

Tide-Surge Interaction near Singapore and Malaysia using a Semi-empirical Model

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The authors investigate the tide-surge interaction near Singapore and Malaysia based on observation data and with a semi-empirical model.

They found tide-surge interaction at all studied locations based on observations. They conclude that the tidal phase could change but with minimum impact on high water. Their semi-empirical model could not simulate the tide-surge interaction.

The paper is well written but there are a lot of unclear points for me.

For whom, do they have written this paper?

Why are the tide-surge interactions so important for this region if there is only a minimum change in water level. What does it mean e.g. for coastal protection or warning systems?

There is no time-series of water level including the diurnal semi-diurnal tides from the different locations, e.g. for one or two weeks. The locations are so different in their water levels.

How good are the observation data? Is there a trend in the observation data? Are there changes in tidal range at the locations over the investigated period?

Are there changes at the gauges, e.g. land subsidence, sea-level rise?

I'm wondering that data from a global database is used and no local data directly from the gauges (authorities) with e.g. 15-20 min resolution. Hourly observations could miss the low and high peaks.

Do the authors test another tide model? How good is the tide model compared to the observation during calm wind situations? How do the authors avoid making mistakes in the phase shift of the tides?

All results of the semi-empirical model are in the supplements. Why?

In general text and figures could be put more into context.

How high are the observed extreme water levels? And are they dangerous for the region?

Would you mind putting the bathymetry around the locations in table 1 or a higher resolution at the coast in figure 1. Is it steep or flat at the coastal locations?

The influence of the bathymetry on surges is a little bit too short in the text.

More specific questions and comments:

Are there regional hydrodynamic models available for this region to simulate surges and tide-surge interaction, too? In line 72 to 79, you mentioned already some paper.

Line 82: What kind of wave?

At the end of the Introduction a roadmap of the paper would be nice.

Line 131 to 135: Did you test other tide models?

Line 157- 162: How long is a storm in this region? Can two extreme storms occur within seven days?

Line 193 what are the differences between the specific locations? Unfortunately, I am not familiar with this region.

Line 201 -214 ???

Line 233-234 also for extreme water level? Is the wind direction always the same?

Line 237, what does it mean masking out the land? Are the locations now at different regions?

Line 243: How do you estimate the influence of bottom friction on the wind surge process with a depth of 58 m?

Line 262: The mean of wind speed over a large area of 759km x 833 km is probably different to wind speed with a spatial resolution of ~31km of ERA5. Please comment!

Why do the authors not use for every location their own wind speed and -direction in their semi-empirical model? ERA5 has a resolution of ~31km. I'm wondering that there is no hint about wind direction.

A storm tide is the sum of tides, wind surge, external surge, the inverse barometer effect, and non-linear tide–surge interactions. I miss the inverse barometer effect in your paper. (Please revise your definition in line 33-34).

Results and Discussion

I am wondering that I have not seen any box plot of the water level and the residuals for every location.

How big is the difference in water level between 99th and 95th (or 90th) percentile. Is the 95th percentile closer to the high-water events than the 99th percentile or is it the same. Are 90th percentile events more dangerous because, they can occur during high tide.

For Figure S2, I would prefer the same axis length and it should in the main part.

S2 to S19 are in the supplements.

Conclusions

The authors provide a lot of statistics, but what do the results mean for decision-makers.

In summary, the paper needs some more investigations and clearer physical explanations.