We thank Referee #1 for the careful reading and reviewing our manuscript entitled: "Assessing and zoning of typhoon storm surge risk with GIS technique: A case study of the coastal area of Huizhou". We sincerely appreciate these constructive comments and valuable suggestions for improving our manuscript. In the following, responses to the referee's comment are described in a point-to-point manner. The referee comments are displayed in the grey background and the responses are displayed in blue.

Major comments:

(1) In the study, the performance of the coupled model for storm surge modeling has already been validated by comparing the simulated data and the water level records obtained from the Huizhou gauging station. However, the performance assessment of the coupled model was not done properly because the Huizhou gauging station was on the left of the study area. I encourage the authors to make another comparison between simulated data and recorded water levels that were obtained from one gauging station on the right of the study area. The validated results from these two gauging stations can make the performance of the coupled model more convincing over the study area.

Response: Figure 2 and Figure 3 in the original manuscript were merged into the Figure. The Gangkou gauging station on the eastern side of the study area has been added to the map, as shown below.

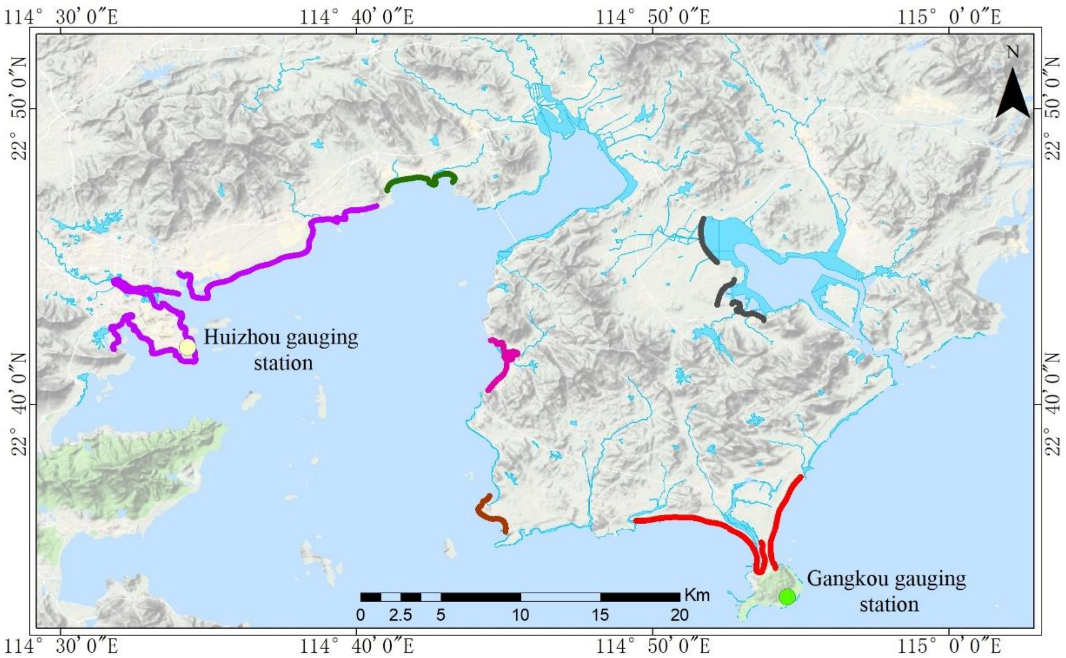
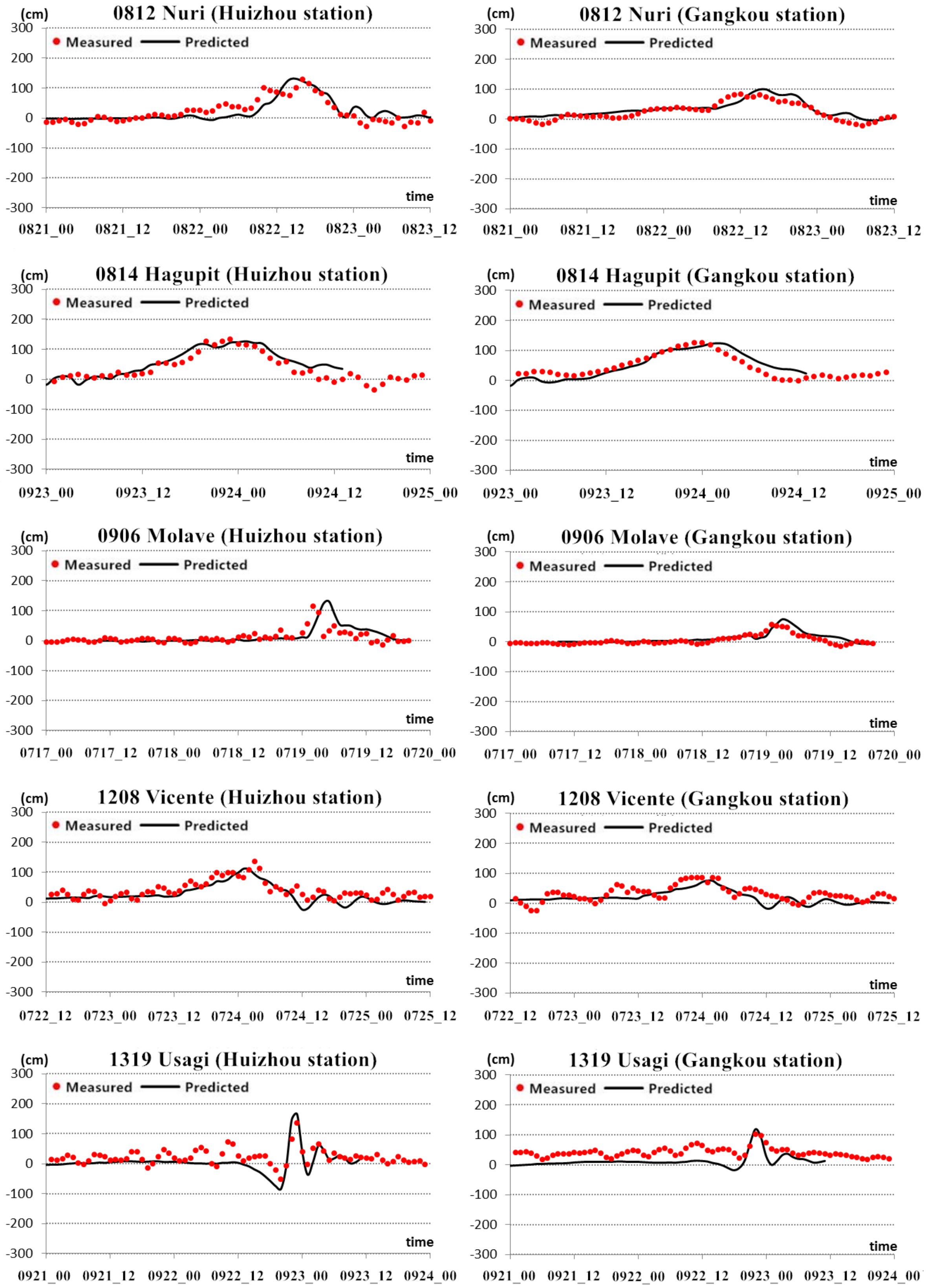


Figure. The two stations including Huizhou gauging station and Gangkou gauging station measure the water levels in the study area.

Moreover, the measured water levels from the two gauging stations including Huizhou gauging station and Gangkou gauging station were compared with the simulated water levels during ten storm events, as shown below.



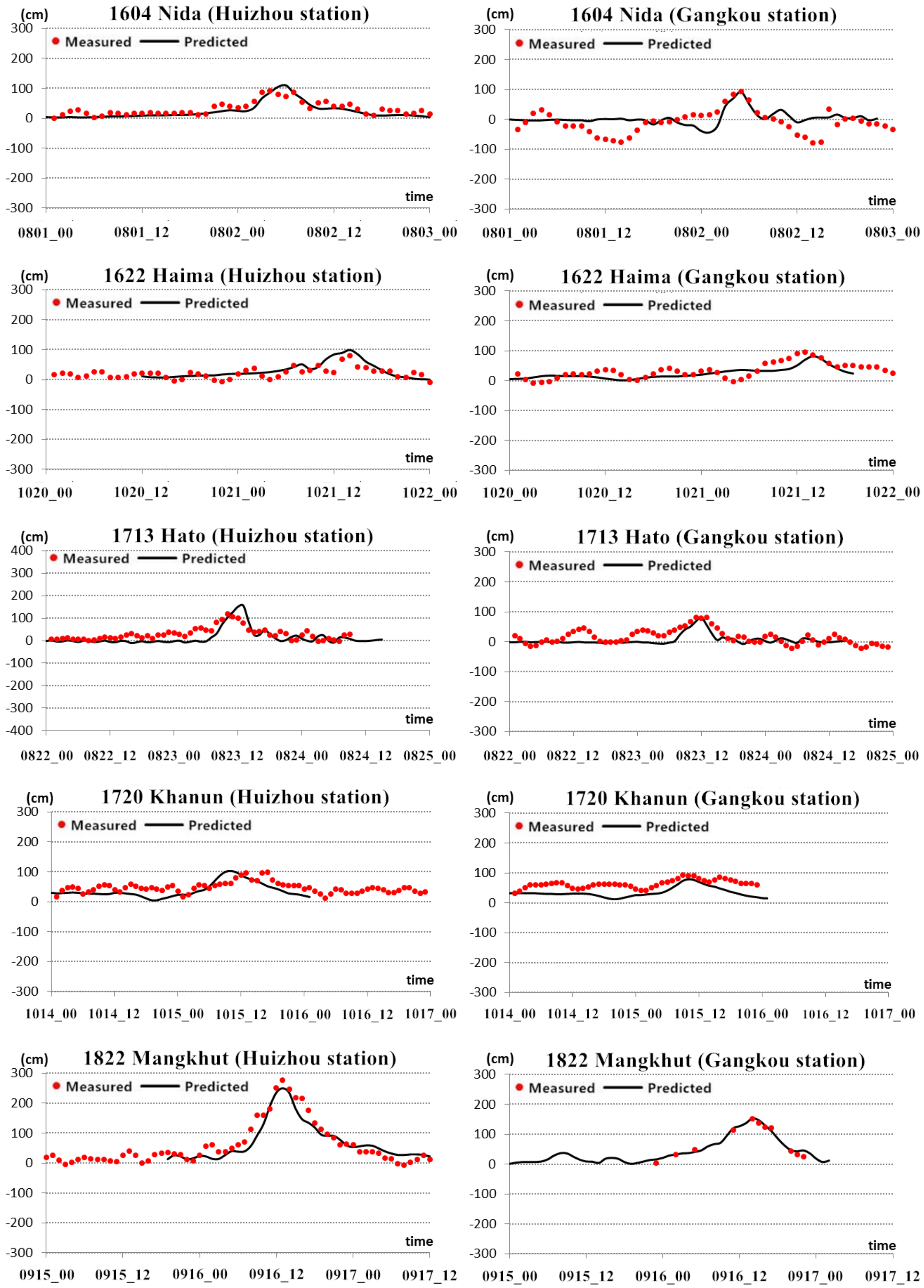


Figure. The predicted water levels (in black line) and highest measured water levels (in red dots) recorded by the Huizhou station and Gangkou station during the typhoon events.

In addition, the Relative Error (RE) is calculated as the measured observed water level is above 100 cm. The Absolute Error (AE) is computed when the highest measured water level is below 100 cm. The statistical results from two stations have been summarized in Table as follows. It displays that the data with RE⩽20% or AE⩽20 cm account for 90% of all simulated data, which satisfies the criterion in the guideline. These remade figures and remade Table have been added to the revised manuscript.

Table. Summary of error statistics (AE and RE) between maximum predicted water levels and highest measured water levels from Huizhou station and Gangkou station during the typhoon events

Typhoon Name	Measured Data (cm)		Relative Error (%)		Absolute Error (cm)	
	Huizhou station	Gangkou station	Huizhou station	Gangkou station	Huizhou station	Gangkou station
0812	129	84	2	/	/	15
0814	135	126	6	2	/	/
0906	116	58	13	/	/	17
1208	136	87	18	/	/	11
1319	137	102	21	17	/	/
1604	92	94	/	/	18	2
1622	81	94	/	/	18	12
1713	120	81	30	/	/	0
1720	98	93	/	/	5	14
1822	278	151	10	1	/	/

(2) The storm surge modeling with the coupled model is an important step for this research and the modeling section requires more clarifying. For the ADCIRC model, I suggest authors give more description including what the discrete method was used and which coordinate system was chosen in the ADCIRC model, and how do you consider the bottom friction in the ADCIRC model because the different land types have various frictional values during the storm surge modeling.

Response: The ADCIRC model uses the finite element method allowing the utilizing of flexible and unstructured grids. The ADCIRC model can be applied in modeling tides, wind-driven circulation, and typhoon-generated storm surge. The ADCIRC-2D in this study was run using a spherical coordinate system. It can provide both water surface elevation and the depth-averaged velocity fields with employing continuity equation and momentum equations.

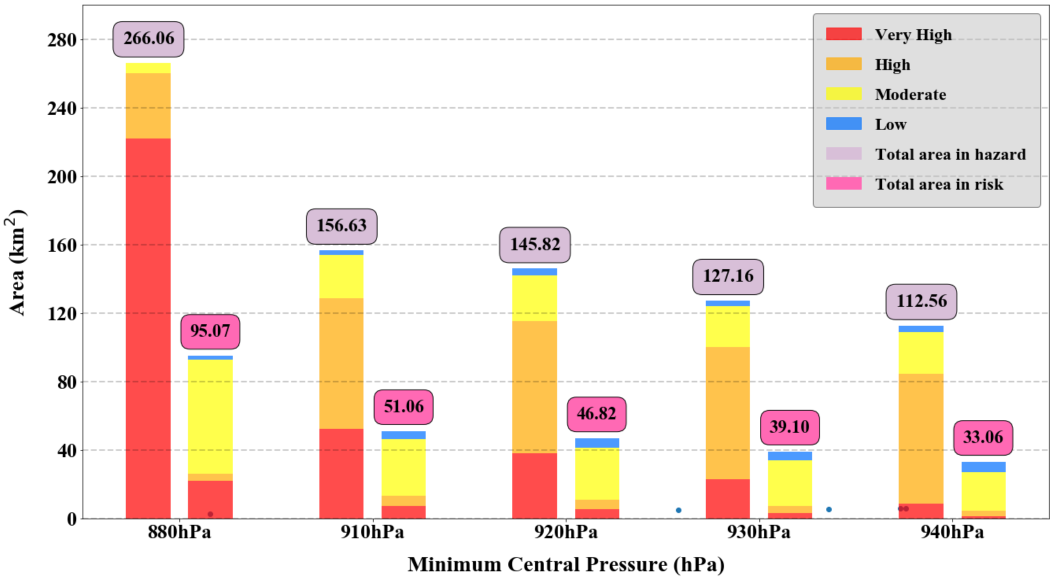
For the friction coefficient, the ADCIRC model in this study utilized Manning's n values derived from the dataset of land cover types. The dataset contains information about the types of land-cover associating with Manning's values over the study area. The land types over the study area were associated with Manning's values, and then average the Manning's n values for the ADCIRC mesh.

Table. The land-cover associating with Manning's values

Land types	Settlements	Forest	Dryland	Paddy field	Road	Riverway	Open spaces
Manning's values	0.07	0.065	0.06	0.05	0.035	0.025-0.035	0.035

(3) The data analysis of storm surge risks on different towns in the study area and the relation between hazard assessment and risk assessment can be added to the research paper, which is helpful to readers, especially to decision-makers, to better understand the impact from the storm surge.

Response: The total area in hazard and that in risk under different typhoon intensities were shown below. It indicates that the area in high hazard level cannot represent that in high-risk level and the area in high hazard level could be turned into the area in moderate or low-risk level due to different vulnerabilities of land type covers. The figure has been added to the revised manuscript



(4). The authors conducted the risk assessment of storm surge for Huizhou city and we can identify the risk zones on different intensity scenarios from the results (analysis and maps). I strongly encourage the authors to demonstrate how the results are useful for developing risk response plans and evacuation strategies for storm surge risk in Huizhou. It is a crucial aspect that can strengthen the study and the manuscript.

Response: The risk assessment, risk maps, and risk analysis over the study area were made in 2019 and have been used in practice. With these escape routes maps and suggestions, the decision-makers can prioritize development strategies and make evacuation plans in the risk areas of Huizhou city. However, limited by paper length, these dozens of storm surge escape routes maps for the study area were provided from the source link (https://figshare.com/articles/figure/escape_routine/12647105).

(5) I suggest the authors improve the presentation of figures 14, 15, 17, and 18: The terrain base map layer can be transparent to avoid blending with the colors on the assessment map layer. The font size of texts on the assessment map layers should be increased. The legends in figures can be removed because they are repeated many times in figures 14 and 18 (b), (c), (d), and (e). The data analysis figure about vulnerability assessment can be added after figure 17 in the paper. The administrative boundaries might be displayed in the figures.

Response: According to the comments about the presented figures by the two referees, many figures have been remade, as can be seen in the revised manuscript. The figures 14, 15, 17, and 18 in the original manuscript were remade and figre depicts the total areas of inundated areas with different hazard levels has been made, as shown below. Based on the comments from the referees, the transparency of the terrain base map layer has been set to 50% to avoid blending with colors in the other layers. Moreover, the font size of texts has been increased and the repeated legends were removed. In addition, administrative boundaries have been added to the figures.

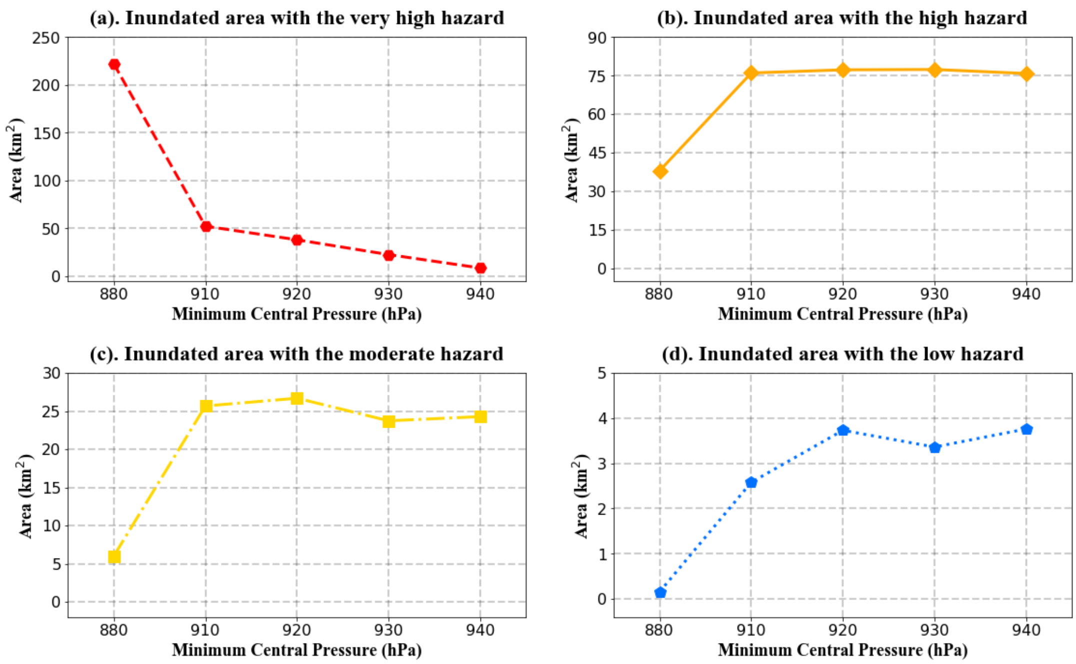


Figure. The total areas of inundated areas with different hazard levels under five five storm scenarios

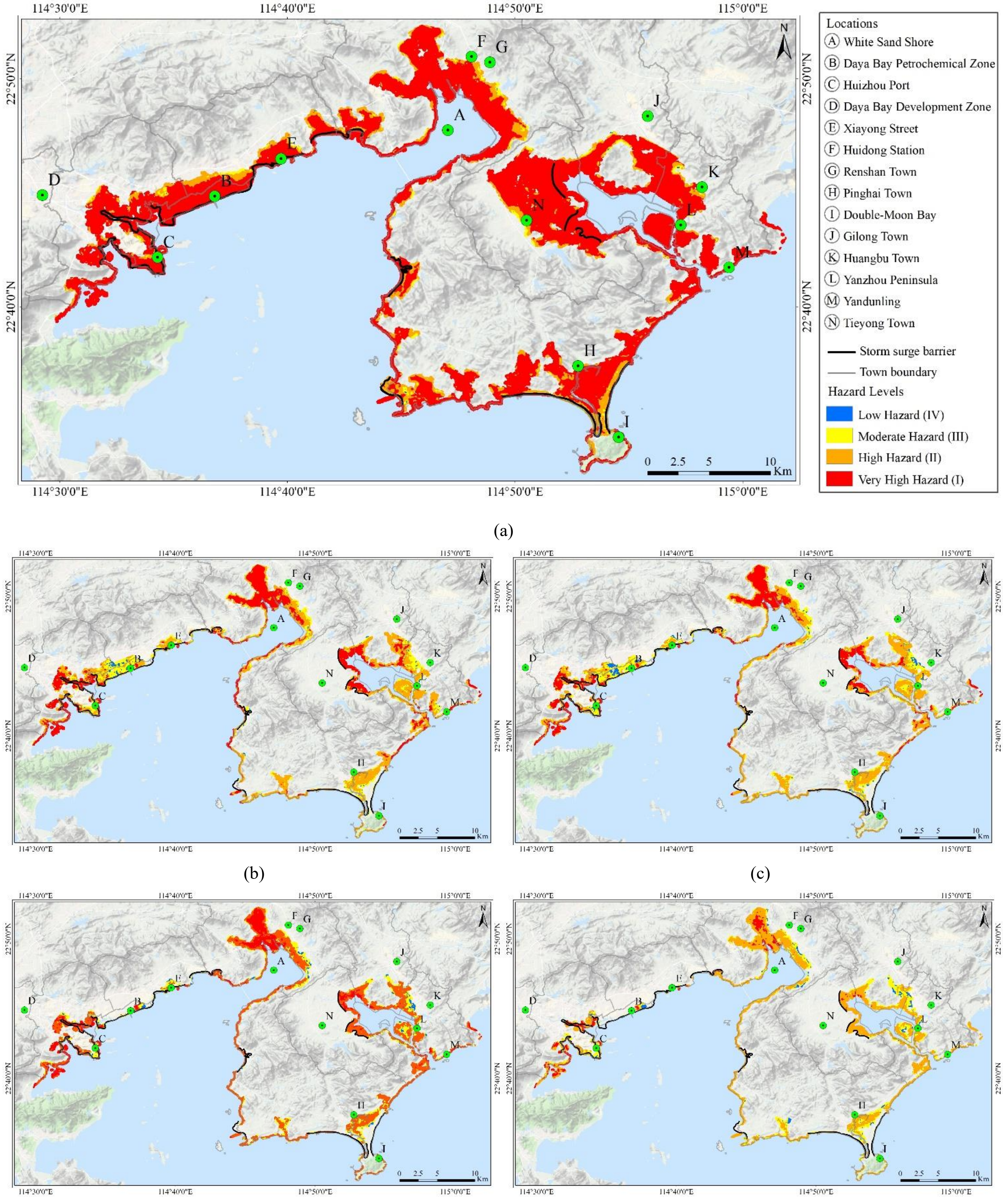


Figure 14. The hazard assessment maps represent the inundation extents and depths for five storm scenarios ((a):880 hPa/1000-year, (b):910 hPa/100-year, (c):920 hPa/50-year, (d):930 hPa/20-year, (e):940 hPa/10-year).

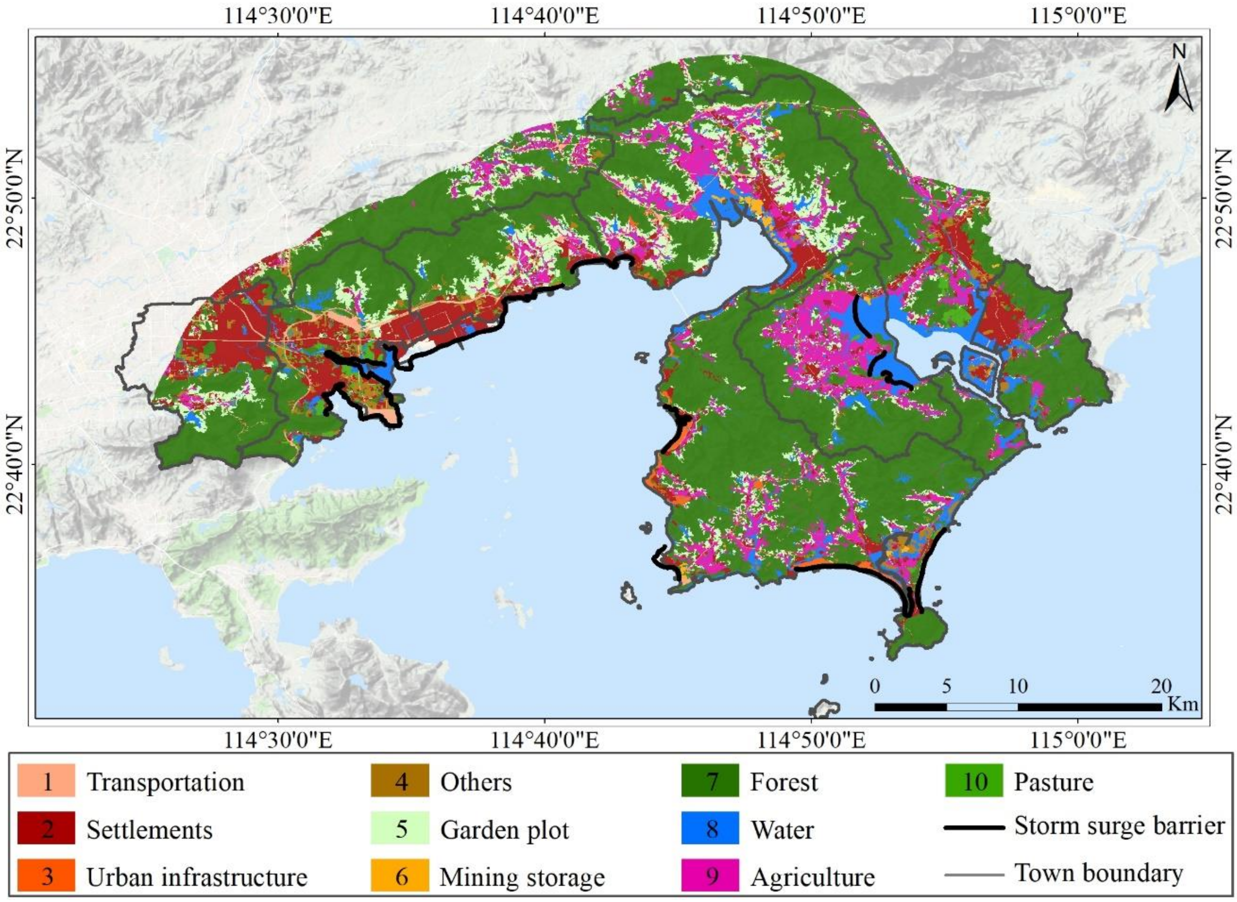


Figure 15. The exposure map of different land cover types over the study area.

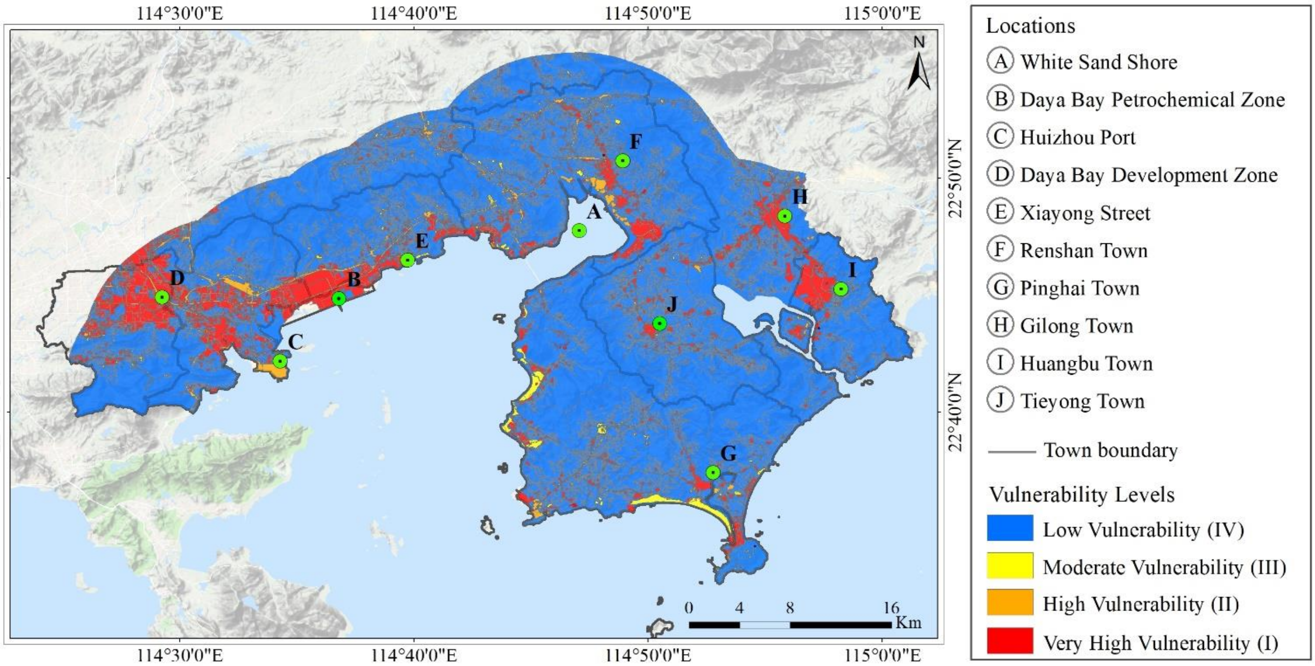


Figure 17. The map of vulnerability zones in the study area. The red means the highest vulnerability level (I) and the blue stands for the lowest vulnerability level (IV) on the map. The map was made with ArcGIS 10.5 software based on the terrain base map layer, which was obtained from Google Maps (Map data ©2019 Google).

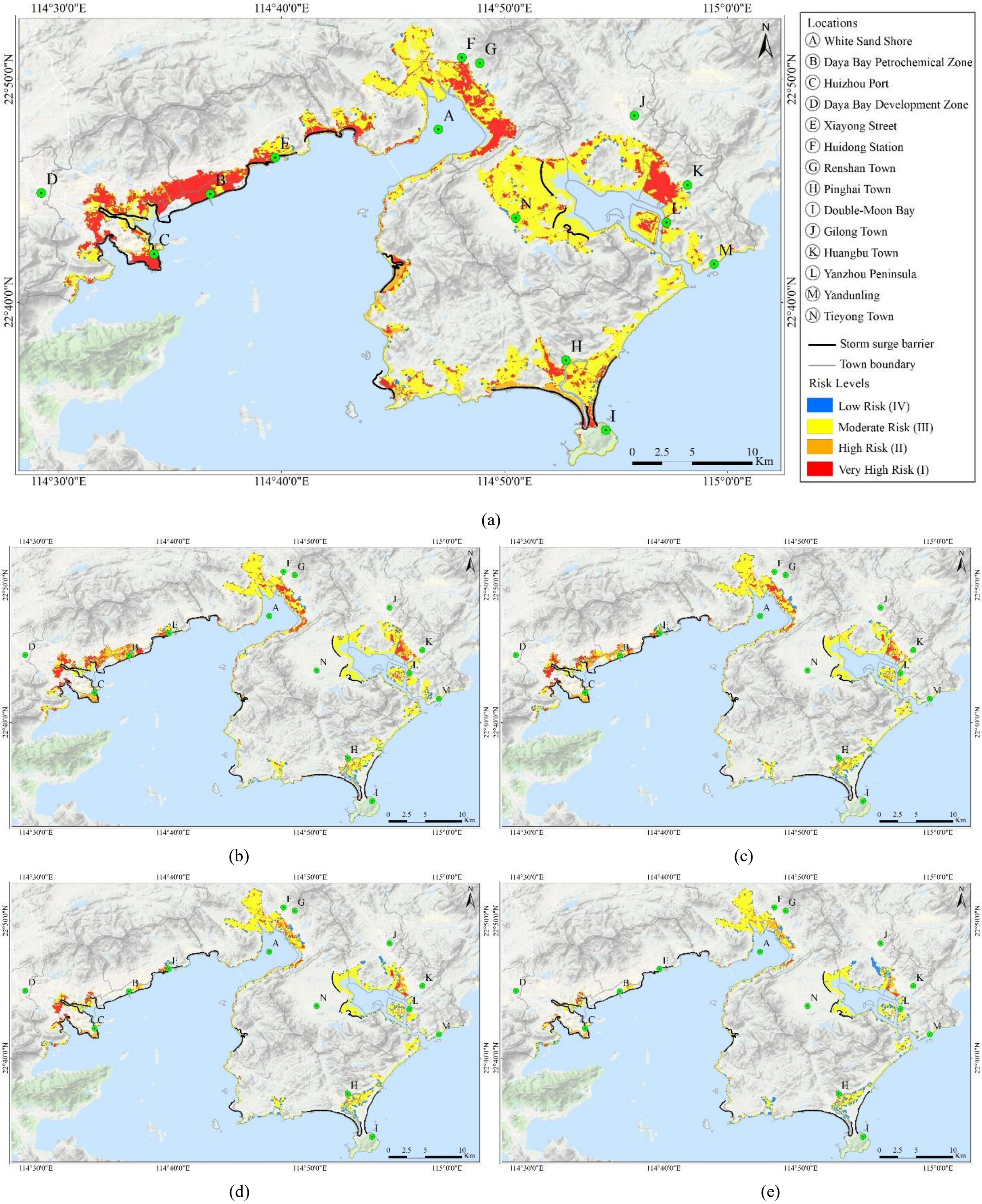


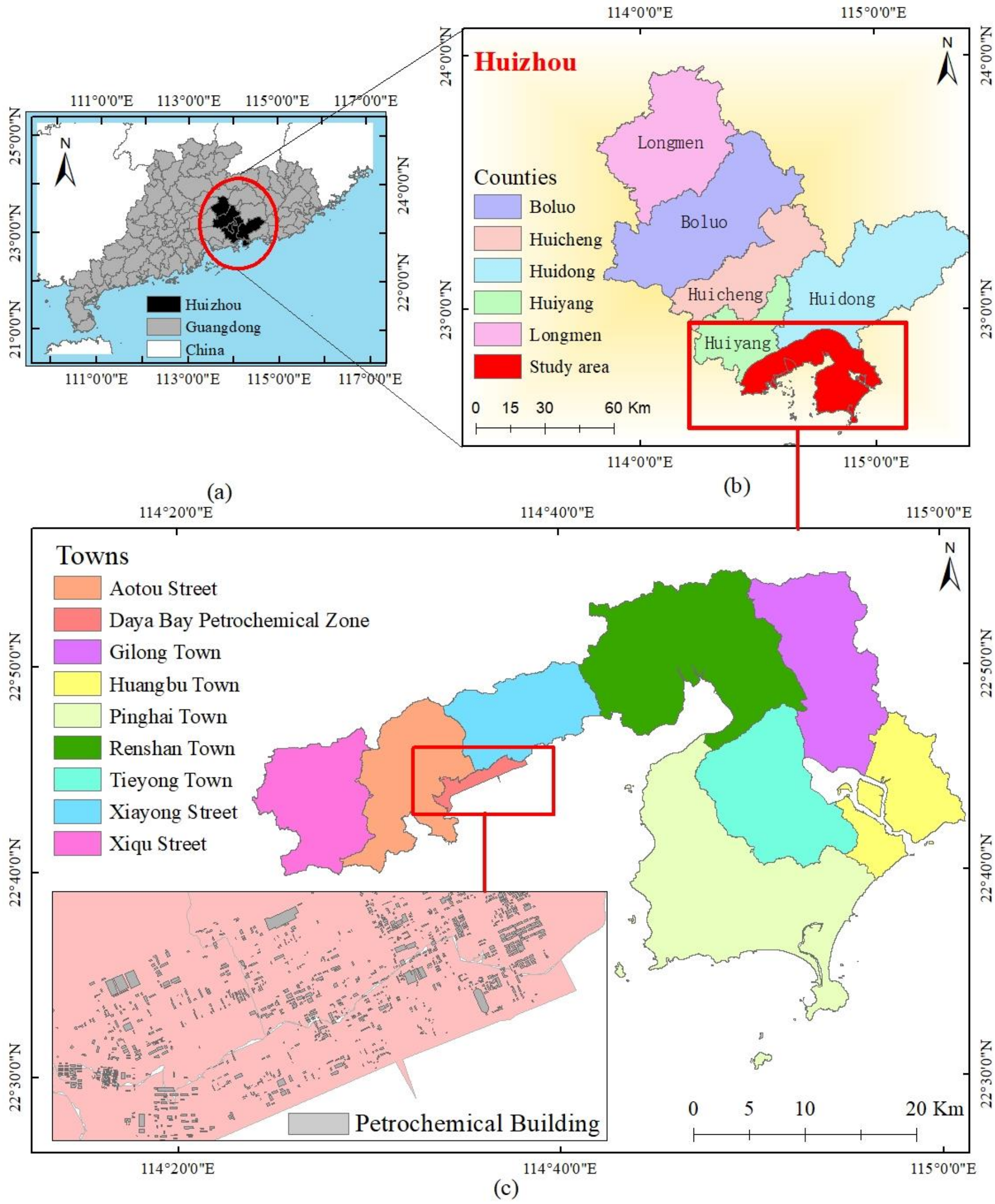
Figure 18. The risk assessments maps represent the potential risk of storm surge for five designed storm scenarios

Minor comments on specific lines:

2.1 Study area

1) Figure 1: It is not clear to me where the Daya Bay Petrochemical Zone is located. It is important to add a visualization of the Daya Bay Petrochemical Zone in Figure 1 because the Petrochemical Zone with a high concentration of petroleum facilities is the reason to conduct the hazard and risk assessment of storm surge in the study.

Response: Thanks for your correction. Figure 1 in the original manuscript has been removed, and the remade Figure 1 in which the 'Daya Bay Petrochemical Zone' and the 'petrochemical building distribution in the Zone' were added is as follows.



2) L130- L145: Some information about the study area is not necessary and can be removed.

Response: Thanks for your suggestion.

3) L160: The elevation map of the study area which is a crucial factor for the storm surge modeling in the paper should be displayed.

Response: Thanks for your correction. The DEM map of the study area including rivers and the elevation value that point covers (see below) has been added to the revised manuscript

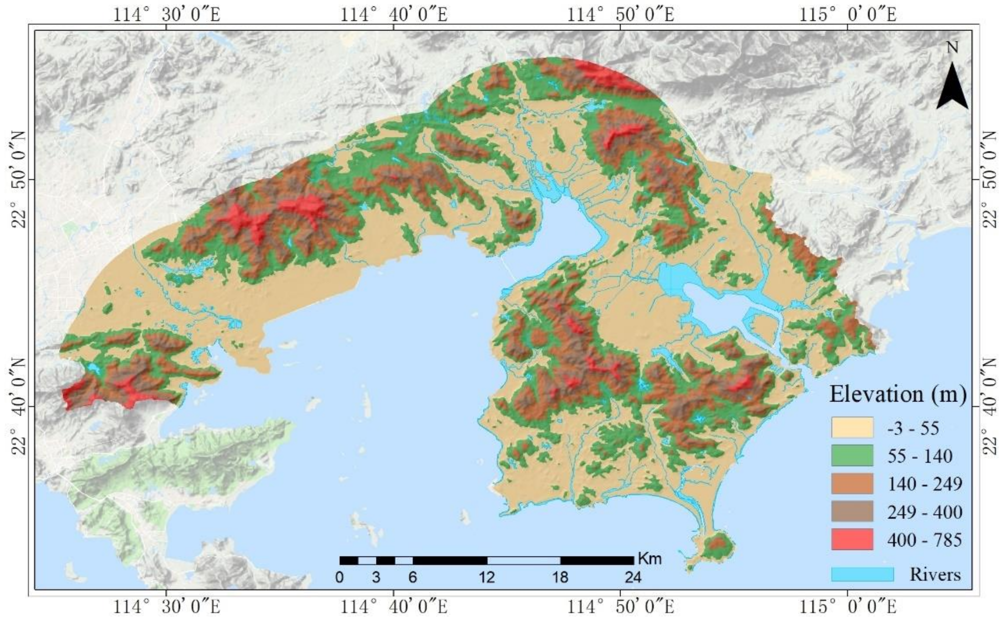


Figure. The DEM map of the study area including rivers and the elevation value that point covers.

4) Figure 2: The more visualization about the barrier that is an important aspect might be given.

Response: Thanks for your suggestion.

5) L178: Administrative boundaries at the township level should be displayed in the figure.

Response: Thanks for your correction. Administrative boundaries at the township level have been added to the figures in the revised manuscript.

6) Figure 2 and Figure 3: North arrow in these Figures are not clear.

Response: Thanks for your correction. The North arrow in Figure 2 and Figure 3 have been replaced.

3.1 Model description and validation

1) L274: The unit of the radius of maximum wind (Rmax) on the Y-axis should be 'm' in Figure 7.

Response: Thanks for your correction. The unit in Figure 7 has been replaced with 'm'.

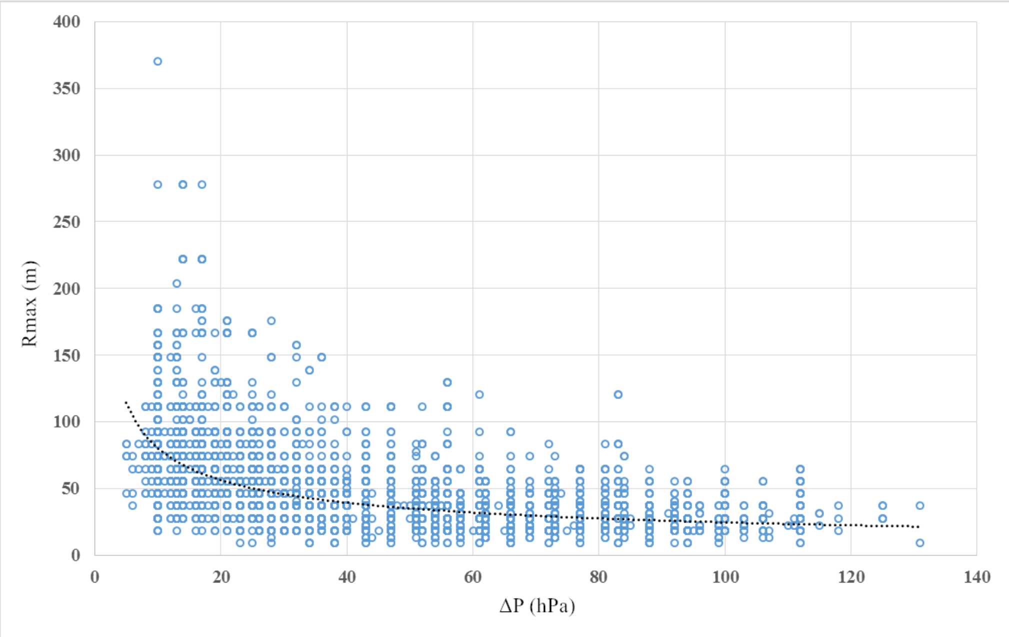


Figure 7. The relation between the pressure difference (ΔP) and the radius of maximum wind (R_{max})

4 Results and discussion

1) Figure 13: The legends are not clear.

Response: Thanks for your correction. The legends in Figure 2 and Figure 3 have been added.

2) Figure 16: The colors of different bars can be set to the same value

Response: Thanks for your correction. Figure 16 has been remade. The bars are labeled with different colors according to the vulnerability levels of land cover types and the legend has been added to the Figure 16, as follows.

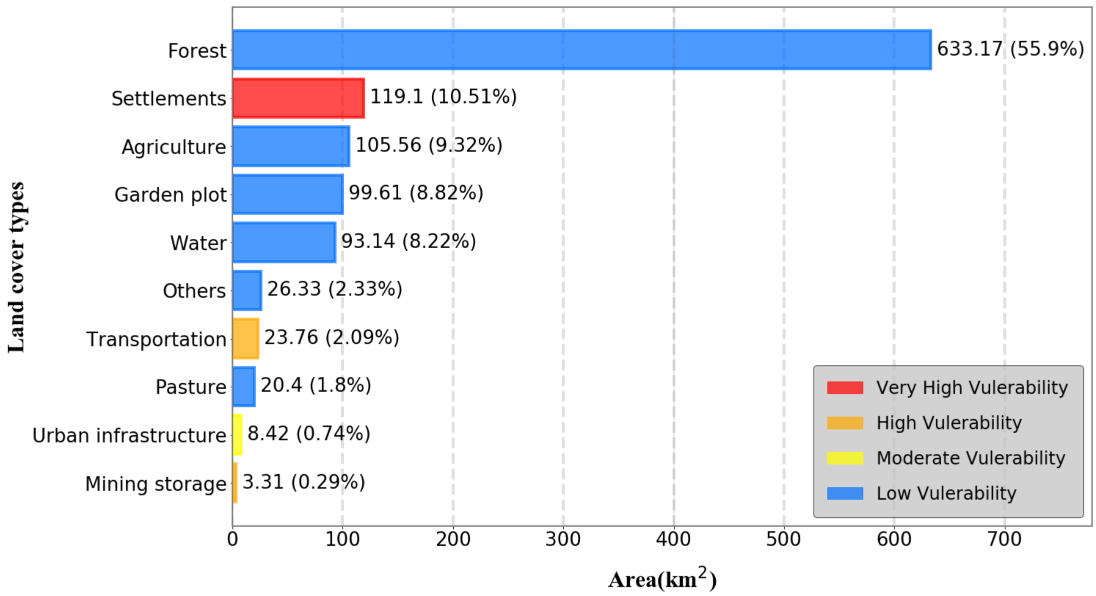


Figure 16. The land areas and proportions of different land cover types in the study area.