Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-505-AC2, 2018

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "CO_2 partial pressure and CO_2 emissions from the lower Red River (Vietnam)" *by* Thi Phuong Quynh Le et al.

Thi Phuong Quynh Le et al.

quynhltp@gmail.com

Received and published: 30 April 2018

Dear anonymous reviewer,

Thank you very much for your kind suggestions and comments for ameliorating our manuscript.

We revised the ms in taking into account all comments and suggestions

Best regards,

On behalf of all co-authors

Thi Phuong Quynh LE

Printer-friendly version

Discussion paper

REVIEWER COMMENTS FOR THE AUTHOR Interactive comment on “CO2 partial pressure and CO2 emissions from the lower Red River (Vietnam)” by Thi Phuong Quynh Le et al. Anonymous Referee 1 Received and published: 19 January 2018

General Comments: This paper provides some important quantification of CO2 concentration, evasion rates, and temporal and spatial heterogeneity in an understudied Southeast Asian river system. Given the lack of data available on these systems, the concentration data presented in the paper is valuable on its own. I am concerned, however, at the large discrepancy between calculated and measured CO2 given the lack of a reasonable explanation aside from calculation error. Furthermore, along with what the other reviewer wrote, the reliance on wind-speed as the only determinant factor for k600 is subject to large errors in flux estimation. Knowing this, it is nearly impossible to assess how well correlated CO2 flux is with any of the environmental parameters used in the multi-variate analysis at the end of the paper. I think if the authors figured out why their calculated values are off, used a more broadly accepted model to estimate k600 (or better yet, measured it directly), and simply presented the concentration and flux measurements from the Red River, it would be a valuable contribution to the literature. Thank you very much for the helpful comments. We revised the paper taking into account your comments concerning k600. k600 now is calculated from the formula proposed by Raymond et al (2012), based on different variables such as river discharge, water velocity, slope. The values of k600 are now considered more realistic and then CO2 flux evasion was recalculated.

Specific Comments: -How exactly does the data presented in this manuscript relate to anthropogenic impacts? The authors suggest that the Red River is “strongly” affected by human activities but do not provide results that suggest humans have altered the amount or way by which CO2 is evaded from the river. The “influence of dams” based simply on observing higher concentrations at that site is unconvincing – there is no direct evidence. Likewise, the ascribed influence of human population is equally weak. Thank you for the comments. We revised the discussion about the human impact on

Printer-friendly version

Discussion paper

pCO2 and fCO2 of the Red river in the section “4.2 Spatial variations of pCO2 and fCO2 outgassing in pages 11- 12. In this section, separated factors such as dam impoundment, population density and land-use were discussed.

- There are more accurate ways to calculate k600 than from wind speed. As the other commenter suggested, instantaneous discharge, flow hydraulics, and even channel slope may provide better or more robust ways to model k600 compared to wind speed. The explanation that wind speed is driving the diel signature in CO2 flux is circular. Wind speed is how the flux was calculated in the first place, so higher winds during the day will always yield a “higher flux” of CO2 during the day. CO2 might have a completely different diel pattern if modelled with something other than wind speed. It’s hard to evaluate the seasonal variation of CO2 fluxes generated from only wind speed and concentration Thank you very much for the helpful comments. As mentioned above, k600 value was determined by the method proposed by Raymond et al (2012), then the CO2 outgassing fluxes were recalculated and discussed for their seasonal and spatial variations. K600 was calculated as presented in the section “2.5 CO2 fluxes determination” , page 5-6: “In this study, k600 was calculated using the equation from Raymond et al. (2012) based on stream velocity (V, in m s -1), slope (S, unitless), depth (D, in meters) and discharge (Q, in m3 s-1), as follow: k600 = 4725 $\pm$ 445 x (V x S) 0.86 $\pm$ 0.016 x Q-0.14 $\pm$ 0.012 x D 0.66 $\pm$ 0.029 Eq. (2)

- Although the authors suggest that their direct and calculated pCO2 values were well correlated, they do not seem to correspond very well at all. The y-axis in Figure 3 makes it impossible to appreciate the noise in this relationship. More importantly, there is no plausible explanation as to why the slope is not close to 1, but rather that calculated pCO2 was nearly 1/5 of that measured directly by their equilibrator. We apologize for the errors of pCO2 calculation values in the previous version of the manuscript. Values were corrected in the revised manuscript (see table 2). Figure 2 (fig 3 old) was also corrected. A difference between pCO2 calculated and measured was found and discussed in the revised manuscript page 7.

Printer-friendly version

Discussion paper

- No specific reasoning given as to why temperature was positively correlated with pCO2 concentration except enhanced weathering rates. Did the authors consider in-stream respiration? This is possibly related to enhanced decomposition rates of organic matter.

-What are the +/- values in any of the tables? Standard deviation? They are standard deviation. We added the information in the table captions.

- There seems to be overall very little diel signature in any of the water chemistry data presented in the paper. All of the differences seem to fit within the error bars of each "average" measurement. Yes, we fully agree with the reviewer, and the discussion concerning day-night variations (first paragraph of the Discussion) was rewritten. pCO2 differences between night and day were really low, most probably because of low temperature difference and low photosynthetic activity due to the turbidity of the Red River.

Technical Corrections: 17: I would avoid the use of the word "good" when describing a river system The word "good" was replaced by "representative"

19: Not sure what is meant by "carbon dynamic" The sentence was revised "This study aims to quantify the spatial and seasonal variability of CO2 partial pressure and CO2 emission of the lower Red River system"

21-22: Do you mean "relative" rather than "in contrast"? "Relative" was replaced as suggested

42-43: Unclear sentence summarizing Raymond 2013 The sentence was revised "Raymond et al. (2013) estimated a global evasion rate of 2.1 Pg C yr-1 from inland waters, and that global hot spots in stream and rivers which occupy only 20

113: How was alkalinity measured? There are no methods detailing this The method for alkalinity determination was added in the revised manuscript (see page 4)

277: Discussion mixed in with results, difficult to follow Results and discussion are now better separated, as suggested.

286: More discussion in the results section This was separated between results and discussion as suggested

346: Results being presented in the “Discussion” This was separated between results and discussion

359: Results being presented in the Discussion Results were added in the “Discussion” in page 12.

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2017-505/bg-2017-505-AC2-supplement.pdf

---

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-505, 2017.

Printer-friendly version

Discussion paper

Supplementary Material

CO_2 partial pressure and CO_2 emission along the lower Red River (Vietnam)

Thi Phuong Quynh Le[1*], Cyril Marchand[2,3], Cuong Tu Ho[4], Nhu Da Le[1], Thi Thuy Duong[4], Trung Kien Nguyen[4], XiXi Lu[5], Phuong Kieu Doan[1], Thi Mai Huong Nguyen[1] and Duy An Vu[1]

[1]: Institute of Natural Product Chemistry, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Road, Cau Giay, Hanoi, Vietnam.
[2]: IMPMC, Institut de Recherche pour le Développement (IRD), UPMC, CNRS, MNHN, Noumea, New Caledonia, France.
[3]: Faculty of Chemistry, University of Science – VNUHCM, 225 Nguyen Van Cu, Ho Chi Minh City, Vietnam
[4]: Institute of Environmental Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Road, Cau Giay, Hanoi, Vietnam.
[5]: Department of Geography, National University of Singapore, Arts Link 1, Singapore 117570, Singapore.

Correspondence to: Thi Phuong Quynh Le (quynhltp@yahoo.com or quynhltp@gmail.com)

Figure SM1: Daily variation of river discharge at the outlet of the Thao (Yen Bai), Da (Hoa Binh), Lo (Vu Quang) rivers and in the main branch of the Red River at Hanoi and Ba Lat stations in 2014.

Fig. 1.