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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.

**Referee #1**

The paper presents an interesting and potentially publishable piece of research that would be of interest to both the wider academic research community as well as stakeholder in the construction industry. However, I recommend a minor revision in terms of contents and editing.

1. Research framework: The main shortcoming is a lack of clear research framework that should contain a clearly set main research goal and objectives, research methodology and research hypothesis.

- We are grateful for this insightful suggestion. Our general approach and workflow regarding estimating non-exceedance probability of extreme surges using tidal gauge data. These can be seen below.

The objective of this study is to estimate the probability of the risk, in years, of typhoon-induced high water levels in Busan. To that end, it adapts Lopeman et al.'s (2015) CSPS, which provides statistical analysis of extreme values in long time-series of natural phenomena. As such, CSPS can provide useful guidance to those tasked with preparing for natural disasters on the Korean Peninsula, and perhaps especially on its southern coast. The findings from this research are therefore expected provide a viable method of predicting economic losses associated with typhoons, and corresponding models for managing emergency situations arising from natural disasters, that can be used by South Korea's government agencies, insurance companies, and construction industry. And, although this study focuses on a specific city-region, its proposed probabilistic methodologies should be applicable to other coastal regions in South Korea and around the world.

To explore the non-exceedance probability of storm surges, this study utilised tidal-gauge data from the city of Busan, collected when Typhoon Maemi struck it in 2003. As shown in Figure 4, we proceeded according to several steps. First, the observed tidal-gauge data was utilized to calculate the predicted water level through harmonic analysis, and then, the storm surge height, which is difference between observed and predicted water height. Second, threshold and clustering techniques were applied to select data meaningful to the non-exceedance probabilities of extreme storm surges. Third, the extreme values were separated into cold-season and warm-season categories, to boost the reliability of our probability-distribution model. Fourth, the maximum likelihood method was used to estimate non-exceedance probability. And fifth, various probability models were built, and the one that best fit the empirical data identified.

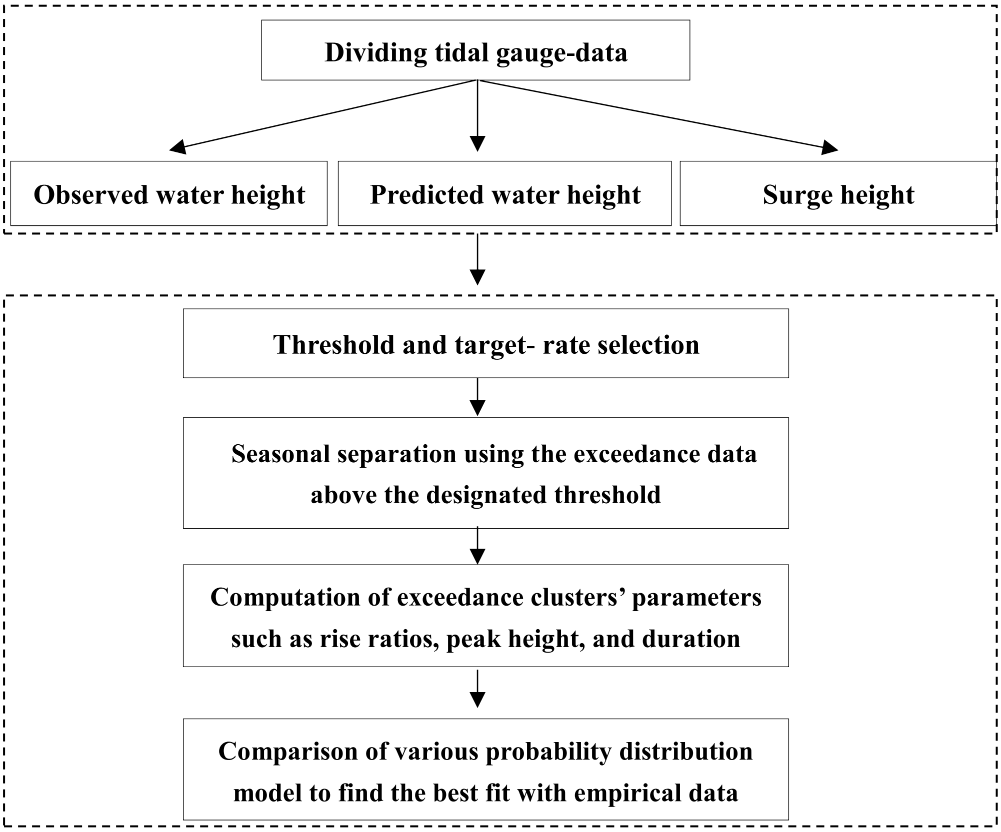


Figure 4. General approach and workflow

2. Conclusions should be more clearly explained with additional discussion and the value of findings/analysis.

- We thank you for this comment. We are grateful to the reviewer for this helpful suggestion. The following passage has accordingly been added

Typhoons cause numerous fatalities and immense property damage, and their frequency has recently been increasing. Nevertheless, typhoon risk assessments are not yet sufficiently comprehensive to estimate either the damage levels from such events, or the probability of their occurrence. If they are to effectively plan for typhoons, governments and the insurance industry will need accurate estimates of both. Prompted by the high levels of damage inflicted by the high surge during South Korea's most severe typhoon, Maemi, this research has estimated the risk of storm surges through non-exceedance probability using MLE. Specifically, we estimated extreme storm surges' non-exceedance probability in accordance with their water levels, with such levels serving as references for non-exceedance probability above a certain threshold. We applied various methodologies to obtain more reliable thresholds, and a threshold-selection algorithm that utilised target rate and number of clusters to more accurately predict the height threshold. Additionally, we separated storm surges into cold-season and warm-season ones, as this allowed more reliable estimations, given their different frequencies in these seasons. Three parameters – exceedance, rise ratio, and duration – were separated from the storm surges and compared to ascertain their relationship. This established that exceedance and duration have a quite strong linear relationship. In previous research, total water level was utilised to estimate the possibility of future occurrences, but such an approach could lead to inaccurate results, for the reasons mentioned in the Literature Review section, above. Accordingly, in this study, we subcategorised total water levels into predicted, observed, and surge levels. Once that had been done, surge level was found to be the main factor influencing damage to coastal infrastructure, and thus, only it was applied to our estimates of non-exceedance probability.

Based on a quantitative risk assessment for extreme storm surges in a city on the Korean Peninsula that was severely damaged by Typhoon Maemi due to its geographical characteristics, this study has proposed a risk-management approach to such natural hazards based on the non-exceedance probabilities of extreme storm surges. Various probability-distribution models were tested within this framework to explore clustering and threshold-selection methods, and Weibull distribution was found to have the best fit to our empirical data. Our results suggest that the use of various probability models, clustering, and separation of tidal-gauge data as described above could all benefit the accuracy of natural-hazard return prediction. The present study's findings also confirm non-exceedance probability as a useful, geographically sensitive tool for government agencies, insurance companies, and construction companies conducting risk assessments, setting insurance prices, preparing safety guidelines, and setting policies aimed at reducing typhoon-related damage and financial losses.

Although the present research investigated various non-exceedance probability distributions of typhoon-driven storm surges, it only used a single extreme event in a specified region. As such, its findings may not be applicable to other regions, each of which has its own unique weather conditions, geographic features, and tidal characteristics. Future research should therefore include tidal and environmental data from a range of different regions and various extreme events to test the present study's findings. Also, various natural-hazards indicators and environmental factors such as wind speed, pressure, rainfall, landslides, distance to waterways, and so forth may be useful variables in estimating the exceedance probabilities of typhoons and other natural hazards, and thus be beneficial to risk assessment and mitigation. Also, it should be borne in mind that much of the tidal-gauge data that this study utilised was from the fairly distant past. Thus, in similar future studies, efforts should be made to ensure that such data are reliable, especially in light of climate-change-driven patterns in sea-level behaviour.

Return periods based on various non-exceedance probability models should also be considered in future research, insofar as elaborated return-period estimation can be utilised to improve disaster-relief and emergency-planning efforts. Our comparison of various probability models to find the best fitting distribution models could be adapted to the simulation of time series of the past typhoons, and the collected simulated storm-surge time series then used to estimate typhoons' return periods using bootstrapping of the exceedance data. Potentially, this would provide more exact return periods with confidence intervals. Lastly, future work on return periods should take account of trends in sea-level change, driven by climate change, which already pose a non-negligible risk to coastal buildings and other infrastructure. Advanced statistical methods such as Monte Carlo simulation, as well as deep-learning techniques, could be applied to make typhoon return-period estimates even more accurate.