

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 comments and responses to your questions:

This research aimed to investigate the effects of cold front passages on the heat fluxes and thermal structure of a tropical reservoir located in Brazil. Understand the physical processes that occur inside the reservoir and its driven forces are crucial for the man-

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agement and optimization of these systems, especially those utilized for drinking water and power generation. The water circulation and mixing process can be related with phytoplankton dynamics (Vidal et al., 2010), iron and manganese release (Tundisi et al., 2004), phosphorus dynamics (Komatsu et al., 2006), cyanobacteria bloom (Atoui et al., 2012) and greenhouse gas emissions (Rudorff et al., 2012).

The main difference between this and de previous research conducted in Itumbiara reservoir (Alcântara et al., 2010) is that in this study we use a 3D hydrodynamic model and considered the stability of the ABL in our estimates while Alcântara et al. (2010) research's was based on punctual measurements and did not consider the stability of ABL. I this study we show that ignore the ABL stability in the estimates of sensible and latent heat fluxes can results in underestimates. We also show that mixing and stratification processes are different in the main body of reservoir and in the river-reservoir transition zone. Finally, in this study we analyzed the effects of successive cold fronts passage while in the former research only a single cold front passage was analyzed.

Specific Comments:

1. p.8468, line 8: What does “resilience” mean? In this case We refer to resilience in the ecological sense, that is, the ability of a system to restore their equilibrium after it has been broken by a disturbance, a cold front in this case.
2. p.8468, line 16: Colder than what? In this sentence We meant “colder than the reservoir water”. We think that this sentence can be rewritten as “The water of the Paranaíba River is colder than reservoir water and contributed to reestablish the thermal stratification following the passages of the cold fronts”
3. p.8469, line 10-11: Could you site references as to “the effects of cold fronts have been reported for North American water bodies . . . in South American lakes and reservoirs” ? Moreover could you clearly tell the difference between former papers and this article?

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We will inset the following references in this statement:

“Although the effects of cold fronts have been reported for North American water bodies (Blanken et al., 2000; MacIntyre et al., 2009; Liu et al., 2011), few studies have addressed this issue in South American lakes and reservoirs (Alcântara et al 2010a)”.

The main difference between the papers published for South American Lakes and reservoirs (e.g. Alcântara et al 2010a) and this article is that in this work we used a three-dimensional hydrodynamic modeling in combination with remote sensing data, while the others papers are based on punctual measurements. Moreover, in this work we consider the stability of ABL in our estimates while the former papers did not consider the stability of ABL in the estimates of heat fluxes.

4. p.8670, line1-3: You said “you did not consider the stability of the ABL” but later in line 9 in p.8478, you said “adjusted base on the stability of the ABL”. Which is right? Both are right. In the P.8470-L.1-3 we refer to a preliminary investigation (Alcântara et al 2010a) which did not considered the stability of ABL in the estimation of heat fluxes. In the P.8478-L.9 we are referring to the present study, which consider the stability of the ABL in estimates of heat fluxes.

5. p.8473, line 24: Generally speaking, the inŕĩŕĆow in a reservoir comes from the difference between the change of the reservoir volume and outŕĩŕĆow, which suggests we do not have to use the precipitation in the simulation. Did you use daily precipitation rates for the simulation? Yes, we used the precipitation rates during the simulations, but first we discounted its value from de inflow data. This was done because precipitation and inflow are accounted in different way by the model.

6. p.8476, line 6: You should not use non SI unit of “mbar” We will change the “mbar” unit to “Pa” (SI).

7. p.8477, line 22: The water albedo “for shortwave radiation” We will include “for shortwave radiation” in this sentence.

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8. p.8480, line 23: Does “average” means daily average? (same in p.8480, line 24 and in p.8481, line 14) In the three cases listed the word “average” means “daily areal average”. We will change the word “average” to “daily areal average”.

References

Atoui, A., Hafez, H. and Slim, K. (2012) Occurrence of toxic cyanobacterial blooms for the first time in Lake Karaoun, Lebanon. *Water Environ. J.*, 49, 42-49.

Komatsu, E., Fukushima, T. and Shiraishi, H. (2006) Modeling of P-dynamics and algal growth in a stratified reservoir—mechanisms of P-cycle in water and interaction between overlying water and sediment. *Ecol. Model.*, 197, 331–349.

Rudorff, C. M., Melack, J., MacIntyre, S., Barbosa, C. C. F. and Novo, E. M. L. M. (2011) Seasonal and spatial variability of CO₂ emission from a large floodplain lake in the lower Amazon. *J. Geophys. Res.*, 116, 1-12.

Tundisi, J. G., Matsumura-Tundisi, T., Arantes Junior, J. D., Tundisi, J. E. M., Manzini, N. F. and Ducrot, R. (2004) The response of Carlos Botelho (Lobo, Broa) reservoir to the passage of cold fronts as reflected by physical, chemical, and biological variables. *Braz. J. Biol.*, 64, 177-186.

Vidal, J., Moreno-Ostos, E., Escot, C., Quesada, R. and Rueda, F. (2010) The effects of diel changes in circulation and mixing on the longitudinal distribution of phytoplankton in a canyon-shaped Mediterranean reservoir. *Freshwat. Biol.*, 55, 1945–1957

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

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