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Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Modeling the effects of cold front passages on the heat fluxes and thermal structure of a tropical hydroelectric reservoir" *by* M. P. Curtarelli et al.

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Dear referee,

thanks for reviewing our manuscript. We found the comments helpful, and believe the revised manuscript will represent a significant improvement over the initial submission. The following are the responses to your comments and suggestions:

1) The satellite data were used in this study to extract the water surface temperature (WST) of the rivers' inflows, but the details of the method are not described in the manuscript. As the inflow temperature acts important role to determine the plunging

point and density flow regime of inflow in the study reservoir, it should be clearly described how the inflow temperatures were estimated and validated.

The M*D11A1 products are generated using a split-window algorithm and seven spectral MODIS bands located in the regions of the shortwave infrared and thermal infrared; This algorithm is based on the differential absorption of adjacent bands in the infrared region (Wan; Dozier, 1996). The M*D11A1 products have been validated at Stage 2 via a series of field campaigns conducted between 2000-2007, and over more locations and time periods through radiance-based validation studies. Accuracy is better than 1K (0.5K in most cases), as expected pre-launch. The WST of rivers's inflows were retrieved using the M*D11A1 product. We considered the temperature values of pixels located in the transects BB '(Paranaíba River) and CC' (Corumbá River). In order to avoid erroneous values of water surface temperature (WST) near the edges due to land contaminations we used a Sub-Pixel Temperature Retrieving (SPTR) approach (Setlinger et al. 2008) to extract the WST in Itumbiara Reservoir. This approach produces accurate, frequent high spatial resolution WST maps by exploiting a priori knowledge of water boundaries derived from vectorized water features.

We will insert more details about this data on "Data and Methods" section.

2) In Fig. 4 and Fig. 6, authors may include reference lines indicating the depth of mixed layers to assist the discussion.

We agree with this suggestion. We will include reference lines indicating the depth of mixed layer in the cited figure.

3) Page 8483, Line 17, "Upwelling events were observed following the F4 passage (Fig. 6i)", Are they really upwelling events? It is not clear from the figure. Should be discussed more detail along with the wind events.

We agree that the upwelling events are not clear from the Figure 6i but they really occurred. The upwelling events were observed both during and after the F4 passage. When F4 passage reaches the Itumbiara reservoir (on 30th May) the wind field changes its direction, from Southeastern to Southwestern, and increases its intensity, reaching 8.8 m s-1. After the F4 passage (2nd July) the wind changes its direction again, from Southwestern to Southeastern, reaching values around 7 m s-1. The two wind episodes (during and after F4) persist for more than 18 hours with wind speed higher than 3.5 m s-1. In both cases, the model results showed the occurrence of downwelling-upwelling cells traveling from the upwind to the downwind side of the reservoir.

We will try to explain in more detail this question on “Results and Discussion” section.

4) In the abstract, the authors talk about “the cumulative effect of cold fronts and the reservoir’s resilience”, but it is not well discussed in the results.

We agree with this suggestion and will insert further discussion about the cumulative effect of cold fronts and the reservoir’s resilience on “Results and Discussion” section.

5) It is not clearly addressed how the precipitation events were considered in the simulation, and their effects on the thermal structure of the reservoir.

The precipitation effects were not analyzed in this work. The ELCOM model considers the precipitation data only to compute the water balance (Hodges and Dallimore, 2010.

References

Hodges, B.; Dallimore, C. Estuary, Lake and Coastal Ocean Model: ELCOM v2.2 Science Manual. Centre for Water Research University of Western Australia. September 29, 2010. Available at: <http://www.cwr.uwa.edu.au/software1/>.

Setlinger, G.I., Hook, S.J., Laval, B. Sub-pixel water temperature estimation from thermal-infrared imagery using vectorized features. Remote Sens Environ, 112, 1678-1688, 2008.

Wan, Z., & Dozier, J. (1996). A generalized split-window algorithm for retrieving land-

surface temperature from space. IEEE Transactions on Geoscience and Remote Sensing, 34, 892−905

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8467, 2013.