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Comment on hess-2021-532

Anonymous Referee #1

Referee comment on "Inclusion of flood diversion canal operation in the H08 hydrological model with a case study from the Chao Phraya River basin: model development and validation" by Saritha Padiyedath Gopalan et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-532-RC1, 2022

This paper describes the successful implementation of flood diversion canal operation in H08 for the Chao Phraya River Basin, which accounts for over half of annual average river discharge diversion of the CPRB. This novel implementation is clever, well described, and I find the paper quite enjoyable to read. I only note a few places where this paper may benefit from improved clarity before publication. Below are a few minor comments/questions for the authors.

- Water diversion during dry season appears to be quite sensitive to the pristine flow simulation used to estimate river and canal carrying capacities. Is it conducted by only including the digitized canal network but excluding direct human influence such as dams, reservoirs and human water use? Are the results then compared with naturalized or raw observed data when computing for NSE (Suppl. S4 L75)? I am wondering why the river canal capacity decreases along the natural river channel between some locations (i.e., C.13 to C.3), even when there are no canals between them (Figure 4). Also, it seems that the capacity values shown in Figure 4 are a mix of simulated Q5 (main river) and observed (canal, Table S1). Is this correct? It would be quite informative if the simulated river/canal carrying capacities are also listed in Table S1.
- While the generalized canal scheme has potential for global applications, a major obstacle is the estimation of retention areas. In this study paddy fields were used as retention area with fixed depth, and this would not be applicable globally. I am curious how the authors would apply this scheme globally, especially when the bathymetry of lakes/ponds are not known and cannot use the 1 m depth assumption.
- Although the authors already did a fantastic job describing the model, I would still like to ask a few questions to make sure I understand the details correctly: In P11L346, “10% of diverted water is supplied to each of the nearby grid cells that was further utilized for irrigation”. Do you mean for each of the 5′ grid that the canal passes, 10% of total diverted water is supplied to that grid? So as the diverted water flows along canal to each grid, it first loses 10% of water for water supply, then fully fill that grid’s retention capacity before moving to next grid, where this process is repeated until either the water is fully contained in the retention area, or flows out of the basin. Is this correct (I am especially uncertain about the retention filling: P14L441 says “this runoff

constitutes a portion of retention pond storage")? If water is only supplied to grids the canal flows to, then the schematic diagram of Figure 2 should perhaps be slightly modified and remove the second arrow of B on the lower left. Also, how is the water balance closed if irrigation demand is less than water supplied to the local grid? And would this "supply to nearby grid" percentage change if the simulation is performed on finer/coarser resolution?

- What are the similarities between the explicit aqueduct water transfer module and this canal operation module? How do you determine if it is canal or aqueduct based on Google Earth images?
- Figure S4: Are you using multi-year averaged crop calendar?