

Interactive comment on “Impact of peatlands on carbon dioxide (CO₂) emissions from the Rajang River and Estuary, Malaysia” by Denise Müller-Dum et al.

Anonymous Referee #1

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The manuscript (MS) submitted by Müller-Dum et al. investigates the C exports from the Rajang River and Estuary (Indonesia) based on sampling cruises during wet and dry season. That includes observations of CO₂ partial pressures (pCO₂), calculation of CO₂ emissions from the water surface, and lateral exports of DOC, POC, and DIC. pCO₂ and emissions are detailed for the peat-draining, non-peat-draining and estuarine parts of the river. One important result is that although the peat cover in the basin is significant, its contribution to C exports from the river system is not visible, as the peatlands are concentrated around the river delta. The manuscript of Müller-Dum et al. is of interest for the readership of Biogeosciences, because it reports the first pCO₂ and CO₂ emission estimates of this important river in SE-Asia, which is surprisingly

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different from what would have been expected from observation from over peat draining rivers in this area. The methodology is well described and seems to be sound. The MS is in most parts well written. The results support the main conclusions drawn in the MS. The discussion of results is thorough and covers well the state of the art with respect to literature references. I suggest the publication of the MS after some moderate revisions. Please, find my comments to the authors below.

Major comment: You have been measuring pCO₂ for quite different parts of the delta system delta (estuary and peat part of the river network) during the wet and the dry season. That becomes quite apparent from the figure 4. Did you do anything to compensate for the discrepancy in observed delta parts? If not, I would suggest that you calculate and report the average wet and dry season pCO₂ only for the parts you have been sampling in both seasons.

General comments: Abstract: The abstract is comprehensible and summarizes well the main findings. However, the abstract would need some minor restructuring: P2, L8-9: It's not easy to see here how these DIC and delta¹³C values show that peatlands are not the main source. That would require some more explanation within the abstract. Maybe you could discard these two number from the abstract.

P2, L10: This sentence is repeating what was stated two sentences before.

P2, L10-12: "Thus...". I feel this sentence should conclude the abstract.

P2, L13-15: "CO₂ fluxes...". This sentence should come slightly earlier and directly follow your statements related to the pCO₂.

Introduction: P3, L2-3: Make clear that you are talking about terrestrial derived C fluxes.

P3, L13-14: Could you report the proportion of the water flux for comparison?

P3, L25-26: Did you do longitudinal transects from no-peat-influenced river reaches to river reaches surrounded by peat? If yes, it would be good to state that here.

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P3, L26-27: Maybe you should discard that last sentence.

Methodology: The only thing I miss is an explanation why you observed the $\delta^{13}\text{C}$ of DIC, and maybe the endmembers you used for your isotopic mixing model, if you applied one.

Results P9,L5-12: With regard to the positive correlation between $\delta^{13}\text{C}$ and DIC concentration in the estuary: What is the marine endmember of $\delta^{13}\text{C}$ in DIC here? With regard to the negative correlation between $\delta^{13}\text{C}$ and DIC concentration in the freshwater part: Is that correlation even stronger between $\delta^{13}\text{C}$ and pCO_2 ?

P9, L8: “Calculate DIC for the wet ...”. For which part of the river network? The freshwater part? Please, clarify!

P9, L21-13: Is it possible to distinguish pCO_2 observations you made during high, rising, falling, and low tide during your cruises? Or were your cruises in the delta predominantly done during a specific part of the tidal cycle? Were those different for wet and dry season cruises?

P9, L27-28: Does that mean you cannot distinguish the diurnal variations from tidal variations for the delta? And you do not have enough data from the non-tidal part to identify a diurnal signal? Please, clarify.

P9, L30 – P10,L1: How did you calculate those gas exchange velocities? I see how your calculations compare well to the A11 model, but R01 model seems to be quite far off. Are those the results for the whole river system?

P10, L3-5: Those emission rates refer to the entire observed river network? Did you weight the emission rates along the longitudinal profile by stream width?

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