

**Review of manuscript:** “Flooding in the Mekong Delta: Impact of dyke systems on downstream hydrodynamics”.

## Overview

The paper describes the effects of the high dykes structures on the complex interaction of the high flows and tides in Mekong Delta. The authors use 1D-2D model Delft3d Flexible Mesh model on unstructured grid to simulate the hydrodynamics at the river branches, canals and the adjacent ocean shelf with certain improvements compared to the previous studies done on Mekong Delta.

No major concerns about the language use, however the manuscript would benefit from the proofread by a native speaker. The research question is clearly stated and addressed in the Discussion section.

## The main concerns

The overall structure of the manuscript is sufficient, however the abundance of details (some of those are unnecessary in my opinion) makes it difficult to read. The modelling part of the study needs major revisions (see comments below). Moreover, the figures should be revised. Therefore, I suggest major revisions of content further on.

## General comments

Introduction. This section is somewhat well-structured and clear, however some information which is repetitive or not directly related to the study objective should be removed. For instance, speaking of the soil quality or challenges in agriculture may confuse the reader in the beginning. One sentence should be enough for it.

Methods. The following aspects need to be addressed:

- Input data. The authors use SRTM data to run the 2D part of the model. SRTM is known to have rather large vertical and horizontal errors, however, there is no overview related to the data pre-processing, resolution used and possible errors coming from the input data accuracy. Some of the simulated water level changes are far smaller than the vertical accuracies of the terrain and bathymetry data. This aspect should be deliberately described in the Methods and Discussion section. The following paper might be useful: Hawker, L. P., Rougier, J., Neal, J. C., Bates, P. D., Archer, L., & Yamazaki, D. (2018). Implications of simulating global digital elevation models for flood inundation studies. *Water Resources Research*, 54. <https://doi.org/10.1029/2018WR023279>.
- High dyke geometry should be described (design return period, crest elevation. precise location etc.) and how they were incorporated into the computational mesh.
- Simulation time, if possible, should be increased to more years. One year is not sufficient enough to track the system behaviour in given setting and may cause biases.
- The authors mention and illustrate throughout the manuscript high dyke as both, a flood protection measure and a dyke protected floodplain at the same time. This causes ambiguity and should be further specified/changed.
- More details about the developed scenarios need to be added (see the dyke geometry).

Results. The calibration/validation outcomes description should be substantially reduced, as it overloads the section. Computational time should be mentioned.

Discussion. I would recommend restructuring the discussion by answering the research questions in the same order as outlined in the Introduction section. It should be pointed out how the study benefited

from using 2D code compared to 1D (MIKE11 or ISIS). The limitations related to data and methods used have to be put in a separate sub-section.

Conclusion. Implications and future work should be added.

Figures. Geographical names and symbols should be consistent throughout the manuscript.

### **Specific remarks**

P.2 line 17 – the sea level rise and land subsidence is an important point in the study area, the data about the future projections can be mentioned. However, it is important to point out why they are not considered in the paper (complexity, uncertainty, etc.).

P.3 line 4 – sentence “These outcomes... “ belongs to Conclusion

P.3 line 15- Figure 4 comes right after Figure 1

P.4 line 3 – the reference seems to be outdated

P.4 line 12 – return period of the event should be specified

P.4 line 14 – sentence “The water...” is ambiguous

P.4 line 31 – units should be specified

P.7 line 21 - the grid density is mentioned to be sufficient, however the grid cell sizes seem to be quite large in fact. It would be useful to have some more explanation for the readers who are not familiar with Delft3DFM model

P.7 line 32 – floodplain ~~bathymetry~~ topography

Table 1 can be removed

Figure 1. The map is hard to read. I would recommend changing the following: reduce thickness of canal network, make the flood zones boundaries and fill more pronounced. The outline of municipalities (the faded orange line) should be removed. It is better to avoid overlap of green and red colours if possible

Figure 2 and 3. What is meant here by high dykes? Dyke protected floodplains or flood defence? Should be clearly stated. Is there a way to combine two figures in one or incorporate in the Figure 4?

Figure 4. One of the north arrows should be removed. Region boundaries are not visible

Figure 7. Everything that is above the sea-level (0m a.s.l.) is topography

Figure 8 and 9. In legend the sign “>=” should be corrected

Figure 10 and 11. The legend which specified the thickness of red arrows should be added