

Interactive comment on “Investigating compound flooding in an estuary using hydrodynamic modelling: A case study from the Shoalhaven River, Australia” by Kristian Kumbier et al.

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We appreciate the comments of the anonymous reviewer. Below, we respond to each of the points raised (reviewer's comments are included in quotation marks).

“Abstract: First sentence of the abstract is exaggerated. Studies assessing estuarine processes and flooding certainly included both forcing conditions combined.”

We agree with both reviewer's comments to our first sentence and therefore changed it (see also reply to first reviewer's comments) to indicate and recognize that there are other studies which consider both flooding processes jointly.

C1

“Clarify or change the term “entrance condition” (page 1, line 20; page 3, line 27).”

The term “entrance condition” was replaced by “boundary setups”. From a modelling perspective it appears more useful to talk about different boundary setups at the intermittent entrance instead of simply “entrance conditions”. Accordingly, Page 1, line 20 now reads as follows: “In addition, comparison of different boundary setups at the intermittent entrance in Shoalhaven Heads indicated that a permanent opening, in order to reduce exposure to flooding, would increase tidal range and exposure to both storm-tide flooding and wave action.” Page 3, line 27 now reads: “To quantify how changing boundary setups at the intermittent entrance in Shoalhaven Heads affect modelled water levels and flood extent.”

“Methods could be significantly shorter. In general, the manuscript is too long. Details such as statistical methods for assessing model quality could be only cited. There is no need to present all the equations (2 to 4). Details of the CFL equation is also not needed (Eq. 1). In general, several details in the method section could be left out. Citations to some of the detailed aspects would be enough and will reduce the length of the manuscript. Details of computer processor, for example, are not needed (page 12, line 17).”

We agree with the comments of the reviewer. We have now shortened the methods section by removing unnecessary information (e.g. Eq. 1, processor characteristics etc.) as the reviewer suggested. Details of statistical equations (Eq. 2-4) were removed and addressed through citations. We have also moved information on the processing and validation of bathymetry data to the supplementary material.

“Has the model been calibrated and validated against measured current velocity data? This is an important aspect that limits the reliability of the application. It would be important to present the calibration of the model for current velocities, even if this is done for a different period, when data is available. If not possible, this limitation should be mentioned in the manuscript. Estuarine modelling applications require an assessment

C2

of their capabilities to reproduce the estuarine hydrodynamics, not only water levels. Aspects such as those discussed in page 21 (Model performance), could be better verified through a comparison of modelled and measured current velocities.”

The model hadn't been calibrated and validated against measured current velocities, but we recently received data for a different event. These measurements of current velocity were collected during neap tidal conditions on a day in September 2017. Therefore, we carried out an additional simulation of tidal conditions for the time period of data collection. Results of this simulation demonstrated a model underestimation of maximum current velocities by 1 cm s⁻¹ (modelled = 0.116 m s⁻¹, observed 0.122 m s⁻¹). This comparison indicates that our model is able to replicate this hydrodynamic parameter quite well. We must note however that our comparison was limited to a single upstream location. We have now included this comparison into our manuscript and also discussed its limitations. Specifically, in page 12, line 23, we have added: “In addition, the models ability to reproduce estuarine hydrodynamics was assessed by comparison of measured and modelled current velocities for a different event. Results show small model underestimation of maximum current velocities by 1 cm s⁻¹.” In page 21, line 30, we have added: “The comparison of measured and modelled maximum current velocities demonstrated a good reproduction of estuarine hydrodynamics. We must note however, that, due to limited availability of measured data, the comparison was limited to a single location and a different event.”

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