

## ***Interactive comment on “CO<sub>2</sub> partial pressure and CO<sub>2</sub> emissions from the lower Red River (Vietnam)” by Thi Phuong Quynh Le et al.***

### **Anonymous Referee #3**

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#### General Comments:

The manuscript entitled “CO<sub>2</sub> partial pressure and CO<sub>2</sub> emissions from the lower Red River (Vietnam)” by Le et al provides new and important data on CO<sub>2</sub> in the Lower Red River. The results are a good contribution for the understanding of the role of Asian rivers for the global carbon evasion from freshwater ecosystems. However, there are many technical problems that need to be address to increase the quality of the paper. I agree with the other reviewers that the estimate of the CO<sub>2</sub> evasion is the main problem in the paper and must be reworked. The figures and tables are clear and well designed. However, I suggested some changes in the number of figures and tables. In summary, the authors should review the flux calculation (see specific comments below); consider k600 calculations based on turbulence generated by water flow and;

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reorganize Results and Discussion sections. Specific comments and suggestions are below.

Specific comments:

66 – This sentence suggests that there is a “limited knowledge” about carbon flux. Does it mean that there are published information about carbon flux in the Red River, or not?

79 – In the figure 1, the Ba Lat station does not seem to be located about 50 km from the sea. Please clarify.

Some references in the introduction are missing (e.g. lines 48, 56)

86 – I suggest removing the sentence “see below for the detail river discharge in 2014” and insert the correct reference - figure, table etc.

109 – The sentence “All solutions used for. . .” is unnecessary.

151 – What is the “regulator”? You mean pump or a flux regulator? Please, clarify.

162 – By convention  $k_{600}$  is the gas transfer velocity normalized to a Schmidt number of 600. And  $k$  is the gas transfer velocity. “ $Sc$ ” should not be the “Schmidt number, normalized to Schmidt number of 600”. “ $Sc$ ” should be the Schmidt number of a given gas ( $CO_2$  in this case) at a given temperature. Please, clarify the calculation and check if the calculation is correct.

166 – I wonder why the authors did not considered the temperature variation measured by HOBO sensor to calculate “ $a$ ”? Were temperature records not made at the same time? In addition, conductivity is much higher in Ba Lat station suggesting differences in salinity among stations. If “ $a$ ” is a constant (line 167), the salinity variation seems not to be considered in the calculation.

170 – Please, check the units of each element of the equation. The flux was calculated in  $\mu\text{mol m}^{-2} \text{s}^{-1}$  but the  $k$ ,  $a$  and  $pCO_2$  air is  $\text{cm h}^{-1}$ ,  $\text{mol L}^{-1} \text{atm}^{-1}$  and ppm,

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respectively. Please reorganize the section 2.4.1 for clarification.

183 – If k600 values are closely related to flow velocity and channel gradient, why author used k600 values calculated from wind speed? The authors should present a convincing explanation or review the calculation and values.

220 – The same results are presented in Table 2 and Figure 2. Please, remove the table or the figure.

223 – I suggest add Alkalinity values in the table or figure 2.

257 – Change “monsoon” to “wet”.

263-269 – Abril et al., 2015 discuss overestimation of pCO<sub>2</sub> using total alkalinity in acidic, organic-rich freshwaters. However, if this water condition is not the case of Red River, the find of Abril is not an explanation for the opposite (lower calculate values when compared with the measured values). These values should be similar or, please, provide a clear and convincing explanation.

276 – Discussion inside the Results section. Results and Discussion are mixed in several parts of these sections. I suggest re-write and reorganize these sections.

Table 1 – Please double check the station location. I plot the station locations and there are some inconsistencies (e.g. Ba Lat is located in the ocean and not in the Red River).

Table 2 and Figure 2 – Why the values after +/- in table 2 and the error bar in Figure 2 are different? What does they mean?

Figure 6 – What the gray and dark circles mean. Dry and wet season? Insert these information in the figure caption.

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