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Comment on hess-2021-360

Maurizio Mazzoleni (Referee)

Referee comment on "Satellite observations reveal 13 years of reservoir filling strategies, operating rules, and hydrological alterations in the Upper Mekong River basin" by Dung Trung Vu et al., Hydrol. Earth Syst. Sci. Discuss.,
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This paper aims at assessing the reservoir release rules and downstream discharge of ten large reservoirs along the Lancang River reach by using DEM data, Landsat images, and altimetry data. These data are used to identify elevation-storage and area-storage curves, generate monthly time series of water surface area, and validate the results. I found the study really interesting and well written. Overall the paper is well structured and with a solid method based on established post-processing approaches for remote sensors data. I think that the paper could be accepted after a moderate revision. Below are my main comments:

1) One of the main results reported in the abstract is that "two reservoirs were filled in only two years, and that their operations did not change in response to the drought that occurred in the region in 2019-2020". However, this issue is barely discussed in the paper (last paragraph of section 4). Tiezzi (2016) and Hecht et al. (2019) showed that emergency releases from upstream reservoirs could mitigate severe drought in the downstream countries of the Mekong basin in March 2016. Why this is not the case for the drought event that occurred in the period 2019-2020? What is the reason? What is the influence of changes in human presence within the river basin during that drought period on hydropower consumption?

2) The authors used the VIC-Res model developed in Dang et al. (2020) to assess the inflow to the reservoir (Eq.3) to then assess the parameter θ . The first upstream reservoir considered in your study is Wunongiong, which is downstream of the reservoirs Guodo and Jinghe considered in Dang et al. (2020) (Figure 1). I was wondering how the non-optimal estimation of the streamflow values from the VIC-Res model, based on rule curves conceived to maximize the hydropower production (similarity to Piman et al., 2012), for the Guodo and Jinghe reservoirs may have affected the inflow to the downstream reservoir of Wunongiong. An uncertain estimation of the inflow could lead to an uncertain estimation of the reservoir release (parameter θ). Do you think these may significantly affect the outcome of your study? Is there a way to compare the simulated streamflow with observed values?

3) Have you compared the simulated release from the VIC-Res model (Dang et al., 2020) based on rule curves conceived to maximize the hydropower production (Piman et al., 2012) with the reservoirs releases estimated in your study?

4) It is mentioned in section 2 that MODIS data were not considered as “may not be best suited for this study”. Indeed, MODIS imagery has high frequency (twice a day) but lower spatial resolution (250 m), which makes it unsuitable for estimating the water surface area of narrow reservoirs, as the case for the Nuozhadu and Xiaowan reservoirs with width between 1000m to 1500m. However, is this the case also for the remaining 8 reservoirs? Would it be more beneficial to use MODIS (high frequency but slightly coarser spatial resolution) rather than Landsat images (higher spatial resolution but low temporal frequency) to catch finer fluctuations of reservoirs releases over time?

5) Have you compared the WAS results with the water surface area from Pekel et al. (2016)? They also used Landsat images for assessing global surface water. This comparison would further strengthen your method and the results of your study. You could include this validation in the supplementary material.

6) Could you summarize the limitations of this study and include them in the discussion?

References:

- Piman, T., Cochrane, T., Arias, M., Green, A., and Dat, N.: Assessment of flow changes from hydropower development and operations in Sekong, Sesan, and Srepok rivers of the Mekong basin, *J. Water Res. Pl.*, 139, 723–732, 2012
- Tiezzi, S. (2016). Facing Mekong drought, China release water from Yunnan Dam. *The Diplomat*, 16.