

Interactive comment on “The effectiveness of polder systems on peak discharge capping of floods along the middle reaches of the Elbe River in Germany” by S. Huang et al.

Anonymous Referee #1

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The paper presents an interesting engineering application that is clearly within the journal's scope of disciplinary fields. The issue of flood mitigation and disaster prevention is of high importance worldwide and has shifted even more into public awareness after the devastating flood events that struck large regions of Central and Eastern Europe in August 2002 - with the Elbe river basin among the most affected. It is particularly true that unsteady 2-D modelling of large floodplains, polders and inundation areas are computationally expensive, hence the 1-D channel-node system can provide an efficient modelling alternative in these cases.

The aim of the paper is clearly set forth within the introduction and coincides with the title. However, while the paper reaches a number of conclusions, some of them will

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actually require further discussion to substantiate the claims made. For instance, the control strategy of the weirs is always referred to as “optimal”, but the paper does not state how precisely this control strategy was found. Another example is the discussion of the sensitivity of the roughness coefficient in polders P4 vs. P1 which speculates rather than performing the actual work based on scientific methods needed to be conclusive about this issue. A number of other issues are discussed below.

Regarding overall structure and language of the paper, it can be said that it is well structured and clear, even though some textual improvements may be required (see below). However, some figures will definitely need to be modified to become more easily understandable, and it also appears as if not enough care was taken in writing concise figure captions that actually correspond to the figure content. Also, the authors are strongly advised to review the references cited in the text and listed at the end of the paper, as some cited literature is not referenced, and some listed references never appear in the paper’s main text. This should never happen in a scientific publication as it needlessly downgrades an otherwise interesting and well-done work. Considering all of these issues, I recommend printing the paper once all open questions have been answered and the necessary corrections have been applied.

The following individual issues will require further scientific discussion in the paper (page and line numbers refer to the print version):

(a) At pg. 215, line 16, the authors state that backwater effects were also taken into consideration when calculating weir discharge in the hydrodynamic model DYNHYD. As the consideration of backwater effects is important particularly during large floods it should be worth more than a side note and discussed in more detail.

(b) At pg. 217, the polder control strategy is explained. Repeatedly the paper states that it resembles the “optimum” control strategy, even though the authors never explain how this strategy was found and how precisely the optimum was defined?

(c) At several locations within the paper, i.e. pp. 219, 220 and 224, the authors discuss

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their choices of bottom roughness coefficients and state that they have to be fine-tuned for each flood event. This issue is nothing new as it has always been a problem in using Strickler/Manning coefficients for roughness parameterization. However, using another sort of roughness parameter, i.e. absolute roughness as it is often used in 3-D models, or the use of lambda coefficients, can provide an effective remedy to this issue. The paper should address this matter more deeply to show that there are more solutions to the same problem than just fine-tuning the roughness parameter for every event.

(d) At pg. 223, the authors discuss their finding that the roughness coefficient is much more sensitive in P4 than in P1. I would feel more confident if this discussion would be based on facts rather than speculation as it is currently done in the paper. Furthermore, the discussion of the deviation in the boundary condition leading to higher capping of the discharge hydrograph is entirely confusing.

(e) Figure 2 depicts the polders to be constructed and features a subdivision of polder P4 in P4a and P4b, and polder P1 in P1a through P1c. Either the text should elaborate on these subdivisions (preferred) or the figure should be changed.

(f) It appears that the schematic drawing in Figure 3 does not contain the area constituted by polder P1c. Why?

(g) In several figures, particularly Fig. 6 and 8, a local peak in the simulated data during the first simulation day is clearly visible. This phenomenon may be either of numerical or physical nature, even though I suppose it is of numerical origin. This issue should be addressed and explained in the text.

(h) The caption for figures 11 and 12 is almost certainly wrong. Please check.

(i) In Figure 13, point (weir?) “j” is referenced. Where is it?

There are also a number of technical corrections I propose:

(1) Pg. 212, line 13: “sensitive analysis” should become “sensitivity analysis”

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- (2) Pg. 212, line 23: “Petrow et al., 2006” is never referenced!
- (3) Pg. 213, line 1: to my understanding, normally web links should be part of the references, not presented in the main text
- (4) Pg. 213, line 3: see comment (3)
- (5) Pg. 213, line 15: “which respect to” should be come “with respect to”
- (6) Pg. 213, line 24: “computationally extensive” should be changed into “computationally expensive”
- (7) Pg. 214, line 1: “substance transport” is normally referred to as “solute transport”
- (8) Pg. 216, line 6: a better term for “depicting” would probably be “representing” in this context
- (9) Pg. 218, line 1: the location referred here should be f2 rather than g
- (10) Pg. 218, line 11: please refrain from explaining the same issue a third time by paraphrasing what has already been said, and remove the sentence reading “In other words...”
- (11) Pg. 221, line 8: “Förster et al., 2006“ is never referenced!
- (12) References: Apel et al., 2004 and Saltelli et al., 2000 are not cited in the text
- (13) Caption of Figure 2: the reference should read “IWK, 2004”, not “IWA, 2004”

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