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Biogeosciences Discussions

Interactive comment on "The significance of organic carbon and nutrient export frompeatland-dominated landscapes subject to disturbance" *by* S. Waldron et al.

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In this paper the authors used nutrient stochiometry to try to predict the fraction of peatland dominated catchment DOC losses sensitive to heterotrophic respiration. In addition they wanted to assess whether soil disturbances as a result of windfarm development would affect catchment DOC and nutrient losses downstream from the disturbances. For this they measured a number of parameters (DOC, POC, TDP, TDN among others) at two catchments in Scotland (one with disturbance planned and partly executed and one undisturbed) for about one year. Although sampling protocol and measurements differed between the catchments, the set-up was such that this study

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Interactive Discussion
Discussion Paper

reports a valuable exercise improving our knowledge about catchment-scale nutrient and DOC dynamics coming from a research group and first author with a good track-record in this particular field.

General Comments

When reading your introduction (and discussion) I wondered about the relative importance of autogenic degradation (uv-degradation) of DOC in respect to heterotrophic respiration. I assume that for the use of nutrient stochiometry, uv-degradation must play a less important role than heterotrophic respiration. Could you maybe expand on this?

M&M: Could you elaborate a bit more on the statistical models you used? Did you use repeated measurements?, What factors were in the model, was your assumption of normality correct?

M&M:Perhaps you could explain why you measured the different P fractions?

M&M:Line 23. Could you elaborate on the way this measurement would affect the concentrations measured? Did you perhaps test this on the Whitelee samples, as you implied in the results on page 1149, line 24?

M&M:I miss methods followed for the d13C or d14C analyses.

Results: At present you do not refer to the disturbance dates in the Whitelee catchment in your results, leaving the reader wondering about possible correlations. Perhaps you could include some information on this in the text (and the figures, with numbered arrows?). Alternatively you could add an additional result-paragraph relating to correlations between measurements and disturbances, it being one of the aims of the study.

Results: I found it interesting that you see a weak relationship (small R2 value) between SRP and DOC for the N-draining catchment but a good one for the S-draining catchment whereas you find the opposite for NO3-, further confirming your conclusions on inter-catchment differences at page 1152:line 19

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Results: I miss the description of the results listed in tables 1 and 2 (now discussed in discussion). I suggest moving the assumptions and results of both tables to the result section. In this way you could focus your discussion more on the constrictions of the assumptions (the latter could use some elaboration).

Discussion: One of the assumptions behind using TP in the stochiometry calculations is that microorganisms can use DOP if P becomes scarce. The reference you use however (Lovdal et al. 2007), is not really representative for peatland waters. I wouldn’t be surprised that a (large) part of the DOP is inaccessible for the microbes – perhaps bound to DOC/organo-metallic complexes? Do you have any references referring to a study system more akin to peatlands (acidic, poor litter quality, high lignin, humic acid concentrations?).

Discussion: I suggest shortly mentioning denitrification as a possibility for removing N in disturbed catchments

Discussion: Could you elaborate on the relevant importance of uv-degradation/ light penetration in relation to heterotrophic respiration and the use of nutrient stochiometry in predicting potential conversion of DOC to CO2

Specific comments

Title: As the use of nutrient stochiometry takes such a prominent role in your paper, I would suggest letting the title reflect this. In this way you would stress the importance of the processes (even if you cannot draw any firm conclusions) instread of stresing the study as a measurements exercise

Abstract: Lines 8-10. I suggest to change sentence into Whitelee… development to host a windfarm. (delete the particulars).

Line 15. Could you define biomass?. I guess you mean microbial/ bacterial biomass.

Lines 26. Maybe change sentence into: … development in ecosystems/catchments with high terrestrial C storage. Being a non-native speaker devel-

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opment of terrestrial carbon stores was a bit confusing, because of the alternative meanings of the word development.

Introduction: Presently your introduction is very short, whereas your discussion is rather long. I would suggest moving some parts of the discussion into your introduction. As far as I can see it, Page 1153: lines 1-7 & Page 1150: lines 14-23 & Page 1156: line 28-Page 1157: line 7 could be moved to the introduction, strengthening the reasons for doing the study and helping to further focuss the discussion.

Materials and methods Maybe you could consider ordering the text using the following structure to facilitate quick reading. Under site description: 1) position, and climate (are there any data available for precipitation/ mean temperature for Whitelee?), then 2) geomorfology (including explanation of N, S draining slopes) and 3) land use/vegetation type (including area were most developments will take place/ are planned and where possible also relate this to the N, S draining catchments). All three points nested within site. So first all three points for one site, then for the other. After this, under a new subheading maybe: experimental set-up and sampling. Here you could indicate the nine sub-catchments for Whitelee and the differences in sampling schemes. How frequent did you sample the Glen Dye catchment? I would also describe here the dates of the development plans in relation to your sampling period. Do you have dates/periods during which the trees were removed, also relating to the N, S draining catchment?

At present the site description is extensive. Perhaps you could shorten it a bit by removing information not directly relating to the study. For example I would omit future developments outside your sampling period. Perhaps you could also consider deleting the reference to grouse/ red deer shooting. I also suggest deleting the detailed information relating to power of the windfarm. You could just refer to the literature source for further details.

Page 1146, line 10. How was the likelihood of carbonate in the samples determined? Was this done based on pH?

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Page 1146, Line 17. Could you please insert a reference for this assumption?

Page 1147: line 4. Could you please insert the criteria you used for excluding data?

Results

I suggest using subheadings to facilitate quick reading

I suggest to stress the conclusions/process more than the values you mentioned. Now you start each paragraph with a numerical statement followed by the conclusion that you draw from it. Personally I find a text more easy to read if the most important statement (and for me this is the conclusion) can be found early in the paragraph.

I would consider deleting page 1148:line 27-page 1149:line 6

I suggest first discussing the DOC relationship with TP, then with SRP (change current order

Discussion

I suggest using subheadings to facilitate quick reading

Page 1156:line12-17. I suggest moving this information to the materials & methods section

Page 1159:line4. I suggest following change (in italics) ..carbon sequestration in the soils.

Conclusions

Could you maybe shorten this part a bit?, only mentioning the most important parts?/ Take home messages?

Figures Could you perhaps indicate the type of disturbances/ disturbance dates into figs 3 & 4?

Could you add the reference to Cross et al 2005 into fig 6 legend?

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Interactive Comment

Are figures 2 and 7 really necessary? Maybe mentioning/ describing these results in the text is enough?

Interactive comment on Biogeosciences Discuss., 5, 1139, 2008.