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Comment on hess-2021-75

Xiao Hua Wang (Referee)

Referee comment on "River-enhanced non-linear overtide variations in long estuaries" by Leicheng Guo et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-75-RC1, 2021

Review of 'River-enhanced non-linear overtide variations in river estuaries' by Guo et al (hess-2021-75)

This paper uses a 1D estuary model to explore the variability of overtide under varying river discharge. Model results show that significant M4 overtide is generated inside the estuary. Its amplitude decreases and increases in the upper and lower parts of the estuary, respectively, with increasing river discharge. More importantly, the paper shows that the total energy of the M4 tide integrated throughout the estuary reaches maximum when the river discharge to tidal mean discharge (R2T) ratio is close to unity. The paper is a good contribution to improve the understanding of non-linear overtides behaviors in river estuaries. A key result of this work is the two folds role of river discharge on tides. It appears that the paper does have something new to add to existing and recent literature of the topic (see below), namely, the authors have conducted analytical analysis of three non-linear terms and their relative contributions to the M4 generation. Further they have found spatial variability of maximum M4 along the river under various river discharges. Based on these two, I consider the paper to be published subject to major revision.

Major comments

However, they have missed one of key references below that let to an incomplete literature review in Introduction and incorrect discussion from line 493-503.

According to this paper, it seems to argue that it is the first time that this two-folds role is shown in literature. However, I would like to point out that we have recently demonstrated this phenomenon in our study on tidal propagation in the Ganges-Brahmaputra-Meghna river system, published in Journal of Geophysical Research Oceans

last year (Elahi et al., 2020). As in the present study, a threshold river discharge dictates the generation and dissipation of overtides beyond the middle of the GBMR estuary.

We also investigated the non-linear terms related to bottom friction by applying a numerical model setup (Delft3d) and following the methods of Goddin (1999) and Buschman et al. (2009). Our results show that the threshold river discharge produces maximum amplitude of frictional coefficient in the non-linear term development, resulting in the maximum generation of overtides. The spatial variations of overtides with river discharge are also apparent in the short length of estuary in the Ganges-Brahmaputra-Meghna delta (< 300 km).

For this reason, I believe that it would be pertinent for the authors to cite our work (Elahi et al., 2020) in both the introduction and discussion of the present study, particularly in line between 493-503. That will enrich the discussion of results and increase the applicability of the study findings around the globe.

Other comments

Line 178: Not true. Although conventional harmonic analysis may not accurately resolve tidal constituents, a non-stationary harmonic analysis based on the Complex Demodulation method (Bloomfield, 2004) can be applied here to water level time series.

Line 458-459: Can you use your model results to explain why R2T ratio close to unity (not other values), benefits maximal M4 overtide generation?

Line 493-504: This is not correct. See the above major comments.

Line 538: maybe -> may be

Line 556: SI?

Xiao Hua Wang

SARCCM, UNSW

Reference:

Elahi, M.W.E., Jalón-Rojas, I., Wang, X.H., Ritchie, E.A., 2020. Influence of Seasonal River Discharge on Tidal Propagation in the Ganges-Brahmaputra-Meghna Delta, Bangladesh. J. Geophys. Res. Ocean. 125, 1–19. https://doi.org/10.1029/2020JC016417