

Interactive comment on “Ensemble Projection of the Sea Level Rise Impact on Storm Surge and Inundation in the Coastal Bangladesh” by Mansur Ali Jisan et al.

Anonymous Referee #3

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The paper uses numerical modelling to analyze the effects of sea level rise (SLR) on the storm surge generated by tropical cyclones (TC) in the Bangladesh coast and the associated inundation on that area. Model results are validated using observations of two previous TC and a number of additional simulations are made to study future scenarios. The manuscript is pretty well written, although it can be improved following the suggestions detailed below. Besides the assumptions made to simplify the high level of uncertainty, the obtained results show how SLR would increase the inundation associated to TC in this area and can help coastal managers to design adaptation measures to deal with these problems. Therefore, the manuscript fits the scope of NHES and may be published provided the authors address the following comments.

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General comments

- The authors should justify why they use the SLR projections from AR4 (IPCC, 2007) (line 60) instead of those from AR5 (IPCC, 2013), although they are based on the worst AR4 scenario (A1F1, line 72). Taking into account that regional SLR rates are much higher than the global rate (lines 64-66) and that global SLR projections from AR5 are worse than AR4, the scenarios considered by the authors could be too optimistic.
- A number of geographical sites are cited in the text (e.g. Bay of Bengal and Andaman Sea (line 37); Ganges, Brahmaputra, Meghna rivers (line 92); Baguna (lines 97 and 100); Patuakhali (lines 99 and 106); Khulna (lines 100 and 106); Jhalokati (line 100); Chandpur (line 106), Sundarban (lines 238, 239, 240)) that should be placed in a map to facilitate the reading of the text. In the same way, a figure showing the topography of the area would be very useful. In addition, the shorelines should be clearer in figures 1, 4, 5 and 8, to better understand the magnitude of the flooded areas.
- In lines 201-206 the authors discuss the potential influence of the tide level on the inundation and indicate that different simulations have been performed considering diverse tide conditions, which are summarized in Table 2. However, nowhere is the magnitude of the tides shown. A description of tide features is necessary to understand the influence of this factor in the inundation.
- The writing of sections 3.2, 3.3, 3.4 and 4 is a little bit confusing with the mixing of percentages, inundation areas and water levels. Perhaps the results could be summarized in a table to ease the understanding of the changes associated to each scenario.
- Lines 321-324: In the discussion about the used methods, the authors say that they “included the increased sea level in open ocean boundary instead of adding it into the whole ocean depth”. In my opinion this makes no sense because it introduces a discontinuity in the water level that physically is not possible. As the authors say, this produces an additional pressure gradient force acting towards the coast. Therefore, the obtained results are spurious. I suggest removing any reference to this method,

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including figure 8.

- Some of the presented results seem inconsistent:

o In Figure 5 the comparison of inundated areas between present day and future climate scenarios is shown. In this figure, there are several small areas of yellow color indicating zones flooded under present conditions but not flooded during future SLR conditions. The authors should explain why these low lying coasts are flooded with present SLR and not with higher SLR, contrary to what would be expected.

o In lines 226-227 the authors say: “the measured water level variation displayed larger amplitudes than did the model output”. Observing Figure 3b, the trend seems the opposite (for positive values) and the red line (modeled) is located above the black one (observed). On the contrary, negative values and total oscillations are greater in the case of observed data. I suggest clarifying this point.

o When comparing water levels of Figure 7 and Figure 3, the observed and modelled values are different in panels (a) and (b) of both figures. It looks like in one of both figures, these panels are exchanged.

Specific comments

- Lines 55-56: “the deaths of hundreds of thousands of lives”. Better “the loss of hundreds of thousands of lives”. This sentence is very similar to the following one: “This type of coastal flooding. . .”, so probably both sentences could be combined into one.

- Line 83: “The impact of climate change. . . . are still debatable” should be “The impact of climate change. . . . is still debatable” or “The impacts of climate change. . . . are still debatable”.

- Line 88: “will be method of this study”, better “will be the method of this study”.

- The name of a district is written differently: Patuakhali (line 99), Patukhali (line 106),

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Patuakhali (line 106). Please be consistent and use only one name.

- Lines 110-114: This paragraph seems a repetition of a previous one.

- Lines 129-130: P0 and f are not defined in equations (2) and (3).

- Line 156: The reference Heming et al. (1980) is missing or there is a mistake and should be Heming et al. (1995).

- Line 167: The meaning of e is not defined in equation (6).

- Line 178: “methods described in Zhang et al. (2012) was followed” should be “methods described in Zhang et al. (2012) were followed”.

- Line 184: “boundary was shown in Figure 1”, better “boundary is shown in Figure 1”. - Line 206: “. . .in making ensemble projections shown in Table 2” should be “. . .in making ensemble projections are shown in Table 2”.

- Line 212: “(-ve)” looks a typo.

- Line 215: Equation (8) is wrong. The MAE is obtained by comparing observations with model results.

- Line 234: “the two TCs considered were shown in Figure 4.”, better : “the two TCs considered are shown in Figure 4.”.

- Lines 262-263: Please substitute “square kilometers” by “km²”.

- Lines 269-272: This paragraph is a repetition of the previous one.

- Lines 310-313 are redundant with the previous paragraphs and although they coincide with Figure 7 caption (which is wrong), they do not describe Figure 7.

- Line 351: “SLR conditions; which is. . .”, better “SLR conditions, which is. . .”.

- References: Alam (1996), Mohal et al. (2006) and Vatvani et al. (2002) are listed in References but are not cited in the text.

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- The reference corresponding to Delft3D model is cited in the text as Delft Hydraulics (2006) but is listed as Hydraulics, D. (2006). Please be consistent.

- Figure 7 caption is wrong and it does not describe this figure, since the results of both future scenarios are included in each figure.

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