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## ***Interactive comment on “Fluvial organic carbon losses from a Bornean blackwater river” by S. Moore et al.***

**S. Moore et al.**

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The authors would like to thank all the reviewers for their comments. We have found them very useful in helping to develop the manuscript further. Most comments have been addressed in the revised manuscript and below we provide further response to those comments that we feel require it.

T. Jennerjahn:

Comment (C): Title: “The title is informative, but I would not use the term “Borneo”. The Indonesians call the island Kalimantan.” Response (R): Kalimantan is the name of the Indonesian part that makes up the island of Borneo, along with Sabah and Sarawak (Malaysia) and Brunei. We have maintained the word Bornean in our title as

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it is geographically correct.

C: Introduction: p. 8321 "...you mention global DOC fluxes which are much lower than the 'commonly accepted estimates' you mentioned in l. 6-8." R: The 'commonly accepted estimates' are TOC flux estimates as opposed to solely DOC fluxes. This has been modified to read more clearly. Methods:

C: p. 8322 "You mention average temperature and rainfall citing Page et al., 2004, and then come up with a 30-year record of these data taken from another source (Hooijer et al, 2008)." R: Two references were cited as we use Page et al., 2004 as a current average annual rainfall and consider Hooijer et al., 2008 to be more appropriate for long-term seasonal variation in rainfall in order to define 'dry' and 'wet' seasons. We agree with your suggestion of a graph displaying this data and this is now presented as the revised figure 1.

C: p. 8323 "Here you provide a lot...should be included in the map (Fig. 1)." R: We intend to focus the discussion of land use/cover in the subsequent manuscript with a far more temporally and spatially detailed data set. We have therefore reduced the unnecessary details about land use/cover and moved the remaining text to the fig 2. caption.

C: p. 8324 "I wouldn't call the tidal range "small"...Do they collect tide data from Indonesia? It is not mentioned in the reference list. R: 'Small range' has been replaced with 'mesotidal range'. "The United Kingdom Hydrographic Office" is now mentioned in the reference list. They collect data from a number of tidal stations in the Java Sea.

Results: The results and discussion section have been revised and separated more clearly to form two distinct sections. Results are now presented in the past tense to clarify that the data were true at the time of measurement. As suggested, focus on the POC fraction has been reduced.

C: p. 8325 "Here you mention figure 3 for the first time without having mentioned figure

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2 beforehand” R: The figures and their numbering have been changed so that they appear in chronological order within the manuscript.

C: p. 8327 “The dry vs wet season discussion requires a bit more detail. . .and what are the differences in precipitation? R: This should now be clearer with the aid of figure 1 and a definition of ‘wet’ and ‘dry’ season provided in the Methods.

C: p. 8327 “You mention average concentrations which differ from those given on page 8325. Please clarify.” R: These average concentrations differ because they are averages taken over different stretches of the river. Those reported on p. 8325 are for the first 100 km of the river whereas those reported on p 8327 are averages over the entire length of the river. The text has been modified to indicate clearly the river stretches being referred to.

C: p. 8328 “Here you report data in less than thousands of Tg.” R: We appreciate your comment, but feel that by keeping the units consistent throughout, we make comparison of the findings easier for the reader, rather than switching between units.

C: p. 8329 “This calculation seems a bit arbitrary. . .last sentence is rather a speculation.” R: We feel that by including fig 1. and providing detailed definitions of ‘wet’ and ‘dry’ season we provide a more robust basis from which to draw the conclusions reported.

Discussion: See earlier comment regarding land use/cover. Instead, the aim of this manuscript is to quantify the amount of fluvial organic carbon lost from the River Sebangau.

C: p. 8329 “So, what is it: alternative or additional?...as mentioned in the beginning sentence.” R: Unfortunately we do not have the required accompanying datasets (DO data) to say with any certainty that organic matter decomposition is the process at work responsible for the decreases in DOC concentration. Therefore we have purposefully left this discussion open to prevent speculation.

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C: p. 8332 “Why do you think that the Sebangau is “a major contributor of organic carbon to the ocean?...comparison to peat-draining rivers from other climate zones.” R: We agree that the original sentence was somewhat misleading and that the total carbon load from the Sebangau is small in comparison with the Amazon. We have revised to emphasise that we mean, per unit area, the Sebangau is a significant contributor of carbon to the ocean.

C: p. 8333 “Here you come up with your final calculations of carbon fluxes from the River Sebangau and extrapolate for whole Indonesia. .Is there a calculation mistake or did I miss something? R: The reason for the mismatch in numbers is the use of different methodologies used in upscaling; Baum et al.’s estimate is calculated using a linear interpolated C flux based on average rainfall and inferred flux data from the whole of Indonesia. Our method employs extrapolating the calculated Sebangau basin flux (g C m<sup>-2</sup>) to the peatland area of Indonesia and is not based on precipitation data.

References: The UKHO reference has been added to the list as well as several others, including Alkhatib et al., 2007.

Figures: The numbering has been revised to match the revised text.

Font and symbol size have been increased.

Figure ‘1’ (now figure 2): Revised to include more land-cover/use information

Figure ‘2’ (now figure 4): We have left this in as we feel it illustrates the carbon dynamics in the River Sebangau, complimentary to the description in the text.

Figure ‘3’ and ‘4’ (now figures 3 and 5): These curves now have additional explanation discussed in the text.

Figure ‘5’ (now deleted)

F. Darchambeau:

C: p. 8324 “Sample preparation and analysis” R: Thank you for alerting us to the

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‘uncommon procedure’ - this is indeed a typographical error and we can confirm that the procedure was oven drying for 24 hours at 40°C. This has been changed in the revised manuscript. For a more detailed description of the POC methodology please see the first author response (C3897, date 18.11.10). We report POC concentration values that are consistent with other studies of tropical blackwater rivers (generally <10% of DOC).

C: p. 8326 “This section should adequately be moved to M&M section.” R: Although this section is a methodological description, we don’t feel that these methods are generic enough to be placed in the methods section as they only relate to one small part of the discussion. We agree that it is however misplaced in the results section and has therefore been moved to the discussion sub-section 4.1 DOC.

C: p. 8328 “Change the unit in order to diminish the number of decimals (use e.g. kg).” R: (see above) We appreciate your comment, but feel that by keeping the units consistent throughout, we make comparison of the findings easier for the reader, rather than switching between units.

C: p. 8332 “This sentence is unclear. Could you clarify?” R: This sentence relates to the water residence time within the peat. During times of high stream flow/discharge, higher water tables and increased surface runoff reduces the water residence time in the peat which results in lower DOC concentrations and vice-versa.

Figure ‘1’ (now figure 2): This figure caption has been added to and the Sebangau watershed shaded grey to clarify.

A.Coyne:

We have edited and repositioned large parts of the ‘results’ and ‘discussion’ sections to improve the logical flow of text and overall manuscript organisation. We agree that discharge data is a valuable addition and have consequently added an extra ‘discharge’ column in Table 1 with added reference to it in the results and discussion sections to

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help clarify some of the interpretation of DOC/POC temporal variation.

We are unsure what is meant by the following: “the authors could strengthen this output by focusing more on the spatial DOC evolution with regard to DOC comprises between 88% and 94% of TOC.” However, we have provided probable explanations for why much of the TOC is comprised of DOC compared to POC.

We agree that a higher temporal sampling resolution would improve the precision of the annual flux estimate. However, this was simply not possible given the difficulties involved in sampling from such a remote area. Sampling was only possible at two time periods during our research trips to Borneo; the wet and dry season. We have, however, added figure 1 which sets the timing of these sampling campaigns on a mean monthly rainfall chart (no hydrograph available) and helps to show that the sampling was representative of contrasting hydrological conditions. The fact that DOC/POC concentrations are relatively constant throughout the year also helps to justify our sampling strategy. In the manuscript, we outline the limitations in extrapolating from one catchment to the whole of Indonesia (peat area) and have added information about other watersheds (e.g. The Siak and Dumai), highlighting the similarities between them (land cover type, pH, DOC/POC concentrations) to show that the Sebangau catchment is highly representative of other large peatland areas within Indonesia.

Nalgene bottles and cellulose acetate membrane filters likely cause negligible/no contamination when pre-rinsed (as was the case in this study). As you mention, contamination is also likely to be negligible in this system due to very high DOC concentrations (>60 mg l<sup>-1</sup>). Analytical quality control for DOC/POC concentration as well as water discharge has been added to the methods.

Figure ‘1’ (now figure 2): Caption has been revised and the Sebangau catchment shaded grey to clarify.

Figures (general): Revised numbering to match revised text. ‘Input’ data points for the channels have been increased in size to increase clarity.

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Anonymous Referee #4:

Your comment about sampling resolution is a valid one and ideally we would have liked to be able to collect monthly data. However, logistically, this was simply not possible. The DOC/POC data presented in this manuscript are the first data ever collected from the Sebangau and are intended as first estimates. We hope that we (or failing that, another research group) can sample with increased resolution in the future in order to constrain our first estimate. See response comment to A.Coyne, 3rd paragraph (above).

The organisation of the manuscript has been revised to contain explicit 'results' and 'discussion' sections. DOC/POC and discharge precision details are now included in the methods. Figure numbering has been revised. The discussion section has been expanded to include more comparisons with other DOC/POC datasets which helps to place our findings in context.

Thank you again to all the reviewers for their time and thoughts on this manuscript. S. Moore et al.

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Interactive comment on Biogeosciences Discuss., 7, 8319, 2010.

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