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Interactive comment on "Irrigation, damming, and streamflow fluctuations of the Yellow River" *by* Zun Yin et al.

Anonymous Referee #2

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The study "Irrigation, damming, and streamflow fluctuations of the Yellow River" by Yin et al. provides an overview of the water budget in the Yellow River basin, by considering irrigation and dam regulations. In this study, the authors developed a simple dam model coupled with ORCHIDEE to represent the major flow regulations in the river basin. The topic fits the scope of HESS, However, as a scientific manuscript, a clearly defined science question is missing in this study. What is your major contribution to the hydrology community as the concept of modeling dam regulation is not new? Also, there are many technical issues need to be addressed and improved (see below) before this paper can be considered for publication.

Page 1, line 5, line 10: new -> newly

Page 4, lines 7-8: Although it's true that many dam model algorithms in recent GHMs

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and LSMs are inherited from Hanasaki et al. (2006), it is worth mentioning there are other types of dam/reservoir models such as agent-based models (e.g. Riverwave), or basin-specific models (e.g. USBR Colorado River Simulation System).

Page 4, line 23: Remove "real" before observations. Are there "unreal" observations?

Page 4, lines 29-30: I'm not convinced that the new dam model "does not require any prior information from observation". In my opinion, observed information include the data or parameters measured/collected from the real world. In this case, the location, storage capacity, geometry of the dam and reservoir, etc. They are all "observations". So, I feel this sentence (and the one in the abstract) is a bit overselling the model and needs to be further clarified.

Section 2.1.1: Could you add some more background about ORCHIDEE before introducing ORCHIDEE-CROP? What's the relationship between these two? Is ORCHIDEE-CROP an offline crop model taking ORCHIDEE output as input, or it's an updated ORCHIDEE with an online crop model, or it's a regional model only focuses on China?

Section 2.1.2: This scheme concept is quite similar to Voisin et al. (2013). Considering citing the work.

Section 2.1.2: Essentially the dam model is trying to flatten the hydrograph. Any support from the observation that all dams follow this generic rule? I understand sometimes it's hard to obtain the actual operation rules from the dam operators, but given this is a basin scale analysis (not global), some level of "fact-checking" needs to be included to reflect the local reality.

Page 8, line 22: Since NI and IR are major simulation experiments performed in this study, it is necessary to include more descriptions about the irrigation scheme in Section 2.1.1. For example, how does the irrigation demand be evaluated, at what time step? How does the irrigation water be applied, at what time step? I'm assuming

different PFTs are associated with different irrigation methods (e.g. drip, sprinkler, or flood)? How does the return flow be treated in the model? How does the groundwater be represented in the model? If no groundwater pumping is represented in the model, the level of uncertainty needs to be evaluated and discussed for the study basin.

Page 10, line 5: I don't understand why ETni and ETir had no significant differences as I can see the discharge had significant decreases at some gauges (Figure 3). I assume the reduced Q is due to the irrigation water withdrawal, and then become additional ET through the irrigation, or it's not the case here?

Page 10, line 9: In this equation, Ai is the total drainage area between two gauges. Will it make more sense to use irrigated area instead of total area? This way you can compare the relative level of irrigation for different sub-regions?

Page 11, line 16: There are many negative spikes in Q_hat_IR time series in Figure 5. This is unacceptable. I don't think your model is doing the right thing.

Figure7: Given it's a regional study, I'm expecting better results than this, especially when you mentioned some previous study reached NSE around 0.9 for natural flow in the very same basin. Theoretically speaking, the inclusion of irrigation and dam regulation would improve the performance, not the opposite. I think more discussion about this issue is required. Also, how confident are you about the numbers in the conclusion?

Figure 7: NSE is good for evaluating high frequency flow data but might not be a good metric for monthly time series, as it is more sensitive to the peak values (Krause et al. 2005). Maybe that's why your NSE is so bad. I would suggest removing this metric.

Voisin N, Li H, Ward D, Huang M, Wigmosta M, Leung LR. On an improved sub-regional water resources management representation for integration into earth system models. Hydrol Earth Syst Sci 2013;17:3605e22. http:// dx.doi.org/10.5194/hess-17-3605-2013.

Krause, P., Boyle, D. P., and Bäse, F.: Comparison of different efficiency criteria for hydrological model assessment, Adv. Geosci., 5, 89–97, https://doi.org/10.5194/adgeo-5-89-2005, 2005.

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