Dear Associate Editor - Dr. Silvio Pantoja,

Thank you again for your comments on our manuscript.

We are submitting an updated manuscript file that was prepared by adding the last modifications you suggested to the previously submitted file. Please find below our response to each of the points raised by you. The reference to page and line numbers match the manuscript document we are submitting now.

We hope you will find this version suitable for publication.

Best regards, also on the behalf of all co-authors,

Raquel Mendonça

Author's responses to Associate Editor's comments

Editor: 1) Page 2, lines 2-4, line 29. Based on accuracy considerations, the concept of "Integrative (whole system) data" does not reflect the real meaning of your approach, which is sampling across a variety (probably most) of depositional local sedimentary environments within the reservoir to produce better estimates than previous work. In addition, I could argue that "whole system" will never be achieved unless we do a census (the "whole" system) and not merely sampling, that is feasible in geosciences. I am inviting you to rephrase accordingly. This rephrasing will not undervalue your work, but give accurate description for the scientific community.

Authors: It was not our purpose to argue that the reservoir was sampled in its totality. By "integrative" and by "whole-system" we meant that we performed a highly spatially resolved analysis of OC burial efficiency (i.e. based on seismic profiles), that could be extrapolated to the entire area of the system. But we agree that the words we used can give erroneous interpretation and we thank the editor for pointing it out. We, then, decided to replace the terms "integrative" and "whole-system" with words such as "highly spatially resolved". Find below the parts of the text we modified accordingly, with added words highlighted.

- Page 2, line 2: "we estimated a ***spatially resolved mean*** OC burial efficiency of 57%. Being the first assessment of OCBE ***with such a high spatial resolution*** in a reservoir, these results suggest that reservoirs may bury OC more efficiently than natural lakes."
- Page 2, line 30: "None of these assessments are based on ***highly spatially resolved data***."
- Page 3, line 26: "This approach resulted in the first ***highly spatially resolved*** OCBE estimate for a reservoir."
- Page 7, line 20: "In the first approach, we combined the relationship between OCBE and sediment accumulation rate (this relationship is strong, see results section) with ***the spatially resolved estimate of reservoir*** sediment accumulation rate (obtained ***from the interpolation of seismic profiles***; Mendonça et al. (2014)) to calculate the mean reservoir OCBE. In the second approach,

we *estimated* the *mean* OCBE for the Mascarenhas de Moraes reservoir from the *spatially resolved mean* OC burial rate (Mendonça et al., 2014) and the mean mineralization rates estimated from the cores."

- Page 9, line 3: "The first *spatially resolved* estimate *of OCBE*, based on the strong relationship between sediment accumulation rate and OCBE and on the *spatially resolved mean* sediment accumulation rate from a previous study (Mendonça et al., 2014), resulted in OCBE of 57% on the entire Mascarenhas de Moraes reservoir. The second estimate, based on mean mineralization rate (34.3 gC m^{-2} yr^{-1}; Table 1) and the *spatially resolved mean* OC burial rate (42.2 gC m^{-2} yr^{-1}; Mendonça et al., 2014), resulted in an overall OCBE of 55% *in the Mascarenhas de Moraes reservoir*.
- Page 14, line 9: "*Highly spatially resolved* analysis of OCBE"
- Page 14, line 15: "The strong predictability of OCBE based on sediment accumulation rate (**Fig. 2**), permits the use of *spatially resolved mean* sediment accumulation rate (0.51 cm yr^{-1}, from a seismic survey; see Mendonça et al. 2014) to estimate *the spatially resolved mean* OCBE in Mascarenhas de Moraes. This analysis shows that 57% of the total OC deposited into the Mascarenhas de Moraes sediments are buried while the remaining 43% are mineralized. The estimate based on the *spatially resolved mean* OC burial rate (Mendonça et al. 2014) and the mean mineralization rate resulted in a similar *spatially resolved mean* OCBE in the Mascarenhas de Moraes reservoir – 55%. The extrapolation based on the OCBE at the pelagic sites, i.e. not applying any *spatially resolved* analysis, would result in an overestimation of 15 to 18% (mean OCBE of 67% in pelagic *coring* sites)."
- Page 15, line 3: "This is the first *highly spatially resolved* OCBE assessment that we know of. A similar approach has been used in natural boreal lakes, most of which showed *mean* OCBE of 5% to ~40%..."
- Page 15, line 8: "The boreal lakes' assessment suggested that *spatially resolved mean* OCBE can be predicted based on lake area and shape"

Editor: 2) Page 10, line 22. You probably mean "terrestrially derived sediment organic matter has been shown…" instead of "terrestrial sediment" that include inorganic matter

Authors: We corrected the sentence, which now reads "Terrestrially derived organic matter in sediments have been shown to be less labile and degrade more slowly than aquatic derived sediments…" (now on page 10, line 22).

Editor: 3) Page 14, line 22. Replace MSM with Mascarenhas de Moraes

Authors: We made this correction.

Reference

Mendonça, R., Kosten, S., Sobek, S., Cole, J., Bastos, A., Albuquerque, A., Cardoso, S., and Roland, F.: Carbon Sequestration in a Large Hydroelectric Reservoir: An Integrative Seismic Approach, Ecosystems, 17, 430-441, 10.1007/s10021-013-9735-3, 2014.