Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-425-AC1, 2020

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Simulation of storm surge inundation under different typhoon intensity scenarios: Case study of Pingyang County, China" *by* Xianwu Shi et al.

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Received and published: 14 February 2020

This study proposed a deterministic method for storm surge inundation simulation under different typhoon intensity scenarios using a numerical model. Several key parameters of typhoon activities (e.g., typhoon track, radius of maximum wind speed) as well as astronomical tide and upstream flood runoff were considered to represent the compound effect of different processes during typhoon-induced storm surge. The proposed method could provide reference for the establishment of a technical system for the assessment and zonation of storm surge risk in the coastal counties of China. Following are some suggestions for the authors which might be helpful to improve the

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study: Response: Thanks for your comments. We really greatly appreciate your kind help in the reviewing the manuscript. A detailed point-by-point response was presented as below according to your comments. 1. What kind of data were used in this study? and the data source? Response: Thanks for your question. Multisource data (Table 1) were collected to perform a storm surge numerical modelling in Pingyang county. The numerical model was used to simulate the storm surge inundated range and water depth. The digital elevation map (DEM) of Pingyang county and nearshore submarine topography data were collected to construct the numerical model, and tidal observational data were used to validate the model. Historical typhoon records, including time, location, and intensity, were collected to set the typhoon parameters driving the storm surge numerical model. A field survey was carried out by Zhejiang Institute of Hydraulics and Estuary to investigate the inundation situation along the Aojiang river in Pingyang County. Researchers equipped with GPS-RTK (Global Positioning Systems, Real-Time Kinematic, which supports cm-accuracy three-dimensional positioning) and rangefinders worked in two groups to make measurements from Oct.2nd to Oct.7th in 2013. The extent of the inundation was estimated based on flooding marks, such as the accumulation of trash, signs of mud, and withered plants. In addition, the range of inundation was established through interviews with local residents. 2. It would be better for the understanding the methodology if a technique flow chart could be provided. Response: Thanks for your suggestion. This study proposed a framework for simulation of storm surge inundation under different typhoon intensity scenarios as shown in Fig 1.

3. It would be better if river networks and DEM could be added in the map of study area. Response: Thanks for your suggestion. The river networks and DEM has been added in the map of the study area as show in Fig 2. 4. This study validated the numerical model in terms of the high tide level and the maximum storm surge at six tidal stations. However, a validation for the inundation simulation is absent, is it possible using historical flood records and marks? Response: Thanks for your suggestion. A validation for the inundation simulation was performed based on the inundation ranges through

field surveying. The model described in section 3 of the manuscript was used to perform a simulation of the area (see Fig 3a) along the Aojiang river (Pingyang County) inundated by Typhoon Fitow. A field survey was undertaken by the Zhejiang Institute of Hydraulics and Estuary to investigate the inundation situation in Pingyang County during the storm surge disaster period caused by Fitow(see Fig 3b). The simulated and investigated inundation areas were compared (Fig. 3). It can be seen that the surveyed and simulated inundated areas are similar. The extent of the surveyed inundated area was slightly larger than that simulated because typhoon precipitation during the period of influence of Fitow caused urban waterlogging in parts of Pingyang County. 5. The advantage of the proposed method should be further discussed. Response: Thanks for your suggestion. This study presents a framework of calculation of inundated areas under different typhoon intensity scenarios. The proposed framework was composed by four parts: model configuration, model validation, parameters setting and inundation simulation. Based on the historical observational data, the key parameters (e.g., typhoon track, radius of maximum wind speed, astronomical tide, and upstream flood runoff) could be set to drive the storm surge numerical model. The obtained results could serve as a basis for developing a methodology aimed at storm surge disaster risk assessment in coastal areas. The proposed method could be easily adopted in various coastal areas and serves as an effective tool for the decision making in storm surge disaster risk reduction practices.

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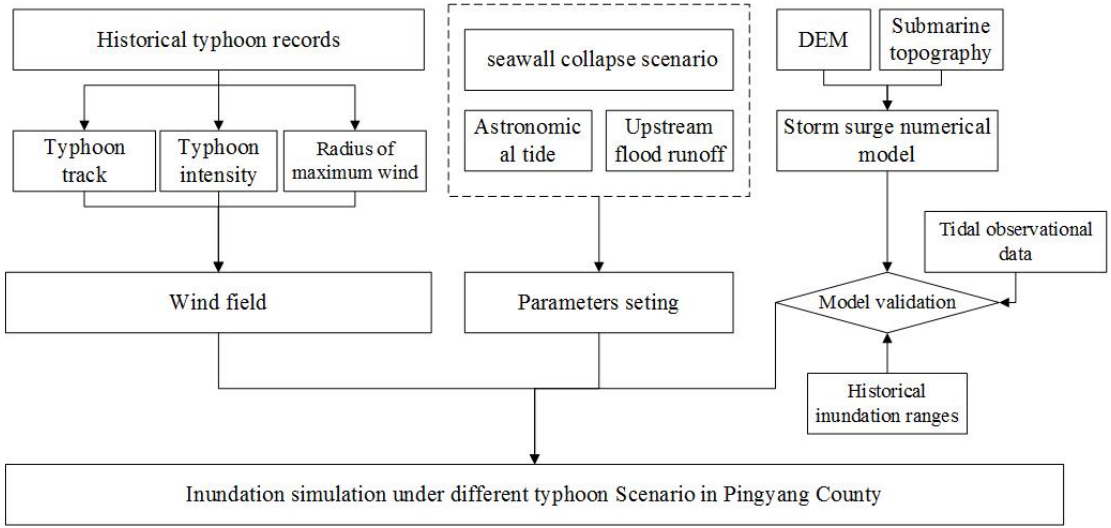

Fig. 1. Framework of inundation simulation under different typhoon scenario in Pingyang County

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Fig. 2. Case study area

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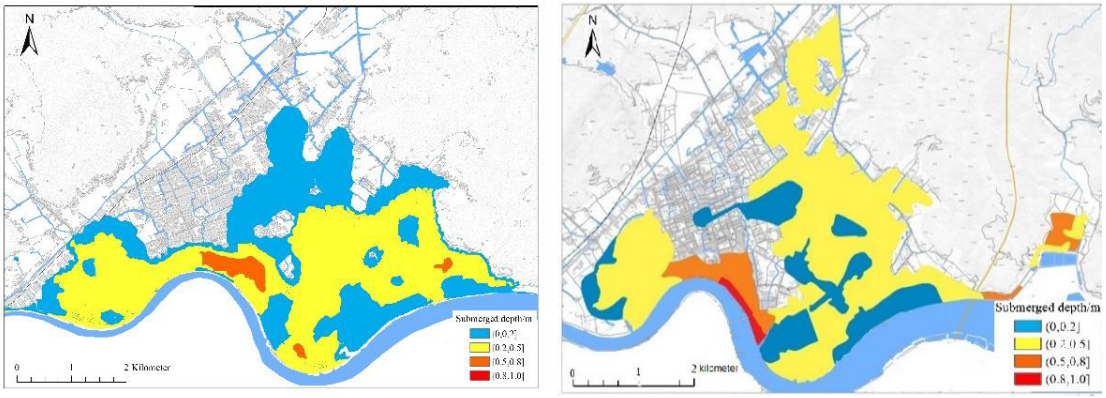

Fig. 3. (a) Simulated inundated area and (b) surveyed inundated area

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Table 1 Multisource data used to perform storm surge numerical modelling in Pingyang County

Data type	Time series	Description	Source
Historical typhoon records	1949–2018	Time, location, and intensity of each typhoon track point	Shanghai Typhoon Institute, China Meteorological Administration
Digital elevation map and submarine topography	2015	Digital elevation map of Pingyang County and shore and offshore submarine topography	Surveying and Mapping Bureau of Zhejiang Province
Tidal observational data	1990–2015	Hourly observational data of surge and water level for tidal station during typhoon periods	East China Sea Marine Forecasting Center, Oceanic Administration of China
Historical inundation ranges	2013	Inundation ranges caused by Fitow along the Aojiang river in Pingyang County	Field surveying by Zhejiang Institute of Hydraulics and Estuary

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