Dear Editor Prof. Marilaure Grégoire,

Thank you for sending me the manuscript "Modeling interactions between tides, storm surges, and river discharges in the Kapuas River delta" by Joko Sampurno et al. for review. I read the paper with great interest. The authors study a flood event caused by a storm surge in the city of Pontianak, West Kalimantan, Indonesia. The study is based on a two-dimensional numerical model and observations of wind velocity and limited gauging data in the river. This study has the potential to contribute to a better understanding, and hopefully mitigation, of flood risk in Pontianak and Indonesia. The methods are sound and the results are in agreement with previous measurements of flow and water levels in the Kapuas. However, at the moment it is focussed on one particular historic event, which is not even extreme. This is not very appealing to the general reader. This could be improved by either more systematically assessing the flood risk for Pontianak, or by providing implications for flood risk assessment in general. With that being said, the manuscript can probably be published without going that far. However, there are some technical inaccuracies, see listed below, which should be brushed out beforehand.

Kind regards,

Major

- The model only predicts flooding at locations near the river (c.f. line manuscript line 242), but the flooding might propagate much further into the city through the drainage channels, which seem not to be well resolved by the model. The SRTM DEM used in this study only states the surface level, the depth and hence flow velocity in the channels will be underestimated. The 30-m resolution furthermore does not horizontally resolve the channels, which are on average 5 m wide. The same applies to streets. This is aggravated by the peculiarity of SRTM to measure the highest point within each pixel.

- While the study is interesting, it does not give insight into extreme scenarios. For example, in 2013, the discharge of the Kapuas exceeded 10^4 m^3/s (*Kästner et al.*, 2018). This is higher than the high flow scenario of 9000 m^3/s in the study, but still not overbank. It would be very insightful to provide a compound extreme value analysis of river discharge, wind and tides, and then create a flood map with likelihood of areas to be flooded in a 10, 100 and 1000 year interval, at best with incorporating the expected sea-level rise.

- The study ignores rainfall-runoff. While it is not significant for the event under study, it is relevant for the general situation in Pontianak, as this results in flooding of large parts of the city every wet season.

Further comments

2.2 Hydrodynamic model

- State, that the model neglects the water level offset caused by the salinity gradient, and provide at least a short estimating of it (*Savenije*, 2012).

104 The equation stated are the shallow-water equations in non-conservative form, while the text says SLIM solves the conservative form. Hopefully, the latter is the case. Please correct the equations in the manuscript accordingly.

106 The Coriolis force is negligible, as it is nearly zero at the equator, where Pontianak is located. It is certainly many order of magnitudes smaller than other neglected effects, like temporal variation of roughness, salinity or secondary flows.

116 A threshold of 0.5 m seems to be too large for elements to be considered dry since flood height in the city is of the same magnitude.

2.3 Model setup

- I recommend extending the model domain of the Kapuas further upstream, at best until Sanngau, about 300 km from the sea. Currently, the model extends only 100 km upstream, which results in a spurious reflection of the tide, as the tide travels much farther upstream (*Kästner et al.*, 2019). The boundary of the Landak river seems also to be too close to the sea.

- Mention that the model leaves out several distributaries of the Kapuas, for example the Mendawat branch and Southern Kubu branch, and to which extend this influences the extreme water levels modelled in Pontianak.

125 Mention which data source was used to predict boundary conditions at the seaward side. (TPXO?)

134 SRTM is outdated. There is the more recent TDM global elevation map. It has also a 30 m resolution but a much higher vertical accuracy.

147 Note that roughness inferred from ADCP measurements are available for the Kapuas (*Kästner et al.*, 2018). Roughness slightly increases with the river discharge.

148 The Kapuas has a sand bed, not a "muddy river bed" (*Kästner et al.*, 2017).

174 The NSE is just the PCC applied to hydrological models. Their values should be identical and it is redundant to report both. As the reported values for the NSE and PCC are different, there seems also some inconsistency in their calculations.

- The bathymetry inset of the Kapuas Kecil shows locations with unreasonably shallow depth of just 3 m, much lower than the thalweg depth of 12 m. This might be due to bathymetry having been directly interpolated from raw data collected by *Kästner et al.* (2017). The raw data contains stretches of invalid shallow depth gauging due to faulty echo sounding which must be removed by preprocessing for obtaining a reasonably accurate bathymetry.

- Figure 5: State at which point the discharge of Wu 2014 was determined, as the Kapuas has several tributaries and distributaries along the coastal plane.

3.1 Model validation

186 Table A1 and A2 and Figure 6 and 7

State for which period and river discharge the tidal constituents and the goodness of fit were determined, as the constituents for the tide in Pontianak and to a limited extent at the river mouth depend on the discharge of the Kapuas.

187 Note that further data for validating the backwater curve in the upstream reach of Pontianak is available (*Kästner et al.*, 2019).

- Was a sensitivity analysis for the mouth bar depth performed? This is crucial for the backwater dynamics but probably not very accurate in the bathymetry.

3.2 Impact of river discharge on water levels

- State for which tidal range and date this was computed, and how this compares to the average spring tide in the Kapuas, as the impact of river discharge will depend on how strong the tide is.

- It would be informative to state which fraction of the discharge of the Kapuas is diverted into the Kapuas Kecil towards Pontianak, and to compare this with previous measurements (*Kästner and Hoitink*, 2019).

196 Figure 8: A maximum water level of 2 m at the river mouth seems to be by a factor two too large, since the maximum tidal ranges of the Kapuas is about 1.8 m. I guess this is water level with respect mean-lower-low-water (mmlw) or lowest astronomical tide (LAT). Indicate this accordingly in the caption of the figure.

3.3 Impact of wind surges on water levels

- Same as for 3.2, state in combination of which discharge and tidal range the wind scenarios are computed. An overview of the scenarios in a table would be meaningful.
- Discuss how the storm duration may influence the surge. Currently, only the wind force is studied.

3.4 Case study

- State the river discharge and the expected tidal range (without storm surge) for the date.

227 Figure 10: It would be informative to include model results (or just a fit) without wind forcing for a comparison.

Data availability

- Make the data, in particular for the gauging data for Pontianak, available in a public repository, as this is not yet publicly available.

Suggested textual improvements

10 Borneo Island → Borneo (or the island of Borneo)

42 storm surge is → storm surges are

84 The river flow ends at the Karimata Strait, creating a five-arm delta in its estuary → The river flows into the Karimata Strait through five major branches.

86 The largest distributary of the Kapuas River is the Kapuas Kecil River. → The Kapuas Kecil is the second largest distributary of the Kapuas. (Mind the name!)

87 The river starts → The river branch starts

87 20km → 20 km

88 the river flow creates a junction with the end stream of the Landak River → the Landak tributary joins the Kapuas Kecil.

89 West Borneo Province → the province of West Kalimantan (Use the current name, rather than the old colonial one.)

91 $6{\times}10^5$ → 600 000

143 Figure 4: It is preferable to plot the data as points or staircase plots, as it is discontinuous.

193 "observed data" → simulated data (since Wu et. al 2014) uses a model

197 "fully controls" → dominates → Tides are still very much important for the (maximum) water level (*Kästner et al.*, 2019)

274 the delineation of the stream zones · Unclear, explain what this means.

158 Figure 2 can be merged into 1 to save space

186 Table A2: middle of Pontianak → specify the exact coordinates

248 eastward wind → West Wind

257 Unfortunately, we failed to define → We could not define

References

Kästner, K., and A. J. F. Hoitink, Flow and suspended sediment division at two highly asymmetric bifurcations in a river delta: Implications for channel stability, *Journal of Geophysical Research: Earth Surface*, *124*, 2019.

Kästner, K., A. J. F. Hoitink, B. Vermeulen, T. J. Geertsema, and N. S. Ningsih, Distributary channels in the fluvial to tidal transition zone, *Journal of Geophysical Research: Earth Surface*, *3*(122), 696–710, 2017.

Kästner, K., A. J. F. Hoitink, P. J. J. F. Torfs, B. Vermeulen, N. S. Ningsih, and M. Pramulya, Prerequisites for accurate monitoring of river discharge based on fixed-location velocity measurements, *Water Resources Research*, *54*(2), 1058–1076, 2018.

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Savenije, H. H. G., *Salinity and Tides in Alluvial Estuaries, 2nd completely revised edition*, salinityandtides.com, 2012.