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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Has dyke development in the Vietnamese Mekong Delta shifted flood hazard downstream?" *by* Nguyen Van Khanh Triet et al.

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The (worsening) flood hazard situation in the Mekong Delta (as many other Deltaic regions in the world) does not have a single dominant explanation. It is explained different factors like changes in (a) upper boundary flow, (b) lower boundary (sea-level, and tides) and (c) within the delta like urbanization, development of hydraulic structures (e.g. dykes) etc. Depending on the issue at-hand during a given discourse, the dominant explanation usually ends up being one or a few of the above. The perceived increase of flooding at the downstream parts of the Vietnamese Mekong delta, has been explained by different authorities using all of the above explanations. Triggered by large floods in 2011, government entities, media and the public in Vietnam were keen to provide an explanation to seemingly increasing flood hazard in the Delta. In these discussions a dominant reason stated is the building of high-dykes within the

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Delta. (Mainly as a means of reducing inundation to pave-way for cultivating 3 crops of rice.)

The authors set-out to investigate this causal link using data analysis techniques and hydro-dynamic modelling. The result is a manuscript that is both interesting and useful not only for the scientist but for the policymakers and other stakeholders of the delta.

First they use flow gauge data to perform statistical analysis of the observed extreme water levels. What they discover is while the temporal trends shown by upstream stations are relatively-small and statistically not-significant, those downstream show stronger trends with high significance. This indicates that the influencing factors for flooding (one or more of (a), (b) and (c) above) has changed. Then they conduct a step-detection analysis which indicates a step-change around year 2000. Taking the inherent uncertainty of the technique (hence the inability to predict exactly where a trends changes), this observation is in-line with the explanation that high-dyke development is a dominant factor for increasing downstream water levels. However, without conducting a series of what-if experiments, it is impossible to say whether high-dyke construction was the ultimate explanation or just a coincidence in time.

They conduct a series of scenario experiments using a quasi-2D flood model (a 1D hydrodynamic model applied in a smart way to represent flooded areas) in order to separate different drivers. As shown in the figure 10., of the manuscript, they demonstrate that 1. High dyke development is a significant contributing factor for increasing floods and high water levels. However, 2. There are other important explanations (Upstream and downstream changes) that has to be taken in to account to explain the full (complex) picture of flood hazard in the Delta.

The analytical work leading to the manuscript is rigorous. The authors employ proper statistical techniques and perform sensitivity and uncertainty analyses where appropriate. The model calibration and validation were done well. However, they should explain the basics of the model they employed in the manuscript. Just referring to the original

source is not adequate here. At least explain the simplifications to the shallow water equation the model employs, solution scheme it uses etc. in the main text (and add an appendix explaining the model in a bit more detail if possible). While the manuscript is generally well written, there are some (minor) language and editorial issues that have to be addressed. Explain what are low-dykes and high-dykes in a way an international reader can readily understand (height limits?). Some colors and patterns used in figure 1 are not clear (at least in the color I wonder whether all the tables included in the main text are really need to be there (why note move the likes of table 5 to an appendix or a supplement?). I do not understand the basis for the last sentence (the recommendation) in the abstract!

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