Response to Reviewer 1

This study conducts systematic post-event field surveys and hydrodynamic numerical simulations for the storm surge disaster induced by Typhoon Hato in Guangdong Province. This work produces valuable ground truth data and model validation references for estuarine storm surge research. However, several aspects of the article require improvement.

Response:

We greatly appreciate your kind help in reviewing the manuscript and all constructive comments. We substantially revised the paper based on these comments.

Major comments:

1. The analysis of damage mechanisms for coastal hazard bearing carriers is insufficient. The manuscript fails to summarize typical destructive patterns or identify vulnerable points of different coastal facilities. A thorough exploration of these vulnerable links is essential to support targeted disaster prevention suggestions in the Discussion Section.

Response:

Thank you for your valuable comment. In response, we have added a new subsection in the Results and Analysis Section to summarize the major causes of damage to different exposed structures. Based on these identified causes, we have further provided targeted disaster prevention suggestions in the Discussion Section. Specifically, in the Results and Analysis Section, we added:

3.1 Analysis of Disaster Causes

This disaster caused serious damage to the human lives, vehicles, fishery, vessels, coastal structures, and other hazard-bearing bodies in the Guangdong province. The main causes of damage to these hazard-bearing bodies were identified using field reconnaissance:

First, the storm surge caused the seawater to come ashore, inundating residential buildings along the coast, garages, lower-floor shopfronts, cars parked on the roadside, and aquaculture areas, causing suffocation and drowning of people as well as the loss of indoor properties, vehicles, and aquaculture products. Second, the combination of the storm surge and nearshore waves had a significant impact on coastal embankments,

deep-water net cages, aquaculture rafts, and fishing vessels, resulting in the damage to embankment surfaces, corners of embankment facilities, aquaculture facilities, and fishing vessels (due to collisions) as well as the death of aquaculture products due to collisions. A detailed description of the main causes of damage to various hazard-bearing bodies is shown in Table 3. (Line 186-196 in the revised manuscript)

Table 3. Causes of damage to various exposed structures

Exposed structures		Damage causes
Human lives		• Underground garages were flooded, causing the drowning of people.
Fishery	**Pond culture**	• Facilities associated with coastal aquaculture ponds, such as board room, were destroyed by the storm surge. • Products from aquaculture suffered from hypoxia and died due to the lack of electricity to supply oxygen to the ponds because many power and oxygen supply facilities were damaged. • Many fish and shrimp swam away from fishponds when the water overflowed.
	Raft culture	• Fish breeding rafts for coastal raft cultures were washed away or dispersed by the storm surge and nearshore waves.
	Fishing boat	• Fishing vessels were turned over by nearshore waves, that is, coastal inundation. • Under the combined impact of the storm surge and nearshore waves, many fishing vessels crashed into docks, revetments, and seawalls and were damaged. • Fishing vessels were washed to the shore by the storm surge and nearshore waves and stranded.

Coastal structures	**Wharf**	• Under the impact of nearshore waves, the water-facing sides of wharves were damaged. • Many wharves were hit and damaged by merchant vessels under the impact of the storm surge and nearshore waves.
	Breakwater	• The storm surge and nearshore waves led to the failure of the protective sides and embankment roots.
	coastal dikes	• Bricks, rubble, and masonry at the bottom of revetments were washed away when the water-facing side was hit by the storm surge and nearshore waves. Thus, revetments were damaged.
House		• Walls and roofs of houses were damaged by the impact of nearshore waves. • Indoor property was damaged due to seawater immersion. • Temporary board room were destroyed by the storm surge.
Coastal Tourism Zone		• The coast and beach of lidos were filled with garbage and rocks washed ashore by the flood. • Signs, lighthouses, and other facilities of the lidos were destroyed by the storm surge and nearshore waves. • The office buildings of the lidos were flooded, and equipment failed to work properly. • The soil was exposed because the beach sand was swept away by the storm surge and nearshore waves, preventing the normal operation of the lidos.

Transportation	• Vehicle engine circuit systems were damaged due to seawater immersion and thus possibly scrapped. • Under the combined impact of the storm surge and nearshore waves, vehicles parked along the coast were swept out to sea and thus damaged. • Many vehicles were also damaged by falling branches and billboards.
Public facilities (e.g., electricity and communication facilities)	• Several facilities in low-lying areas were flooded and thus damaged.

In the **Discussion Section**, we added:

Importantly, the observed spatial heterogeneity in inundation severity also points to the role of local vulnerability and protection capacity in shaping disaster impacts. During Typhoon Hato, several areas across the Pearl River Delta experienced levee breaches, overtopping, and piping. These failures resulted in prolonged and widespread inundation, affecting a wide range of exposed assets, including agricultural land, aquaculture facilities, transportation, communication, and energy infrastructure. Field investigations further revealed that severe inundation in some locations was closely associated with low protection standards, aging and poorly maintained levees, and gaps in coastal defenses. The impacts of coastal flooding, therefore, are determined not only by the extent and depth of inundation, but also by how effectively local infrastructure can withstand and contain floodwaters. These findings highlight the need to translate spatially heterogeneous inundation characteristics into differentiated disaster risk management strategies. Areas experiencing severe and extensive inundation should be prioritized for disaster risk assessment and zoning, with particular attention to identifying critical defense gaps and vulnerable infrastructure. Existing coastal defenses, including levees, sluice gates, and drainage facilities, should be systematically inspected and evaluated, with reinforcement, upgrading, or reconstruction prioritized

according to their protection capacity and local inundation conditions. For areas containing densely populated communities, critical infrastructure, or major economic assets, the identified inundation risks should also be incorporated into local emergency preparedness and response plans, including targeted evacuation and emergency response measures. Such spatially differentiated risk management can help local authorities better prioritize limited disaster prevention resources and strengthen preparedness for future coastal flooding. (Line 357-378 in the revised manuscript)

2. Descriptions of storm surge numerical model parameters is insufficient. Essential settings for the hydrodynamic model require full documentation.

Response:

Thank you for your valuable comment. We have added a paragraph to provide the essential model settings and parameters used in the Typhoon Hato simulation. Details are as follows:

For the Typhoon Hato simulation, the computational domain covered the South China Sea, the East China Sea, and the western North Pacific, together with the Pearl River Delta and its major river systems. An unstructured mesh was adopted, with spatial resolution gradually refined from approximately 10 km in the deep ocean to 50 m in the delta and river system, and to 5 m over the Macau Peninsula. The model was forced by astronomical tides at the open-ocean boundaries and river discharge at the upstream boundaries, while typhoon-induced wind and atmospheric pressure fields and rainfall were applied as time-varying forcings. The simulation covered the entire Typhoon Hato event, from 00:00 UTC on 20 August to 00:00 UTC on 25 August 2017. Manning roughness coefficients were set to 0.016 for the deep sea, 0.025 for offshore areas, and 0.040 for land . A critical water depth of 0.1 m was adopted to control the wetting and drying processes. Wave effects were not considered because previous studies reported a limited influence of waves on storm-surge inundation in the Pearl River Delta. (Line 127-136 in the revised manuscript)

Table 2. Manning' s n value for numerical model in different areas.

3. The Discussion lacks actionable, policy relevant outputs for local decision makers. While the study effectively characterizes disaster severity and the regional heterogeneity of inundation risk, it remains largely descriptive and does not translate these spatially variable findings into concrete, implementable countermeasures.

Response:

Thank you for your suggestion. The policy relevant implications raised in this comment have been addressed in our response to **Comment 1 of Reviewer 1**. Please see this response for the specific revisions and corresponding details.

4. The manuscript includes comparisons between simulated water levels and observed data, yet it lacks sufficient quantitative evidence for model validation. Statistical error indices need to be supplied to quantitatively demonstrate model performance.

Response:

Thank you for your valuable comment. To provide quantitative evidence for model validation, we have added a systematic comparison between the simulated and observed hourly water levels at four tidal stations. The model performance was quantitatively evaluated using the coefficient of determination (R^2), root mean square error (RMSE), and mean absolute error (MAE). The results show strong agreement between the simulated and observed water levels, with R^2 values ranging from 0.895 to 0.948, RMSE values from 0.164 to 0.310 m, and MAE values from 0.111 to 0.236 m. In addition, we have revised the structure and corresponding subsection titles of the Results section. A new subsection "3.4 Model Validation" has been introduced to integrate the water-level validation with the subsequent comparisons of inundation extent and inundation depth. Details of water-level validation are as follows:

To quantitatively evaluate the performance of the hydrodynamic model in reproducing the temporal evolution of water levels during Typhoon Hato, simulated water levels were compared with hourly observations at four tidal stations (Figure 5). Overall, the simulated and observed water levels showed a strong linear correspondence

across all stations, with coefficients of determination (R^2) ranging from 0.895 to 0.948. The relatively high R^2 values indicate that the model successfully captured the temporal variability of water levels during the event, including the overall rising and falling patterns associated with tidal fluctuations and storm induced water level changes. The magnitude of the errors was generally moderate, with RMSE values ranging from 0.164 to 0.310 m and MAE values ranging from 0.111 to 0.236 m. The best agreement was obtained at Zhuyin, where the model achieved an R^2 of 0.895, an RMSE of 0.164 m, and an MAE of 0.111 m, while Chiwan showed the highest R^2 (0.948) and relatively low errors (RMSE = 0.181 m; MAE = 0.147 m). Sishengwei exhibited the largest deviations, with an RMSE of 0.310 m and an MAE of 0.236 m, suggesting greater uncertainty in reproducing the local water-level response. At Hengqin, the regression slope was slightly greater than unity (1.060), indicating a modest amplification of the simulated water-level variability relative to the observations, whereas the slopes at the other three stations were slightly below unity (0.958–0.964), suggesting a generally consistent but slightly compressed response amplitude. The close correspondence between simulated and observed water levels across the four stations demonstrates that the model reasonably reproduces the hydrodynamic response to Typhoon Hato and provides a reliable basis for subsequent assessment of inundation extent and depth. The model performance was therefore further evaluated by comparing the simulated inundation extent and depth with field observations. (Line 251-267 in the revised manuscript)

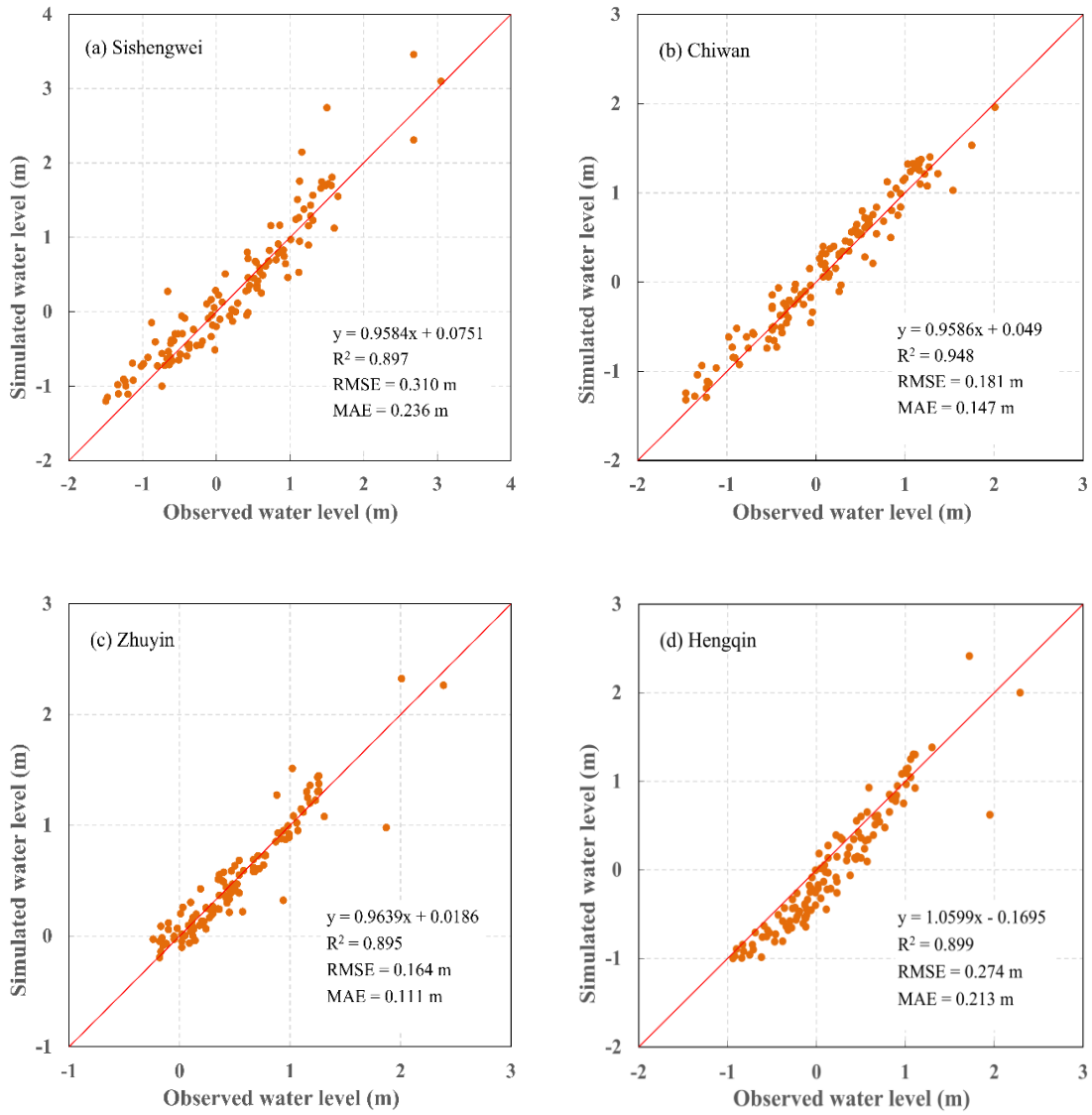


Figure 5. Comparison between the simulated and observed water levels during Typhoon Hato from 0:00 on August 20 to 0:00 on August 25.

With the addition of water level validation, corresponding revisions have been made throughout the manuscript. Details are as follows:

Objectives in Introduce: We have revised "(3) evaluate the capability of a previously developed numerical model to reproduce the distribution of the inundation depth and extent using field-surveying observations" into "(3) evaluate the capability of a previously developed numerical model to reproduce observed water-level dynamics and inundation characteristics, including inundation extent and depth, by integrating tidal-station observations with post-event field surveys." (Line 67-69 in the

revised manuscript)

Numerical simulation: We have revised "In this study, the simulated inundation extents and depths were extracted and compared with post-event field survey observations to evaluate the agreement between numerical simulations and observed flooding characteristics" into "In this study, simulated water levels were compared with hourly observations from four tidal stations, while simulated inundation extents and depths were evaluated against post-event field survey observations to assess the performance of the numerical model." (Line 122-124 in the revised manuscript)

Discussion: We have revised "The favorable consistency between field-surveying and simulated inundation characteristics, in terms of both spatial extent and water depth, indicates that post-event field surveys provide reliable benchmark datasets for numerical model validation" into "The favourable consistency between observed and simulated water levels, as well as field-surveyed and simulated inundation characteristics in terms of spatial extent and water depth, demonstrates the reliability of the numerical model and highlights the value of post-event field surveys as benchmark datasets for numerical model validation." (Line 329-331 in the revised manuscript)

5. Table 6 presents a valuable classification of inundation types for coastal sites. These distinct dike failure and inundation modes receive little substantive discussion. Further interpretation of these categories can strengthen the mechanism analysis of coastal damage.

Response:

Thank you for your valuable comment. We have further expanded the discussion of the inundation and dike failure types presented in Table 6, with emphasis on their distinct damage mechanisms and characteristics. The corresponding interpretation has been added to the Discussion Section in the revised manuscript. Details are as follows:

The different inundation modes summarized in Table 6 further illustrate this mechanism. While overflow was the most widespread mode, several locations

experienced combined overflow and dike breach or piping, indicating that structural failure of coastal defenses could further intensify flood propagation. These combined failure modes were observed in areas with relatively high inundation depths, such as Yantian District (1.2–2.0 m) and Humen Town (1.2–1.4 m), highlighting the importance of dike integrity in shaping local inundation severity. (Line 362-367 in the revised manuscript)

Minor comments:

1. I suggest the authors add the geographic locations of observation sites mentioned in Table 3 onto spatial maps. This improvement can enhance visual readability for readers.

Response:

Thank you for your valuable comment. We have added the geographic locations of observation sites mentioned in Table 3 onto the study area map (Figure 1). The revised figure is as follows:

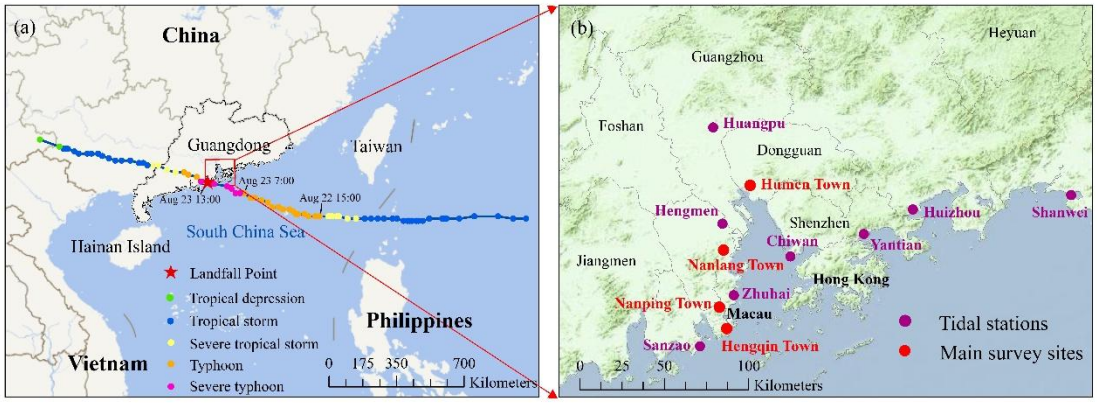


Figure 1. (a)Track and intensity variation of Typhoon Hato. (b) The spatial distribution of tidal stations (purple circles) and main field survey sites (red circles).

2. Line 299: The word “improving” is wrongly split into “im-proving”.

Response:

Thank you for your careful reviewing. We have corrected the spelling error in the manuscript.

3. Inundation depths are reported in centimetres within Table 6 but in metres in the main text, creating potential confusion for readers.

Response:

Thank you for your reminding. We have revised the units of inundation depth in Table 6 from centimetres (cm) to metres (m).

4. The authors have to improve and rewrite the Conclusion Section in a crisp manner.

Response:

Thank you for your suggestion. We have rewritten the Conclusion Section to make it concise and more focused. Details are as follows:

This study investigated the spatial characteristics and damage mechanisms of storm surge inundation induced by Typhoon Hato (2017) in Guangdong Province through the integration of post-event field observations and numerical modelling. The results demonstrate pronounced spatial heterogeneity in inundation severity across the surveyed coastal areas, reflecting the combined effects of coastal hydrodynamic forcing, local topography, estuarine setting, and the capacity of coastal protection systems. The field investigation further identified distinct inundation and dike failure modes, including dike overtopping, breaching, and piping, which contributed to substantial differences in local inundation severity and disaster impacts. Comparison between field observations and numerical simulations showed generally good agreement, supporting the applicability of the hydrodynamic model for reproducing the major inundation characteristics of the Hato event. Overall, the findings highlight that coastal flood impacts are governed not only by hydrodynamic conditions but also by the vulnerability and protection capacity of exposed areas. Integrating post-event field evidence with numerical modelling therefore provides a useful basis for improving the understanding, validation, and assessment of storm surge inundation and coastal disaster risk. (Line 385-395 in the revised manuscript)

Response to Reviewer 2

Reviewer #2:

This paper presents valuable post-event field survey datasets and hydrodynamic model validation for the destructive 2017 Typhoon Hato storm surge flood across the highly-urbanized Pearl River Estuary. Overall, the work is well-structured and delivers meaningful observational evidence, yet several textual inconsistencies, methodological gaps and presentation defects need revision before formal publication.

Response:

We greatly appreciate your kind help in reviewing the manuscript and all constructive comments. We substantially revised the paper based on these comments.

1. Table 1 lists 2024 remote-sensing imagery and national ocean product statistics. Since Typhoon Hato occurred in 2017, explicitly explain how these late-period datasets support the 2017 disaster reconstruction, or remove irrelevant entries if they are not actually used in analysis.

Response:

Thank you for your careful reviewing. We have carefully rechecked the data sources listed in Table 1. The 2024 remote sensing imagery was not used in the analysis and has therefore been removed from Table 1. For the National Ocean Product Statistics, the data year has been corrected from 2024 to 2017, as the 2017 statistics were used to provide the national marine economic context for evaluating the economic impact of Typhoon Hato.

2. In Section 2.3, the reliability classification framework (Table 2) for field-survey evidence lacks quantitative threshold definition. Please add measurable criteria to distinguish “reliable”, “less reliable” and “reference-only” field indicators, rather than purely descriptive qualitative descriptions.

Response:

Thank you for your valuable comment. We agree that the reliability classification of field survey evidence should include measurable criteria rather than relying solely on qualitative descriptions. Accordingly, we have revised Table 2 by retaining the

original three-level reliability framework while introducing quantitative criteria based on the estimated vertical uncertainty of field indicators. Details are as follows:

To quantify the water depth and inundation areas caused by storm surge, the survey of the submerged area generally involves three methods: searching for drifting objects, identifying residual inundation traces, and conducting interviews with local residents. In this study, these complementary methods were jointly used to assess the reliability of the reconstructed storm-surge inundation extent (Table 2). First, inundation edge points were identified based on multiple field indicators, including the accumulation of floating objects, such as dead tree branches transported to the edge of inundated areas, information provided by coastal residents regarding whether inundation occurred, and residual inundation traces on coastal buildings. To reduce subjectivity in the interpretation of these field indicators, their reliability was assessed according to both the estimated vertical uncertainty and the degree of independent corroboration. Evidence with a vertical uncertainty of $\leqslant$0.10 m was classified as reliable when the inundation trace was clearly identifiable and supported by at least two independent indicators or cross-checked by multiple investigators or respondents. Evidence with a vertical uncertainty of >0.10–0.20 m was classified as less reliable, whereas evidence with a vertical uncertainty of >0.20 m or without a reasonably quantifiable uncertainty was classified as reference only. These thresholds were adopted as operational criteria for this study, following established practices for evaluating uncertainty and reliability in post-event high-water-mark surveys (Koenig et al., 2016; Feaster and Koenig, 2017; Dottori et al., 2013). Similar multi-level reliability assessment approaches have been applied in recent post-event tsunami surveys by considering measurement accuracy, cross-checking, and field conditions (Yuhi et al., 2024). After the edge points were determined, their longitude, latitude, and elevation were measured using RTK and other surveying techniques (Fig. 4). Based on the positions of the edge points, plane survey grids were established. Survey grids were densely distributed in coastal areas containing residential areas, schools, ports, and aquaculture facilities, with the distance between adjacent survey points generally less than 300 m. The investigation team

determined inundation depth by measuring residual inundation traces in inundated residential areas and recorded the observations in a storm-surge inundation survey form. Finally, interviews with local residents were conducted to further cross-check and revise the reconstructed inundation extent and depth. (Line 158-180 in the revised manuscript)

Table 2. Determination of the reliability of the storm surge inundation investigation.

Reliability level	Quantitative criteria	Field-evidence criteria
Reliable	Vertical uncertainty ≤ 0.10 m	Clearly identifiable field evidence, supported by at least two independent indicators or cross-checked by multiple investigators/respondents
Less reliable	0.10 m < vertical uncertainty ≤ 0.20 m	Directly observed or reported evidence with limited independent corroboration, incomplete traces, or local ambiguity
Reference only	Vertical uncertainty > 0.20 m, or uncertainty cannot be reasonably determined	Indirect information, personal recollection, or ambiguous traces without sufficient independent corroboration

The references added are as below:

[1] Dottori, F., Di Baldassarre, G., and Todini, E.: Detailed data is welcome, but with a pinch of salt: Accuracy, precision, and uncertainty in flood inundation modeling: OPINION, Water Resour. Res., 49, 6079–6085, https://doi.org/10.1002/wrcr.20406 , 2013.

[2] Feaster, T. D. and Koenig, T. A.: Field manual for identifying and preserving high-water mark data, U.S. Geological Survey Open-File Report 2017-1105, 67 p., https://doi.org/10.3133/ofr20171105, 2017.

[3] Koenig, T. A., Bruce, J. L., O'Connor, J. E., McGee, B. D., Holmes, R. R., Jr., Hollins, R., Forbes, B. T., Kohn, M. S., Schellekens, M. F., Martin, Z. W., and Peppler, M. C.: Identifying and preserving high-water mark data, U.S. Geological Survey Techniques and Methods, book 3, chap. A24, 47 p., https://doi.org/10.3133/tm3A24, 2016.

[4] Yuhi, M., Umeda, S., Arita, M., Ninomiya, J., Gokon, H., Arikawa, T., Baba, T., Imamura, F., Kumagai, K., Kure, S., Miyashita, T., Suppasri, A., Kawai, A., Nobuoka, H., Shibayama, T., Koshimura, S., and Mori, N.: Dataset of Post-Event Survey of the 2024 Noto Peninsula Earthquake Tsunami in Japan, Sci Data, 11, 786, https://doi.org/10.1038/s41597-024-03619-z , 2024.

3. Table 3 provides surge and tide-level records for tidal stations, yet it lacks clear definition of storm-surge variables. Clarify whether the "Surge (cm)" column represents residual storm-surge component or absolute water-level readings, and double-check unit consistency across the whole table.

Response:

Thank you for your suggestion. We have clarified the definition of the "Surge (cm)" variable in Table 3. It represents the **residual storm surge component**. To avoid ambiguity, "Surge (cm)" has been revised to "Storm surge residual (m)" in Table 3, and the caption has been revised to "Maximum storm surge residual and tidal levels at each tidal station during Typhoon Hato on August 23". Furthermore, to ensure consistency in units throughout the manuscript, all water-level measurements in Table 3 have been converted from centimeters (cm) to meters (m). Details are as follows:

Table 5. Maximum storm surge residual and tidal levels at each tidal station during Typhoon Hato on August 23.

Observation station (point)		Maximum storm surge		Maximum tide level		Warning water level (m)
		Time	Storm surge residual (m)	Time	Tidal level (m)	
1	Huizhou	10:00	1.20	10:24	4.45	4.40 (Red)
2	Chiwan	13:00	2.03	12:51	5.59	4.87 (Red)
3	Yantian	10:00	1.29	09:44	4.21	4.12 (Red)
4	Huangpu	16:00	1.94	15:00	2.73	2.61 (Red)
5	Hengmen	14:00	2.15	14:00	2.94	2.36 (Red)
6	Zhuhai	12:00	2.79	12:00	6.14	4.67 (Red)
7	Sanzao	13:00	2.16	13:00	2.48	2.26 (Orange)
8	Shanwei	12:00	1.18	11:49	3.04	2.97 (Yellow)

4. When interpreting simulation-observation mismatches in Discussion section, the authors point out small-scale topography and coastal-structure limitations of regional hydrodynamic models. It is suggested to add one short paragraph discussing which specific local defense facilities (seawalls, groins) most likely cause those spatial deviations.

Response:

Thank you for your suggestion. We have systematically discussed the sources of

simulation-observation mismatches in the Discussion section, and added a separate point regarding local coastal defense facilities as follows:

Third, coastal defense structures may contribute substantially to spatially heterogeneous discrepancies. Seawalls and coastal dikes can restrict, redirect, or confine floodwaters, thereby locally controlling whether water propagates inland or remains within the coastal zone. Consequently, differences between their actual and modelled crest elevations, structural continuity, openings, and conditions may shift the simulated inundation boundary. Groins can likewise alter nearshore flow patterns and water-level distributions, thereby affecting the pathways through which coastal floodwaters reach adjacent shorelines. Because such structures are often much smaller than the spatial resolution of regional hydrodynamic models, their hydraulic effects may not be adequately resolved. (Line 339-345 in the revised manuscript)

5. While the paper reports good overall agreement, Figure 6 shows notable deviations in some areas (e.g., Yantian, Bao'an). The authors attribute these to topographic uncertainties and simplified parameterization (lines 257–263), but this explanation remains qualitative. I recommend a more systematic discussion: could these discrepancies be due to the absence of pluvial or fluvial contributions in the extracted simulation results?

Response:

Thank you for your valuable comment. We have carefully rechecked the simulation results presented in Figure 6. We also clarify that Yantian and Bao'an are not included in the numerical simulation results, therefore, no simulated–observed discrepancy is evaluated for these two areas in Figure 6.

The hydrodynamic modelling framework used in this study is an integrated compound flood model that incorporates coastal flooding, fluvial flooding, and pluvial flooding processes, which has already mentioned in the Numerical simulation Section. Therefore, the discrepancies between simulated and observed inundation characteristics are unlikely to be caused by the absence of fluvial or pluvial contributions in the extracted simulation results.

We acknowledge that the discussion on deviations is insufficient. Therefore, we have revised Lines 257–263 accordingly to provide a more systematic explanation of these discrepancies. Details are as follows:

Such discrepancies may stem from several sources of uncertainty. First, uncertainties in rainfall, river discharge, and boundary conditions can affect the timing and magnitude of pluvial and fluvial flooding. Uncertainties in topographic and bathymetric data may further modify local flow pathways and determine whether low-lying areas are inundated. Second, model parameterization and land-surface representation can introduce additional discrepancies, as simplified hydraulic parameters and incomplete representations of buildings and drainage infrastructure may not fully resolve local flow processes. Third, coastal defense structures may contribute substantially to spatially heterogeneous discrepancies. Seawalls and coastal dikes can restrict, redirect, or confine floodwaters, thereby locally controlling whether water propagates inland or remains within the coastal zone. Consequently, differences between their actual and modelled crest elevations, structural continuity, openings, and conditions may shift the simulated inundation boundary. Groins can likewise alter nearshore flow patterns and water-level distributions, thereby affecting the pathways through which coastal floodwaters reach adjacent shorelines. Because such structures are often much smaller than the spatial resolution of regional hydrodynamic models, their hydraulic effects may not be adequately resolved. Fourth, the wetting–drying threshold can influence the identification of marginally inundated cells, particularly near the simulated flood boundary. Finally, uncertainties in field observations may also contribute to the observed–simulated discrepancies, owing to incomplete spatial coverage and the difficulty of accurately delineating inundation boundaries after floodwaters have receded. (Line 334-348 in the revised manuscript)

6. Grammatical errors and typographical mistakes appear throughout the text. For example, “The simulated and observed inundation extents was presented in Figure 5” contains subject-verb disagreement; Table 4 shows “51,5424.4” with incorrect thousands separators for economic loss values. Please conduct full manuscript

proof-reading and standardize numeric formatting for all tables and main-text figures.

Response:

Thank you for your careful review. We have carefully proofread the entire manuscript and corrected grammatical errors, typographical mistakes, and inconsistencies in numerical formatting. For example, the subject–verb agreement error in the sentence "The simulated and observed inundation extents was presented in Figure 5" has been corrected to "The simulated and observed inundation extents were presented in Figure 5". In addition, the incorrect thousands separator in Table 4 has been corrected, and numerical formats throughout the manuscript, including tables and figures, have been standardized.

7. Several in-text citations miss proper punctuation and formatting. For example, reference citations like "(Yang et al., 2019). These findings demonstrate…" should maintain consistent punctuation style across the whole manuscript; please standardize all in-text citation formatting following NHESS template requirements.

Response:

Thank you for your reminding. We have carefully checked and standardized all in-text citations throughout the manuscript to comply with the NHESS template requirements, ensuring consistent punctuation and citation formatting.

8. The informal phrase "storm water" repeatedly appears in Section 3.1, this should be replaced by the standard term.

Response:

Thank you for your valuable comments. We acknowledge that "storm water" is an informal term and may cause confusion. Therefore, we have revised the relevant sentence to make it more professional and clear. The revised sentence is as follows:

The maximum storm surge occurred 1–2 h after the astronomical high tide of the day. Thus, the peak storm surge was superimposed on the astronomical tide, resulting in a substantial increase in water levels near the Pearl River Estuary and evident

exceedance of the warning water level. (Line 201-203 in the revised manuscript)

9. Some references (e.g., Du et al., 2024a,b) are cited but not clearly distinguished in the text; ensure proper differentiation when citing multiple works from the same author/year.

Response:

Thank you for your valuable comments. We have carefully reviewed all citations of multiple works by the same authors published in the same year and revised them to ensure clear distinction in the text. For instance, the citation to the compound flood modelling framework has been revised from "Du et al. (2024)" to "Du et al. (2024a)" to distinguish it from the related study by Du et al. (2024b) cited elsewhere in the manuscript.

10. Line 185: Table 5 caption refers to "Hato typhoon storm surge" - be consistent with "Typhoon Hato" throughout.

Response:

Thank you for your suggestion. We have revised the caption of Table 5 from “Hato typhoon storm surge” to “Typhoon Hato” to ensure consistent terminology throughout the manuscript.