

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

**Anonymous Referee #2**

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This paper details a hydrodynamic modelling study of the storm surge inundation produced by two historical typhoons (Winnie in 1997 and Wipha in 2007) in Shanghai. A hydrodynamic model was set up using an unstructured grid mesh varying from 100 km offshore to 100 m near to the shore then a high resolution coastal model based on MIKE 21 was used to simulate the overland flooding. The authors claim that the novelty in their modelling approach is the use of the two models to ensure maximum resolution of results at the coast without exceptionally high computer overheads. The results consist of time series validation at two tide gauges and an inundation map for Shanghai for each event, which is claimed to align well with observed inundation. The authors go on to conclude that their model results based on MIKE (a commercial software product) show that the MIKE software is competitive with other open-sourced codes such as

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ADCIRC and FVCOM. In general, I was not convinced by the arguments put forward by the authors. Nested modelling strategies to maximise coastal details while employing larger regional scale models to provide the boundary conditions have been around for decades. I found this paper to provide little new insight into the modelling of storm surge inundation. The structure of the paper was confusing. The details of the models are discussed throughout the paper making it difficult for the reader to seek the details of the model setup from what was reviews of other studies. For example, there is some description of the modelling approach in section 3.2 and also in 4.3, which should be the results section. The results section was disappointingly slim. 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. 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. However, the authors do not detail how they have modelled the rivers. How is the input from the rivers incorporated into their model grid? 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 runoff)? My conclusion is that this paper requires considerable work to make it acceptable for publication. If its purpose, as the authors claim, is to provide a new modelling strategy that addresses a resolution gap not addressed by previous studies, then they need to more carefully document what other studies have done and show how their study addresses this gap. They also need to provide more details of their model setup and the processes that they have accounted for and those they have neglected and discuss the significance of

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these. Finally the organisation of the paper needs to be clearer. I therefore recommend rejection of this paper in its current form.

I offer some more specific comments below title There should be a hyphen between 'typhoon' and 'generated' Abstract A sustainable urban plan relies on sound preparedness. . . (i.e replace 'well' with 'sound') Page 2, line 15 Insert 'the' in '...three types based on the scale of modelling. . .' In the first paragraph of section 2, the authors discuss large, meso and small scale studies. Many references are quite old now. There have been many more studies undertaken post-2012. Also the way in which some of these studies is described is not strictly correct. E.g. the authors describe McInnes et al as being a large-scale study. It focused on a small regional town in Australia, although it did use a nested approach to achieve a similar goal to the study presented here. More recent studies in Australia include for example those of Haigh et al 2014 a, b or McInnes et al, 2013.

references: Haigh I, Wijeratne EMS, MacPherson L, Pattiaratchi C, Mason M, Crompton R, George S (2014a) Estimating present day extreme water level exceedance probabilities around the coastline of Australia: tides, extratropical storm surges and mean sea level. *Clim Dyn* 42:121–138. doi:10.1007/s00382-012-1652-1 Haigh I, MacPherson L, Mason M, Wijeratne EMS, Pattiaratchi C, Crompton R, George S (2014b) Estimating present day extreme water level exceedance probabilities around the coastline of Australia: tropical cyclone induced storm surges. *Clim Dyn* 42:139–147. doi:10.1007/s00382-012-1653-0 McInnes KL, Macadam I, Hubbert G, O'Grady J (2013) An assessment of current and future vulnerability to coastal inundation due to sea-level extremes in Victoria, southeast Australia. *Int J Climatol* 33:33–47. doi:10.1002/joc.3405

Page 3 line 17 Change to '...pressure fields were calculated. . .' Page 3 line 18 Change to '...collected to validate the hydrodynamic models.' Page 3 line 22 Suggest to use the word surge not wave here so as not to confuse with wind-generated waves Page 4 line 7 Change to 'tide constituents are prepared' Page 4 line 12 Change to '... to provide

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accurate wind and pressure..' Page 5 line 13 Insert 'model' after 'hydrodynamic' Page 5 line 14 Change to 'typhoon-induced' Page 6 line 28 '... regarded as real...' . I suggest changing this to 'regarded as providing a close approximation of the state of the atmosphere'. Page 6 line 28 If the ECMWF data is such a good approximation, then why not dispense with the Holland vortex model all together? Page 7 line 14 Change to 'Shanghai lies at the half way point..' 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? Page 9 Line 19 importance -> important Page 11 line 9 Mode -> model

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