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Interactive comment on "Fate of peat-derived carbon and associated CO_2 and CO emissions from two Southeast Asian estuaries" *by* D. Müller et al.

Anonymous Referee #2

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General remarks

The paper presents a high quality dataset from a not well studied region. The topic of carbon cycling in coupled systems, in this case peatlands, streams, and estuaries is highly interesting and fits to the focus of the journal. The data are new and strongly deserve publication. To accept this manuscript, however, a number of critical points have to be addressed:

The main problem with the manuscript is that the data do not really fit to the story. The rivers are dominated by upland areas, just passing the peat area on their way to the ocean. The authors state that only 3 and 15% of the DOC in the rivers stems from the

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peat area. Thus, the link between the peatlands and the stream biogeochemistry is not really convincing. I recommend to re-write the story with a focus on the turnover of land derived organic carbon in the estuaries.

A second shortcoming of the paper is the absence of data on methane emissions. Since the authors used a FTIR, I am pretty sure that they have also data on methane. Probably, they saved those data for another paper. However, for the actual manuscript I consider data on methane production and emission indispensable.

My third point is that the fate of organic carbon in aquatic systems cannot be understood without the inclusion of the sediments. This is especially relevant in such large scale studies, where spatial patterns of carbon cycling are usually heavily influenced by sedimentation and benthic metabolism. The authors probably do not have data on sediment quality or carbon turnover. However, it should be possible to discuss the possible role of sediments using relevant literature.

Detailed remarks

8301, l.8: It is not clear to me why different units were used for CO2 and CO. I suggest to use either partial pressure or concentration.

8303, l.2: DOC is probably not completely oxidized to CO and CO2, but a major reaction-product is (modified) DOC.

8303, l.24: Not being an expert in marine science I do not know the meaning of the word “macrotidal”.

8304, l23: Explain all abbreviations (in this case CTD).

8304, l.24: Wasn′t the boat drift affected by wind?

8305, section 2.3: give companies and country for instruments

8305, l.13: Do these filters really have a defined pore-size of 0.7 μm?

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8308, l.1-3: Better use same unit for both gases.

8308, l.14: How long were the chamber measurements? A few minutes per measurement? Did you check the temperature in the chamber. There might be substantial warming under the tropical sun.

8309, l.1: Was the surface rough?

8301, section 3.2: I wonder whether the estuary was fully mixed all the time. This is important if the samples are considered to be representative for the whole water column.

83011, l.27How deep were the estuaries? I wonder whether a large part of the turbidity originates from re-suspended sediment rather than river discharge.

8313, l.1: The week correlation between O2 and CO2 is a hint that CO2 was not regulated by metabolic processes but by chemical reactions and transport processes.

8313, l.12: Wasn't there a diurnal cycle of CO2? If not, that is another hint that CO2 was not controlled by metabolism.

8314, l.3: I do not completely understand, which k values were used in this calculations.

8314: The whole section contains a lot of method descriptions. I wonder whether some text can be moved to the method section.

8314, l.25: I guess you mean the "total flux between water and atmosphere for the Lupar was . . ."

8314, l.28: Is this the best way to estimate river surface area? Maybe you should try to multiply river length with an estimated mean width.

8314, l.26: What about CH4?

8315, l.1: I do not understand why a mean river flux was used to determine the flux from the peatland.

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8315, l.2: What is the “rest”?

8315, last section: I wonder whether the GHG fluxes from the river network should be included in the budget or if it is probably better to concentrate on the estuary. The database for the streams is suboptimal, because, e.g. small tributaries are neglected.

8315, l.13: It looks a bit like the classical zonation of processes in a reservoir as nicely explained in the book of Thornton (Reservoir Limnology, 1990). Metabolic processes are often highest in the intermediate section of reservoirs, because when the stream is entering the lentic waterbody, that is the site of sedimentation and also plankton development. It would be extremely interesting to have some information about the sediments along the stream-estuary transition.

8316, l.15: Above you say that the correlation between AOU and CO2 was bad. What is true? Maybe show data.

8316, l.28: pH has a strong influence on the CO2 concentration. Do you know the pH of the streams draining the peatlands and is it possible that the CO2 concentration is mostly regulated by pH changes and geochemical reactions?

8317, l.2: Since you know k600, you can easily calculate reaeration from the measured oxygen concentrations in the water.

8317, l.14: What is the mechanism of CO production from particles?

8317, l.29: There is much more literature about the effect of UV on the degradability of DOM. Please improve the discussion at this point.

8319, section 4.4: I suggest to discuss also the role of temperature as a regulator of the fluxes.

8320, l.5: Better “floating chambers” instead of “FCs”.

8321, l.6: Yes – the pH is important. That discussion has to be extended and placed earlier in the paper.

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8336, Figure 3: I do not fully understand the lines.

8339, Figure 6: I suggest to include a 1:1 line

8340, Figure 7: I guess the location of the measurements was variable during the diurnal cycles. Was the boat also moving in the darkness or is there a possible bias towards non-moving measurements during the night?

Interactive comment on Biogeosciences Discuss., 12, 8299, 2015.