Biogeosciences

Discussions

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Interactive comment on "Drivers of seasonal and event scale DOC dynamics at the outlet of mountainous peatlands revealed by high frequency monitoring" *by* Thomas Rosset et al.

Anonymous Referee #2

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The manuscript of Thomas Rosset et al. aims at disentangling drivers of DOC dynamics in different peatland catchments. It utilizes a spectrofluorometric probe to monitor high frequency DOC concentrations. Additionally, parameters like temperature, precipitation, stream and peat water level were recorded to explain DOC concentration variability by means of statistic modelling. The generated dataset is quite extensive and worth to be published in Biogeosciences. As I was really pleased by the title and abstract I must say that the main part of the manuscript is rather descriptive and lacks a clear message or novelty. A major drawback of this manuscript is the lack of discussion of major processes and drivers concerning DOC export from peatlands, like hydrological flow paths, biogeochemistry and hydrologic preconditions. In its current

state, the study is too much focused on the statistical results of their modelling, but no or little mechanistic explanation of the modelling results. What exactly happens during a rainfall/discharge/DOC concentration event in the different systems and concerning the hydrologic conditions? In general I think that this paper needs a stronger discussion on hydrologic flow paths in peatland systems. Flow paths are not discussed until the very end. I miss a description of e.g. a simple acrotelm/catotelm distinction, which provide different hydraulic conductivities and thus lead to a distinct hydrograph. I miss a discussion of pre-event conditions, or of hydraulic conductivities in general, contributing to different flow paths. The interpretation of the piezometer data is difficult, as there is no information provided about depth of installation, hydraulic conductivities and thus how to interpret recession times. I miss mentioning importance of pH (DOC solubility!), do you have data about this? It is mentioned that the fen site is on limestone, while bog systems are generally acidic systems. As the authors are throwing in the term "biogeochemical hotspot" in the end: I would be pleased to hear more about this earlier on in the manuscript. The introduction on P 2 second paragraph is rather superficial. Furthermore, I am very concerned by the representativeness of the bog site especially when it is compared to a fen as exemplary system (Scientific objective no 3, P3 line 3). There are several factors differing between the sites, besides just fen/bog: climate (e.g. 4 month snow covered – no snow hardly sub-zero temperatures), anthropogenic influence (burned – unburned). Additionally, mentioning agro-pastoral practices: does this mean the bog is used for grazing? Could these systems thus be considered as representative? Besides this, from the location maps I draw conclusions that apparently the monitoring spot also receives water which is not originating from the peatlands itself. Is there any data about it? Do you have any idea about the whole catchment and how much water contributes to the discharge that is not from the peatlands? This is one of my major concerns, as I feel like the authors completely disregard this. If the concentration pattern are driven by discharge from other areas, the discussion of concentration pattern and water levels at the monitoring spot and within the peatland would be difficult. Did you calculate also total DOC export fluxes next to the concentrations?

This would highlight, how important this carbon output is to the system, as the concentrations seem to be quite low. Besides from this: Did you also compare the Bernadouze and Ech sites over a time period, where data from both sites are available? This would help to access, if there is any bias by having two different time periods here. Weather conditions can be very different each year having a very dry or wet year or season, respectively. I am no native speaker myself, so it is not easy for me to criticize language issues. But even though in your acknowledgement you state a language assistance, I am sure that there are some unusual or wrong wordings in the text (e.g. confusing usage of "contrasted" "strong concentrations"). So, from my point of view this needs further editing. Furthermore, your expression is imprecise at some points. Please edit (e.g. header of Table 1; P5 Lines2-5: it is not clear what you mean; or speaking of "stream level increase") Please, check your figures for clear distinction and readability when not color printed (e.g. Fig 1 stream/peatland boundary, Fig. 5 Ech/Ber)

In summary I see a very valuable dataset of potentially high interest. However, in its current state the discussion seems too superficial and the study remains rather descriptive. Therefore, I recommend major revisions before this study can be accepted for publication.

Specific comments:

P1 L 10/P2 L2: A very common number I know is 30% of global carbon stock. Please check more references for the number you give.

P2 L 12-15: too simplistic statements. Drivers of DOC concentration are not dependent on latitude, but mostly on the system studied and climate

P 2 L 32: "seasonal climatic conditions are contrasted" what does this mean?

P3 L 19: What "logging activities" do you mean?

P4 L 21: In which depths are the piezometers connected to the peat body? This is very important if you talk about recession times and peat water temperature. Maybe

also interesting: What diameter have these wells? Or did you attempt to determine hydraulic conductivities by a slug test?

P5 L 2 "Flood sampling" is a weird expression. What about event sampling?

P5 L 12: when did "the turbidity events" occur? I assume this is mostly the case during high discharge. How much of your DOC event data is affected by this?

P5 L 11: Reference not correctly inserted in text, happens occasionally in the manuscript

P6 L 20: which variables were selected? Next sentences are unclear.

P7 L 31 "...1.36 and 0.35. in..." unit missing

P7 L 19: why? You did not introduce site heterogeneity before (Introduction). I would also like to have an introduction in hydrologic connectivity, so are the different spots relevant for the discharge? What about the rest of the catchment?

P8 L 4 ff: Discuss different pre-conditions, changes in hydrologic conductivity with depth

P8 L 9 ff: give conc. maxima. I am very surprised by the low mean values. When you have 2 and 7 mg/L mean DOC concentrations I am about to doubt the significance for the carbon balance. This only gives me the idea that you have a lot of water not originating from the peatlands itself. Calculating fluxes might be helpful here. You might check literature and compare

P8 L 31/32: Is this much? More than half cannot be explained by your model in Ech, other factors seem very important as well. Which could this be?

P 9 L 1: Peat water temperature dependent on depth?

P 9 L 9: speaking from "water table increase" and "water level increase" is confusing to me. Give more precise names, maybe include "stream" or "peat" for clear distinction

P9 L 19: This is a very simple statement and would be very odd, if this is not the case.

P9 L 27: what is a "strong concentration"?

P9 L 29: Please reword

P9 L 30: Is this important? What is the novel statement/finding of your study? So far I mainly see confirmation of former results

P 10 L 2 ff: Biogeochemistry? This is new and not mentioned before. Please introduce, the biogeochemical background or processes could be much more discussed in this paper

P 10 L 5: expression "Thanks to" sounds uncommon, please reword

P. 10 L 7 following: Chapter 5.2 is badly structured. If evapotranspiration is unlikely don't put it there so prominent. The discussion of this part is interrupted and starts again further below -> confusing

P11 L 1: Peat pore water DOC: You did not mention those in the result section. A short description/discussion about those concentrations would be nice.

P11 L 3 f: What differences? Explanatory variables? Leachable Pools is a good keyword, but please discuss this on your data and not switch directly to the next topic.

P11 L 8. This is indicative for the discussion. There is just an isolated statement that vegetation type plays a role for DOC production. How is this related to your findings?

P 11 L 21: This is not true! Please try some more literature search

P 11 L 22 ff: Discuss flowpaths. Try e.g. DOC concentration vs Q plots. You throw in "non-linear flow DOC concentration relationship", try to discuss this.

P 11 L 30: just single observations, discuss mechanisms

P 12 L 3-4. Provide references

P12 L3-12: This is all described before! Provide references and try to discuss more about pre-event conditions

P12 L 8f: This finding is not new. Give references.

P12 L 13- P13 L13: Missing point: Conductivity in peatlands typically changes/decreases with depth! What depths are your piezometer? Give references! This is not a new topic! An important keyword here would be 'transmissivity feedback' or a similar effect.

P13 L 8 ff: This is nothing else than hydraulic conductivities

P13 L 18: introduce the term "hot moments"; what are the processes inducing hot moments?

P13 L 20: hydraulic conductivity? Acrotelm/catotelm in bog vs fen?

Fig. 1: Additionally, as your catchment is in a mountain area, it might be helpful to have some contour lines.

Fig. 2: showing an exemplary DOC event and way of examination is helpful. I would also like to see corresponding discharge values. In general an evaluation of DOC versus discharge (DOC/Q plot) might improve understanding of flow paths and DOC origin

Fig. 3: maybe add a line in the Bernadouze data set where the Ech dataset starts -> better comparability

Fig. 6: I am a bit lost what you want to show here. This is not how a peatland complex looks like and far too generalized trends that you cannot state like this.

Table 1: Header is not self-explanatory. Why did you choose peat water temperature at the beginning of DOC event and not weekly mean like at the other parameter?

Table 2: Check time period given for Ech. It seems to be incorrect (2015-2017?).

BGD

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comment

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Discussion paper