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Natural Hazards and Earth System Sciences
Discussions

# *Interactive comment on* "Meso-scale Simulation of Typhoon Generated Storm Surge: Methodology and Shanghai Case Study" *by* Shuyun Dong et al.

**Shuyun Dong et al.**

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Anonymous Referee #2 It consisted only of a time series comparison at two tide gauges (remarkably in agreement with the observed sea levels during each event) and a single inundation map of maximum inundation area and water depth. How much of the total water level was storm surge and how much was tides in each event?What about validation of the typhoon winds that the authors note is key to accurately simulate the storm surges?

It is not possible to tell when exactly the typhoon occurred from the water level time series. A map of the cyclone tracks and the tide-only contribution and the residual difference would be useful.



RESPONSE: Figure 2 has been changed to include typhoon tracks. As we have added 4 new figures to provide additional modelling details (and this is a method focused paper) we feel more figure is unnecessary. The text (page 13) already contains details of the timing and extent of both typhoon.

The authors claim that other studies have failed to pay enough attention to the river basins whereas they claim the resolution of the model in the present study fills this gap.

RESPONSE: Here we are commenting of the absence of considering storm surge flooding into the river mouths, rather than the discharge of water from river basins. Our modelling showed this is important in the case of Shanghai and had not previously been recognized.

However, the authors do not detail how they have modelled the rivers. How is the input from the rivers incorporated into their model grid?

RESPONSE: Model grid is only designed for the coastal area, rivers are not modelled in this study, freshwater discharged is considered and setup in the model (refer to Table 1)

There is no mention of including flow hydrographs as boundary conditions for the terrestrial input. Is rainfall flooding a contributing factor in addition to the storm surge from the sea? What about other factors that contribute to total water levels such as from wind waves (setup and runup)?

RESPONSE: Our modelling doesn't include these variables in order to operate at the scale we are focused on.

2.1 Title Changed 'typhoon generated' to 'typhoon-generated'. 2.2 Abstract, Page 1, line 11 Changed 'sustainable urban plan relies on well preparedness' to 'sustainable urban plan relies on sound preparedness'. 2.3 Page 2, line 15 Changed to '. . .the three types based on the scale of modelling. . .'. 2.4 In the first paragraph of section 2,

many references are quite old now. Corrected and updated the reference used here. 2.5 Page 3, line 17 Changed to '...pressure fields were calculated...'. 2.6 Page 3, line 18 Changed to '...collected to validate the hydrodynamic models...'. 2.7 Page 3, line 22 Changed to 'wind-generated surges'. 2.8 Page 4, line 7 Changed to 'tide constituents are prepared'. 2.9 Page 4, line 12 Changed to '... to provide accurate wind and pressure...'. 2.10 Page 5, line 13 Changed to 'hydrodynamic model'. 2.11 Page 5, line 14 Changed to 'typhoon-induced'. 2.12 Page 6, line 28 Changed '... regarded as real...' to 'regarded as providing a close approximation of the state of the atmosphere'. 2.13 Page 6, line 28 If the ECMWF data is such a good approximation, then why not dispense with the Holland vortex model all together?

ECMWF reanalysis dataset has a good spatial resolution of 0.25 °. On the one hand, the quality of ECMWF is not as good as simulated results from the local typhoon best track data. On the other hand, the simulation results from the Holland model have shown that the wind speed after the typhoon makes landfall was much lower than the measured data. To improve the quality of typhoon simulated results, these two data have been blended.

2.14 Page 7, line 14 Changed to 'Shanghai lies at the half way point...'. 2.15 Page 9, line 14 'Simulated results have been passed to the storm surge model to generate wind-induced waves'?? Normally a storm surge model is a hydrodynamic model, incapable of simulating wind-waves. Can you clarify what is meant here? Changed this sentence to 'Computed results from the typhoon model have been passed to the storm surge model to simulate typhoon-generated storm surge.'. 2.16 Page 9, Line 19 Changed 'importance' to 'important'. 2.17 Page 11, line 9 Changed 'Mode' to 'model'.

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