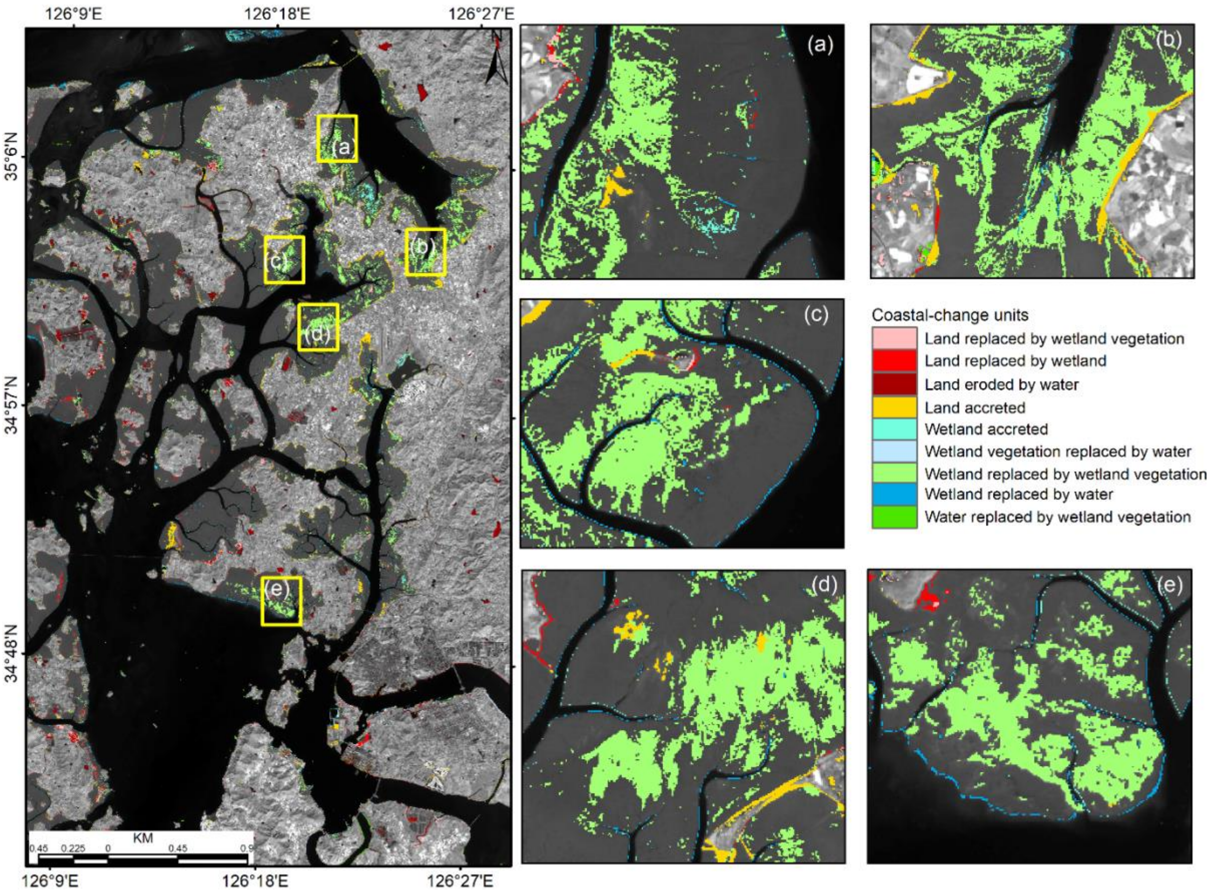

Figure 16. Recovery status of different coastal landforms after typhoon Soulik of Mokpo coastal region, whereas zoom boxes (a-e) show the increase of wetland vegetation at various sites.

Table 9. The details of coastal land transformation classes identify during the post-typhoon the period.

Coastal land transformation	Area (km^2)	%
Land replaced by wetland vegetation	4.06	6.67

Land replaced by wetland	4.59	7.54
Land eroded by water	7.23	11.88
Land accreted	10.05	16.52
Wetland accreted	2.82	4.64
Wetland vegetation replaced by water	2.12	3.48
Wetland replaced by wetland vegetation	24.17	39.71
Wetland replaced by water	4.41	7.25
Water replaced by wetland vegetation	1.41	2.32

On the other hand, the short-term effects of a typhoon on the shoreline have also been determined based on the NSM model. The results exhibit the extensive shoreline alteration in the entire Mokpo coastal region after one year of typhoon Soulik, with an accretion of 48.03% transects and erosion of 51.97%. The NSM statistics showed an average shoreline movement of -1.08m, with a recorded mean erosion of -9.25 and deposition of 7.75m (Table 10). The overall erosion was recorded in response to typhoon Soulik even after one year along the Mopko coastal region. This is due to the extensive damage to wetland vegetation during the typhoon period (Table 7). In addition, it was observed that the wetland experience accretion during the typhoon period, but it made the coastline vulnerable to erosion in the near future. The natural native vegetation and wetland vegetation play a critical role in the shoreline stability of the coastal region due to its anti-erosive nature. This phenomenon was evident in the NSM statistics obtained during the post-typhoon period. Therefore, the use of these models can help predict how the shoreline and adjacent coastal landforms will respond to typhoons, identify vulnerable areas, and inform recovery efforts. This can enhance the area's resilience to natural disasters and reduce the risk of future erosion and other environmental problems.

Table 10. Post-typhoon shoreline change statistics based on the NSM model.

NSM statistics	Summary
Total transects	38313
NSM_{mean}	-1.08m
$NSM_{mean\ accretion}$	7.75
$NSM_{mean\ erosion}$	-9.25
$NSM_{maximum\ accretion}$	44.76
$NSM_{maximum\ erosion}$	-121.14
Total transect that records accretion	18400
Total transect that records erosion	19913
% of total transect that records accretion	51.97
% of total transect that records erosion	48.03
Overall pre to post-typhoon trend	Erosion

Comment 4: The unit of area in Table 7 should be checked.

Response: Thank you for the comment. We have reviewed and updated the unit of area in Table 7 in the revised manuscript.

Comment 5: The table format is not correct. Check it out in its entirety. Text alignment in table should be checked.

Response: Thank you for the comment. We have carefully reviewed the format of all tables in the revised manuscript and made updates wherever necessary.

Comment 6: The position of the legend is not correct for each Figure(Figure 4, 8, 9).

Response: As suggested, the position of the legend of Figures 4, 8, and 9 (now Figs. 5, 12, and 13) has been updated in the revised manuscript as,

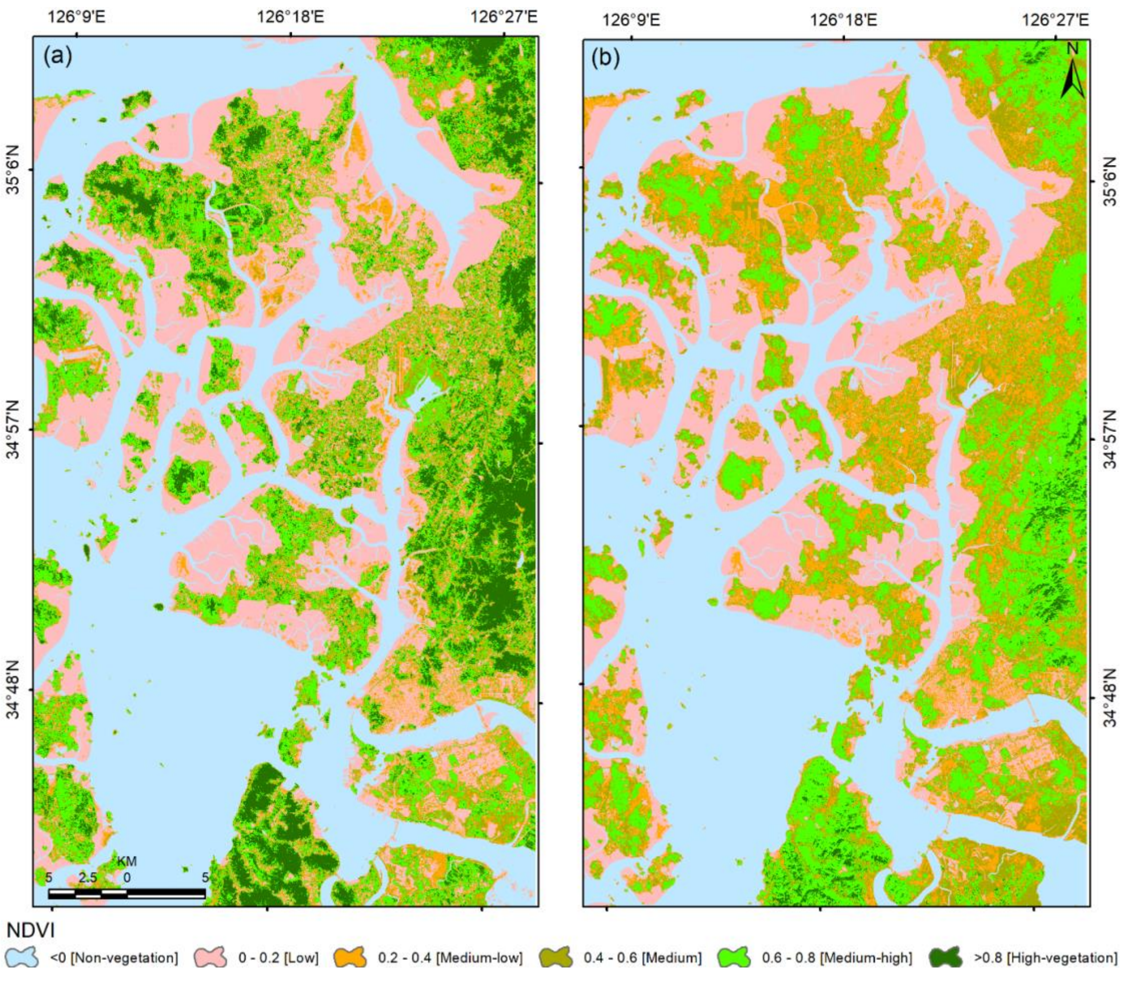

Figure 5. Status of vegetation greenness based on the NDVI data for the (a) pre-Soulik (01st August 2018) and post-Soulik (15th October 2018) period.

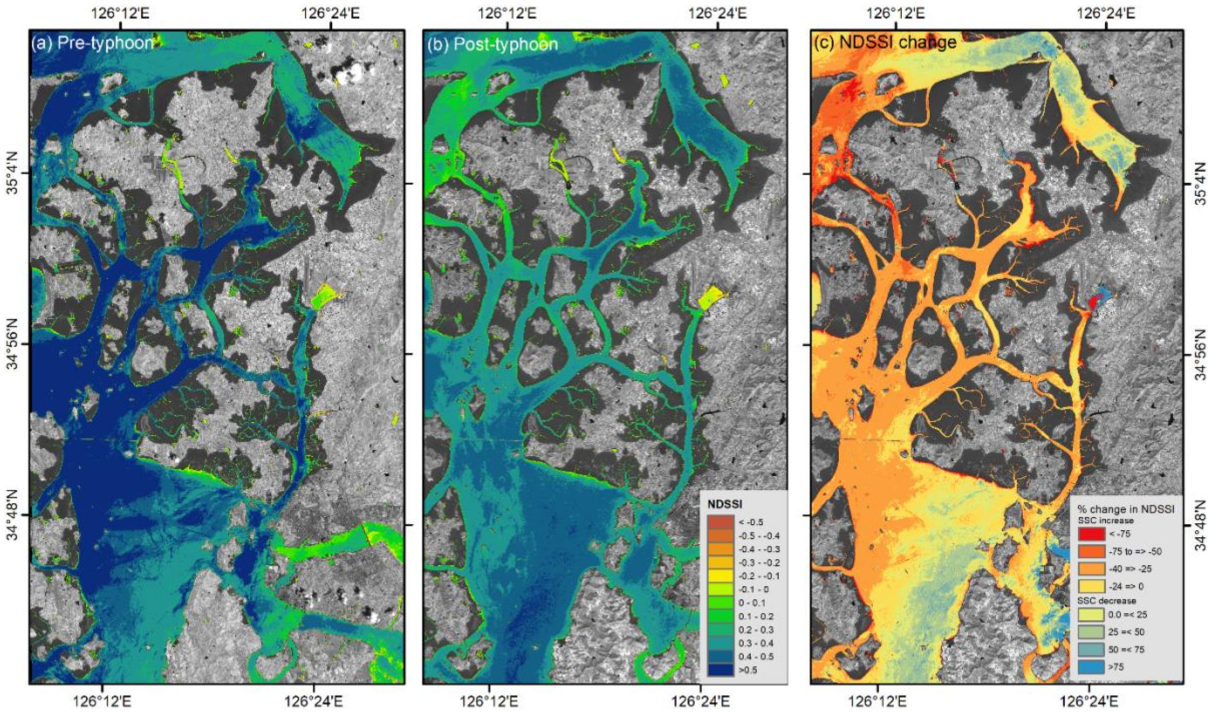

Figure 12. Relative SSC for (a) pre-typhoon and (b) post-typhoon period, while (c) represents the changes in the NDSSI.

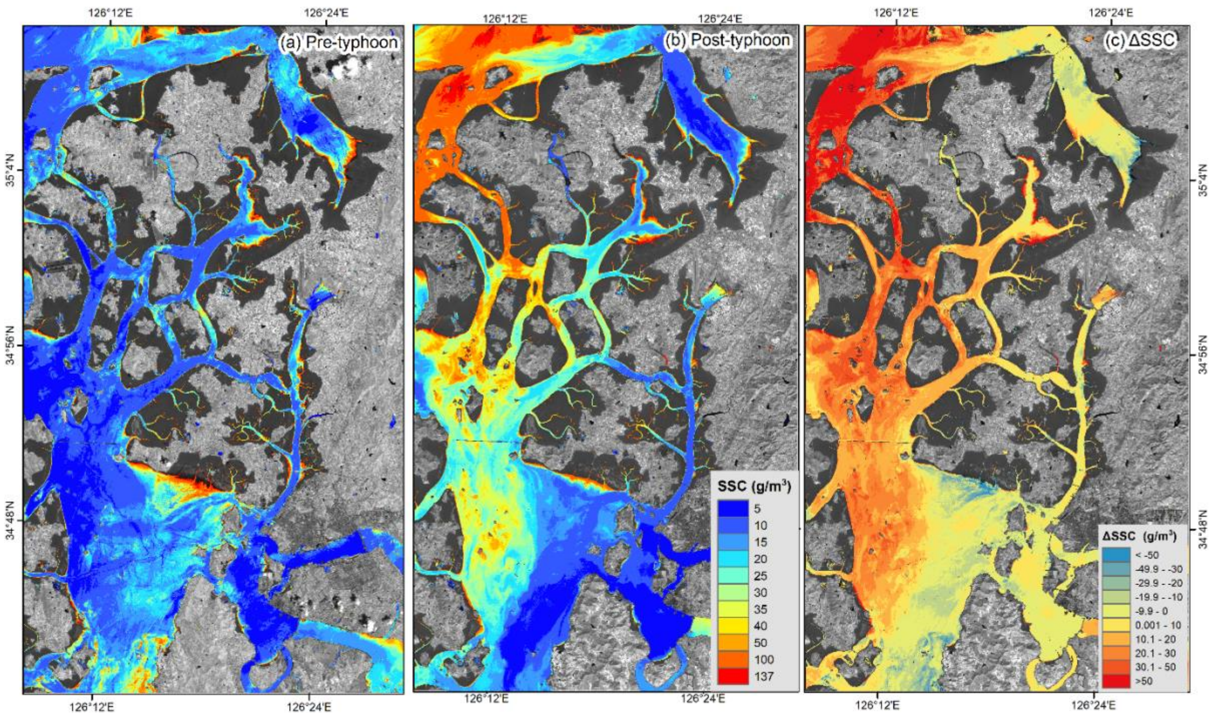

Figure 13. The simulated SSC distribution for the surface water of (a) pre-typhoon, (b) post-typhoon period, and (c) represents the spatial changes of SSC from pre- to post-typhoon.

Comment 7: The detailed title in Figure 11 should be modified for improvement.

Response: Thank you for your comment. The figure caption (Figure 15, revised figure number) has been updated in the revised manuscript as

Figure 15. Net surface area changes (i.e., erosion and accretion) due to typhoon Soulik along the Mokpo coast. Subplots (a-d) show extensive accretion, while erosion is shown in plot (e). The bar graph (f) represents the area changes from the pre to post-typhoon period.