

## ***Interactive comment on* “Effect of winds and waves on salt intrusion in the Pearl River Estuary” by Wenping Gong et al.**

**Wenping Gong et al.**

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Comment (1) from referee #2 This is a very interesting and well written paper that examines the response of the Pearl River Estuary (velocity, salinity and salt intrusion) to freshwater inputs, winds and waves. The figures are of a high quality and the tables helpful to the overall study. The approach used was to apply well established models with actual environmental forcing variables to ‘with-and-without’ simulations. The COAWST system of models was used. The results demonstrate some very interesting (if sometimes intuitively obvious) phenomena that are worthy of publication. However, it is very difficult to quantitatively review an article of this nature, which is so far from ‘first principles’ and which relies so heavily on the interpretation of model results. The paper is also complicated in that numerous scenarios are explored and quite a lot is

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expected of the reader. A further complication is that actual environmental conditions are used. It is not easy to compare e.g. the tidally-induced effects of neap and spring tides when runoff, wind and wave conditions are different for the chosen tides.

Response:

We very appreciate the reviewer's efforts for providing us valuable comments.

Comment (2) from referee #2

I have two important 'issues': First, the authors refer to the 'skill' of the model (from Eq. 3 on p. 6) as being good or excellent - whereas a simple visual appraisal of Fig. 2 shows that the description (except for Fig. 2 (s,t,u)) should be 'satisfactory for the present exploratory purposes'

Response:

We modify this part of the text, not to exaggerate the model's performance. As also raised by the first reviewer, the worse model performance occurs in the dataset of Dec.9 to 26, 2009, which was conducted in the Modaomen Estuary. This estuary is narrower, and features complicated geometry and bathymetry. The model's resolution is not high enough to resolve all the small scale variations, resulting in a poor performance.

Comment (3) from referee #2

Second, I am surprised that a major conclusion of the paper for the spring-neap behavior is apparently based on an error (p. 13, 35-40) – neap tides (days 40-42) are plotted to have much smaller freshwater runoff than spring tides (days 47-49) unless the plot (Fig. 3) is wrong or the intrusion depends only on the East River inflow.

Response: This is a confusion caused by our insufficient explanation. The river discharge data shown in Fig. 3b are those from the upstream of the West, North and East Rivers. The freshwater takes approximately 3-5 days to reach the head of the PRE. Thus the river inflow into the PRE lags the variations of upstream river discharge.

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Therefore, the neap tide coincides to a higher inflow, while the spring tide to a lower inflow. Another fact is that under the similar river discharge, more freshwater is detained in the Pearl River Network during the spring tide by strengthened bottom friction, thereby smaller amount of river inflow into the estuary is expected, and vice versa. Above explanation are added into the revised manuscript in the end of the third paragraph of section 5.1. To further confirm our statement, we select the cross-section at the HumenOutlet, and calculate the freshwater flux during our study period. More information can be seen in the supplement pdf file.

Comment (4) from referee #2

I have four small issues 1. Eq. 1 and 2, p. 5 - the paper by Lerczak et al. (2006) does not use this decomposition as I recall – either use the correct citation or give more details of the derivation please.

Response: Our derivation should be right. Lerczak et al. (2006)'s equation:  $F_s = \langle \int_{A_s} \bar{u} \, dA \rangle$ , the equation has only one argument, but has two integral symbols. This should be not right. We only correct this. as for the equation 2, we are similar to that used by Chen and Sanford (2009): Axial Wind Effects on Stratification and Longitudinal Salt Transport in an Idealized, Partially Mixed Estuary. Journal of Physical Oceanography 39 (8) :1905-1920.

Comment (5) from referee #2

2. Eq. 3 on p. 6 uses an over-bar to denote e.g. an ensemble average, whereas the over-bar on velocity,  $U$ , on Line 8, refers to a depth-averaged quantity (also Lines 9 etc.) – please be consistent

Response: We use  $\bar{u}$  for the timely mean, and the overbar for the depth-averaged. We revise the text correspondingly.

Comment (6) from referee #2

3. Line 35 on p. 9 has 'T3' whereas the Fig. 10 caption has 'T4' (and is wrong)

Response: We correct this error in the caption of Fig. 10.

Comment (7) from referee #2

4. Line 40 on p. 12 should have 'continuous increases'

Response: We correct this error in the revised manuscript.

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2017-73/os-2017-73-AC2-supplement.pdf>

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2017-73>, 2017.

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