Hydrology and Earth System Sciences Discussions

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 #2

Received and published: 13 February 2007

The aim of the paper is not clear. The title points to a discussion of the effectiveness of polder systems along the Elbe River. However, the polders are not described in sufficient details to understand their function, not even their volumes in absolute terms or in relation to the flood volumes are given. The quite complicated operation of the weirs is not discussed; obviously they are just designed for maximum effect during the 2002 flood with prior knowledge of the hydrograph. The effectiveness of the system for other hydrographs and no prior knowledge is not discussed at all. The paper is mainly a description of an application of a 1-D model that was made quasi-2D by connecting many river sections in parallel. However, it does not give enough details to really understand the benefits of this approach, as compared to many others that already exist. I would

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therefore not print the paper in its present form.

The following is a collection of questions or weak points.

Many models have already been proposed to simulate the effects of retention. The filling of the polders in the Elbe case is a slow process, taking a day or more. What is the benefit of using a hydrodynamic model as compared to much simpler models?

Fig. 1 should illustrate the 2-D spatial representation of the discretisation network. To me, the figure doesn't explain anything.

In table 1, some discharge values are given. In 2002, the upper station Torgau recorded a higher discharge than Wittenberg, although the Schwarze Elster joined in between. This should be commented.

In Fig. 2, there are polders P1a, P1b, P1c etc. shown that are never mentioned the text. What is the effect of the indicated retention areas and how are they modelled?

in Fig. 3, the main polders are split up into many smaller ones. How has the discretisation been made? What is the advantage of considering inertia terms when water level changes are a few cm/h? The text mentions 4 control weirs, I count 5 (E, F2, G, H, I). What do the arrows at H and I mean? The lower one leads into the polder, the upper out. What is the function of weir f2?

Fig. 4: What is meant with optimum control strategy? How was it found? How effective is it for other floods than the 2002 event? Why are gates H and I in the same graph?

Fig. 5 and 7: scale is too small to show anything reasonable. In addition, as I understand it, the Manning's n has been changed along the river to provide the best fit for the highest water levels.

Fig. 6 and 8: The reason given for the deviations at the beginning of the hydrograph "..is due to the model being fitted to the peak discharge (pg.220, line14)" is not really an explanation.

Improve Fig. 9 and 10. There are too many lines that give redundant information. Except at the beginning of the filling of the polders, water levels in the polders raise and fall simultaneously at both ends. Therefore hydrodynamic modelling seems not required. I think the weir length not the breath is 100 m

Fig. 11: confusing. I don't see any water levels in the river. Nothing is visible in the lower figure. It is not polder P4. The figure doesn't show the "efficacy of the quasi-2D approach in capturing the spatial differentiation in flow characteristics (pg. 221, line16)", but only that the water is flowing downhill.

Fig. 12: see comment Fig. 9. Shown are only water levels in P4, not in P1 and P2. Where is point j?

Fig. 13: see comment Fig. 9. Nothing new

Fig. 14 and 15: I don't understand why a reduction of the weir length by 50 % from 100 m to 50 m has no effect on the capping (pg.220, line 24), while a reduction of the weir coefficient by 10 % reduces capping by 10 %.

Does percentage deviation in the boundary conditions mean reduction of the discharge (m3/s) or in the water level? Are the volume reduction and the capping reduction compared to the initial volume or relative to the reduced flood volume?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 211, 2007.

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