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Interactive comment on "Synchrony in catchment stream colour levels is driven by both local and regional climate" *by* Brian C. Doyle et al.

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Responses to reviewer No 1' Comment:s for Doyle, B. C., de Eyto, E., Dillane, M., Poole, R., McCarthy, V., Ryder, E., and Jennings, E.: Synchrony in catchment stream colour levels is driven by both local and regional climate, Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-272, in review, 2018.

Reviewer 1

Comment:

Specific Comment:s to the authors - Throughout the manuscript: The authors often use terms such as "controls" and "drivers" (see e.g. p. 2, L. 11). These terms imply mechanistic relationships between environmental drivers and water color. However, the

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authors used a statistical approach that allows to investigate correlations, not mechanistic links. I suggest to rephrase all terms throughout the manuscript to make clear that relationships were correlative, not mechanistic.

Response:

We agree generally with the reviewer on this point. We have gone through the manuscript and replaced with terms that reflect the statistical nature of our analysis in many places. These include, for example, p2 line 11: 'and used to assess the effect of individual catchment characteristics and identify the drivers that best explained observed temporal change in river colour.' Another example at p2 line 13: 'General additive mixed modelling was used to identify the principle environmental drivers that explained a significant percentage of the deviance in colour levels in the rivers.' However, we would also argue that there are well recognised mechanistic links between local weather and the concentration of humic material in surface waters in peat catchments (Clark et al., 2008; Ryder et al., 2014; Ritson et al., 2017). Therefore where required and particularly in relation to this analysis we use the term drivers which we now have defined in the methods section as follows: p. 7 L24: 'To identify the main explanatory factors, which we refer to as drivers, of colour, general additive mixed models (GAMM) with cubic smoothing regression splines and Gaussian distributions were developed using the mgcv package (Wood, 2006).'

Comment:

p. 2, L. 1 (Title): Here, the term "climate" is used, but in the abstract (L. 25) the term "meteorological drivers". Please harmonize.

Response:

To address this point, the text now reads. 'The results of the study highlighted the interaction of catchment characteristics and local and regional climate in controlling aquatic carbon export. The important role of temperature, and past and current precipitation, in

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Discussion paper

particular, show the vulnerability of blanket peatland carbon stores to projected climate change.'

Comment::

p. 2, L. 4: the term "reservoirs" could be misunderstood, especially by the aquatic biogeochemistry community. Maybe simply use the term "stocks", or "soils" instead of "terrestrial reservoirs"?

Response:

We agree. The text now reads. 'significant loads of carbon from terrestrial stocks to downstream freshwater and marine aquatic ecosystems'

Comment:

p. 2, L. 7-10: This is a very long sentence and hard to digest. I suggest to split it.

Response:

We agree. The sentence now reads. 'We analysed sub-annual and inter-annual changes in river water colour (a reliable proxy measurement of dissolved organic carbon (DOC)) using six years of weekly data, from 2011 to 2016. This time-series data set was gathered from three contiguous river sub-catchments, the Black, the Glenamong and the Srahrevagh, in a blanket peatland catchment system.'

Comment:

P. 2, L. 12: maybe clarify more by adding "in correlations" after "frequencies"?

Response:

We agree – the sentence now reads. 'while wavelet cross correlation analysis was used to identify common frequencies in correlations.'

Comment:

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P. 2, L. 12-14: “Although at 130 mg PtCo L-1, the colour levels in the Srahrevagh (the subcatchment with lower rainfall and higher forest cover) were almost 50% higher than those from the Black and Glenamong, 95 and 84 mg Pt Co L-1 respectively.” Why do the authors introduce the sentence with “although”? is it to highlight that the low rainfall catchment was expected to have clearer water than the other catchments? I would restructure the sentence to get this message better come through.

Response:

Agreed - This sentence now reads: ‘At 130 mg Pt Co L-1, the colour levels in the Srahrevagh (the subcatchment with lower rainfall and higher forest cover) were almost 50% higher than those from the Black and Glenamong, which were 95 and 84 mg Pt Co L-1 respectively.’

Comment:

p. 2, L. 15-16: “illustrating that environmental drivers operated synchronously at each of these temporal scales, and also spatially within the same catchment “: what exactly do the authors want to state here? It reads to me like that environmental drivers were similar across the catchments, but this would contrast to the conclusion that drivers varied depending on catchment-specific characteristics. It would also contrast the statement further down in the abstract (L. 24-25) that “the results of the study highlight the interaction of catchment conditions and regional meteorological drivers”. Please clarify.

Response:

We agree with the reviewer that the differences in spatial characteristics for a small sample of three sub-catchments was not sufficient to undertake statistical analysis and therefore to make robust conclusions. We have removed references to spatial analysis between the sub-catchments from the manuscript due to lack of statistical support, with the exception of noting the statistical difference in colour levels in the Srahrevagh (see point immediately above). We propose that the sentence referred

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to will now read: '. . .illustrating that environmental drivers operated synchronously at each of these temporal scales'

Comment:

p. 2, L. 23: why is the term "although" used here? Isn't it enough to simply write that there was inter-annual variation?

And

p. 2, L. 24: it would be interesting for a wide readership to know whether these interannual variations in DOC loads are linked to variability in climate. This remains unclear in the way it is phrased here.

Response:

We agree with the two points above. The word 'although' has been removed. The inter-annual variation in DOC loads are undoubtedly linked to climate, and more specifically variation in rainfall however we have not statistically tested for this. This sentence now reads: 'The estimated mean annual DOC loads exported from the Black and Glenamong rivers to Lough Feeagh were 15 t C km2 yr-1 and 14.7 t C km2 yr-1 respectively. The annual export values over the six years displayed significant inter-annual variation that was most likely linked to climate variability.'

Comment:

p. 2, L. 24: Can the authors specify what is meant with "interaction of catchment conditions and regional meteorological drivers? what characteristics makes DOC export from a catchment more or less susceptible to environmental drivers? This should be highlighted here, or at least in the conclusions of the manuscript, if supported by the data.

Response:

We agree that this sentence is unclear. As noted above, we have removed references

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Discussion paper

to any spatial analysis between sub-catchments and any conclusions related to that. This sentence now reads: 'The results of the study highlighted the role of climate in controlling stream water DOC concentrations, and aquatic carbon export, and therefore the vulnerability of blanket peatland carbon stores to future changes in temperature and precipitation.'

Comment:

p. 3, L. 3: "warmer and wetter" conditions is relative. Which climate zone is referred to here?

Response:

We agree. The sentence now reads: 'Blanket peat ecosystems occur within a narrow window of climatic conditions, characterised by relatively warmer and wetter conditions, in temperate regions where precipitation exceeds potential evaporation by a ratio of about three to one.'

Comment:

p. 3, L. 19: what are "year-to-year changes in climate"? climate refers to a period of at least 30 years. I think it is meteorological conditions the authors refer to here.

Response:

We agree. The sentence now reads: 'Longer term patterns in DOC concentrations or in proxies for DOC have been linked to year-to-year changes in meteorological conditions at both local and regional scales.'

Comment:

p. 3. L. 19-25: is an introduction of these enzymatic mechanisms needed? The terms used are quite technical and it seems that it is not relevant for the remainder of the manuscript

Response:

Agreed. The sentence has been removed from the manuscript.

Comment:

p. 3, L. 26: “Canadian lakes have been shown to correlate”: what property of these lakes is referred to here? Response:

We agree that the meaning was not clear. The sentence now reads: ‘At regional scales, DOC concentrations have been shown to be influenced by global weather patterns, for example DOC concentrations in certain Canadian lakes have been shown to correlate with climate indices such as the Pacific Decadal Oscillation and the Southern Oscillation Index (Zhang et al., 2010)’.

Comment:

p. 3, L. 32: which “Ref” is referred to here?

Response:

Apologies. This was a typo and has been removed from the manuscript.

Comment:

p. 4, L. 25: the authors mention here the implications for future management of peatland systems. Can the authors formulate such implications in the discussion section?

Response:

As we consider that peatland management is is outside the scope of this manuscript, we think it best to remove this part of the sentence entirely. The sentence now reads: ‘Examining riverine fluxes of carbon from these catchments provided a means to quantify the export of C from long-term storage in peatland ecosystems and to explore the effects of climatic variables on these C stores’.

Comment:

p. 6, L. 11: define “blanket peat” (regarding peat depth) when first mentioned in the manuscript

Response:.

The definition has been moved to P3 L. 6&7

Comment:

p. 6, L. 18+20: “gentle” and “steeper” slopes are relative terms. I suggest to refer to absolute numbers here.

Response:

This sentence now reads. ‘The Srahrevagh sub-catchment has the greatest proportion of slopes with gradients ranging between 0 and 20%, while the Glenamong is the most mountainous of the three sub-catchments, having the greatest altitude range and containing the greatest proportion of slopes steeper than 50% (Table 1).’

Comment:

p. 6, L. 23: Please add a reference or vendor for the Arcmap program.

Response:

The vendor has been added: ‘ArcMap 10.3.1. Environmental Systems Research Institute (ESRI)’

Comment:

p. 6, L. 29: Is it the Newport Met Station that is indicated in Fig. 1? If so, please indicate in the figure and refer to the figure in the text.

Response:

Yes, Newport Met Station is in Figure 1, the figure has been amended.

Comment:

p. 6, L. 30: please give the location of the vendor of the water level loggers.

Response:

This is added as 'OTT Hydrometry Orpheus Mini water level loggers'.

Comment:

p. 6, L. 31: please report goodness of fit / error measures of the site specific rating curves.

Response:

We have amended and the sentence now reads. 'The levels for the Glenamong and Srahrevagh rivers were converted to volume of discharge per second (m3 s-1) using site specific rating curves: Glenamong R2 = 0.98, Srahrevagh - R2 = 0.9677 (Marine Institute unpublished data).'

Comment:

p. 7, L. 6-9: How does this analysis relate to the study aims? Also, I'd appreciate a motivation for the choice of the statistical tests. Was the A Wilcoxon Signed Rank Test used to account for the nestedness of the Black and Srahrevagh rivers?

Response:

This section now reads. 'This analysis was conducted to ascertain if there was significant statistical difference between river colour in each catchment. A Mann-Whitney U test was used to test for statistical differences between colour concentrations in the Glenamong and Black and the Glenamong and Srahrevagh rivers. As the Black and Srahrevagh rivers are in the same river system, a non-parametric Wilcoxon Signed Rank Test was used to test for statistical differences between their colour concentrations.'

Comment:

p. 7, L. 11: please clarify “Loess”

Response:

The following sentence was added: ‘Loess (locally weighted smoothing) regression is a nonparametric technique that uses local weighted regression to fit a smooth curve through points in a scatter plot.’

Comment:

p. 7, L.11: please give a reference for the R program used (move it up from p. 7, L. 29).

Response:

Reference has been moved.

Comment:

p. 7, L. 23- p. 8 L. 19: How were the GAMM models reduced to find the optimum model with three smoothers?

Response:

The optimum models were found by an iterative process described in Zuur et al. (2009). Explanatory variables were initially tested for any evidence of collinearity. No variables that were collinear were used in the same model. The resultant GAMs were then first tested for any breach of the assumption of equal variance. If required, a variance structure was added, with the optimum structure selected based on AIC values. Any non-significant variables were then removed from the model. As a next step, tests were carried out for any breach of the assumption of independence. If found in the models, various autocorrelation structures were tested and the optimum structure was added, again based on the AIC value. This model was the final ‘optimum’ model.

Comment:

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p. 7, L. 25: is the mgcv package an R package? Please indicate.

Response:

This sentence now reads. 'To identify the main explanatory drivers of colour in the rivers, general additive mixed models (GAMM) with cubic smoothing regression splines and Gaussian distributions were developed using the mgcv package in R (Wood, 2006).'

Comment:

Equation 1: use italics consistently, i.e. even for T_{lt}

Response:

Equation has been corrected in the manuscript

Comment:

p. 8, L. 6: What is the motivation to include wind speed, radiation and humidity in the model? Background / hypotheses for testing these variables are not given in the introduction.

Response:

Higher wind speeds are positively correlated with higher air temperatures at this site, due to warm westerly air masses. Since decomposition of peat and therefore production of DOC is sensitive to temperature, there was potential for a relationship. However, none was found.

Comment:

p. 8, L. 12: How did you use NAO in the statistical analysis? As explanatory variables? Please clarify.

Response:

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This sentence now reads. ‘Both daily and monthly means of the NAO index were downloaded from the National Oceanic and Atmospheric Administration (NOAA, 2017) and used as explanatory variables in the statistical analysis.’

Comment:

p. 8, L. 13: please clarify the abbreviation “SMD”

Response:

We note that the abbreviation is explained where soil moisture deficit is first mentioned in the manuscript, page 8 line 12: ‘Hydrological explanatory variables included river discharge (m3 s-1), soil moisture deficit (SMD) (mm day-1) and actual and potential evapotranspiration (mm day -1).’

Comment:

p. 8, L. 21: what exactly is meant with “to further examine the linkages between each of the explanatory drivers”? I would expect many readers to be unfamiliar with the crosswavelet transform analysis (including myself) and would appreciate a clarification, in simple words, what the analysis does.

Response:

We agree with the reviewer and have rewritten as follows. ‘A cross-wavelet transform analysis was carried out to further examine the trends and periodicities in colour concentrations with the explanatory drivers of colour in the rivers. Cross-wavelet transform analysis can be used as a method of examining pairs of time series that may be expected to be linked in some way. Continuous wavelet transforms from pairs of time series are used to construct the cross wavelet transforms, revealing their common power and relative phase in time-frequency space. In particular, the analysis examines whether regions in time frequency space with large common power have a consistent phase relationship, suggesting causality between the time series pairs (Grinstead et al, 2004).’

Comment:

p. 8, L. 27: Please give more details on the Monte Carlo methods used!

Response:

The Monte Carlo methods used are imbedded within the R programme / package algorithms, and we have decided to remove the reference to Monte Carlo methods in the manuscript. The sentence now reads: 'A cross-wavelet power spectrum was calculated from the cross wavelet transform results in order to estimate the covariance between each pair of time series as a function of frequency and the statistical significance was also as part of the analysis.

Comment:

p. 8, L. 32: were the residuals of the linear regression between DOC and color homoscedastic?

Response:

Variance was checked for the residuals from each GAMM using the gam.check function in mgcv. This indicated that the residuals were homoscedastic and therefore a variance structure was not added to the model

Comment:

p. 9, L. 1: add details on the location of the vendor of the DOC analyzer.

Response:

Sievers 5310C Total Organic Carbon analyser (Sievers Instruments, Inc. sievers.instruments.wts@suez.com)

Comment:

p. 9. L 4-5: What is meant with "mean load" and "annual load"? is it the annual mean load referred to here?

Response:

We have corrected the sentence to now read. 'The annual load was calculated by multiplying the calculated stream discharge volume for each week by the weekly DOC concentration and summing the totals for each year'.

Comment:

p. 9, L. 19: which time period is referred to here? 1995 to ... ?

Response:

The sentence has been clarified and now reads:

'A comparison of monthly precipitation values during the six year study period with monthly precipitation for the previous 15 years (1995 to 2010). . .'

Comment:

p. 9, L. 28: is the "top 10%" the 90% percentile?

Response:

This sentence now reads. 'Values greater than the 90% percentile of discharge for the Black river were > 4.47 m3 s−1 while those less than the 10% percentile were < 0.26 m3 s−1 (Figure 2B).'

Comment:

p. 11, L. 2: what does "edf" stand for?

Response:

Sentence now reads: 'The smoother explaining the relationship between soil temperature and colour was linear in the model (estimated degrees of freedom (edf) = 1) and positive, indicating that colour increases with increasing temperature.'

Comment:

p. 11, L. 12-25: I very much appreciate the sensitivity analysis, investigating the performance of the GAMM model depending on whether SMD or discharge is included!

Response:

We felt we should include this for completeness.

Comment:

p. 11, L. 26-31: How strong was the correlation between NAO, soil temperature and SMD? It comes somehow through in Fig. 5, but some metric describing this correlation might add further valuable context to the relatively low contribution of NAO in addition to the effect of soil temperature and SMD.

Response:

We draw the reviewers attention to the F statistic in Table 2 which gives an indication of the relative contribution of each explanatory variable to each model. For the NAO this would be approximately 4% for the GAMM for the Black, and 2.5% for the Glenamong and for the Srahrevagh

Comment:

p. 13, L. 8: To my understanding, DeFries and Eshleman (2004) only discuss forestry effects on hydrology, not DOC export. Please refer some of the many papers that show increased DOC loads in response to forest clear-felling (e.g. Nieminen 2004, Silva Fennica 38(2); Schelker et al. 2012.

Response:

This sentence now reads: 'Forestry is also known to influence DOC release from soils and it has been observed that both afforestation and forest clear-felling result in increased DOC concentrations and that these increases may continue for several years after the initial event (Cummins and Farrell, 2003; Schelker et al. 2012).'

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Comment:

p. 13, L. 10: how about replacing “goes some way in” by “may help”

Response:

Agreed, and the sentence now reads: ‘Spatial analysis, comparing the extent of peat soils in the study catchments, the length of streams intersecting the peat, slope analysis and CORINE land cover in each sub-catchment, may help in explaining the higher levels of colour found in the Srahrevagh.’

Comment:

p. 13, L. 12: How much is known about the forestry intensity in the catchments? Is the forest clear-cut? In Table 1, only the areal proportion of forest (based on CORINE data) is given, but this does not imply that the forests are managed. Is this the same information that is given in Fig. 1 (symbol code “forestry”)? More information on forestry is needed to support the statement that forest clearcutting could explain differences in DOC loads across catchments.

Response:

We agree that more information should be provided and therefore the text has been amended to read: ‘All of the coniferous forestry in the catchment is owned by the semi-state company Coillte or managed by private forestry companies. These areas of forestry are intensively managed, and when the timber is harvested the forests are generally clear-cut.’

Comment:

p.13, L. 27-30: Would the interaction with water table fluctuations imply that correlations between soil temperature and water color is low at time scales Âń 1 year (as apparent from Fig. 6)? If so, I’d suggest to refer to results shown in Fig. 6 here. Response:

For clarity, the cross-wavelet analysis showed that soil temperature and water colour

were almost exactly in-phase, with a significant positive correlation. This indicated that when soil temperature was higher/lower, stream water colour was also higher/lower. This cross-wavelet analysis also indicated that there was very little correlation between these two variables at time scales other than the annual time scale across all six years. Based on these results, we concluded that the relationship between water colour and soil temperature indicated by the GAMM operated mainly at the annual time scale. We have stated this in the text as follows: 'For soil temperature, the width of the orientation at the annual time step was relatively consistent with phase arrows that all pointed right, i.e. there was a positive correlation between soil temperature and river colour that was consistent at the annual scale'

Comment:

p. 14, L. 4: to test this, would it be possible to run the cross-wavelet analysis for time scales longer than 1 year?

Response:

To clarify, this analysis included all data over the full 6 year study period, and assessed correlations at all time steps up to 64. There were not sufficient data to analyse at time periods longer than 64 weeks.

Comment:

p. 15, L. 18: the term "weather" is maybe not optimal here. How about "low pressure systems" or "cyclones", etc...?

Response:

This sentence now reads. 'During the construction of the GAMMs, both the weekly and monthly NAO index values were tested in the analysis. The models using the weekly data consistently explained more of the deviance in the model. This most likely reflects the proximity of the site to the Atlantic coast and the time frame over which weather systems associated with the NAO pressure difference generally reached the

study location.‘

Figures and Tables:

Comment:

Fig. 1: referee 1 asked what did the green-blueish areas mean in the figure and pointed out that this color code was not explained in the figure legend.

Response: These areas have been removed from the figure.

Comment:

Fig. 1: is the weather station the “Newport” met station? Please indicate.

Response: Yes, this has been clarified in the figure.

Comment:

Fig. 1: please explain the red dot in the map of Ireland.

Response: This is the study site, it has been clarified in the legend.

Comment:

Fig. 2: explain the abbreviation “SMD” in the figure caption.

Response: This has been explained in the figure caption.

Comment:

Fig. 3: improve the resolution and contrast of the figure

Response: The resolution and contrast of the figure has been improved.

Comment:

Fig. 3, caption: add “water” in front of “color”.

Response: This has been done

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Comment:

Fig. 3, caption: the letters “B”, “C” and “D” appear in the wrong position. Please correct.

Response: The figures have been re-positioned.

Comment:

Fig. 4, caption: explain the meaning of “s” shown on the y-axis scales.

Response: this has been clarified.

Comment:

Fig. 4, caption: explain the abbreviation “SMD”

Response: this has been clarified.

Comment:

Fig. 5: I cannot find an explanation in the methods section on how this analysis was done. Please clarify. Details on the trend analysis of water color is given, but not for the environmental driver variables.

Response: this has been clarified in the methods section.

Comment:

Fig. 5: the figure appears stretched along the x-axis in my version. Please modify.

Response: This has been resolved in the figure.

Comment:

Fig. 5, caption: please indicate the time scale of the trends shown. Is it weekly averages?

Response: They are weekly averages, this has been clarified.

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Comment:

Fig. 5, caption: explain the abbreviation “SMD”

Response: this has been clarified.

Comment:

Fig. 6: What do the line graphs on top of the contour plots indicate? Also, the tick marks along the axes of these line graphs are hardly visible. Please increase font size and add axis labels.

Response: The line graphs show the two time-series datasets being analysed, however given the small size of the contour plots, it will be quite difficult to create legible titles and axis labels, we propose to remove the line graphs in fig.6 in the final manuscript.

Comment:

Fig. 6: Which depth does soil temperature refer to?

Response:

Soil temperature is at 1 m depth. This has been added to the figure caption.

Comment:

Fig. 6, caption: explain the abbreviation “SMD” Response: this has been clarified.

Comment:

Fig. 6, caption: What are edge effects and what is the cone of influence? Please explain here or in the methods section.

Response: These have been clarified in the caption as follows: ‘Pink regions on either end indicate areas where the analysis is unreliable as there is no data before and after the study period.’

Comment:

Table 1: is the climatological data given here recorded at the Newport met station? Please indicate.

Response: this has been clarified in the caption.

Comment:

Table 1: “stream length” can differ a lot depending on how / at which spatial resolution it is mapped. how is “stream length” defined? What is the smallest system (e.g. in terms of upslope contributing catchment area) considered here?

Response: Stream length was sourced from a national coverage of streams and lakes that are available from the Irish Environmental Protection Agency and available as a shape file for download and use in GIS software.

Comment:

Table 2: please explain the abbreviations “edf” and “Ref.df”. These values are identical. Why?

Response: We agree with the reviewer: edf has been explained in the Table caption and Ref.df has been removed from the table.

Comment:

Table 3, caption: maybe mention that Lough Feeagh is the lake shown in Fig. 1, or indicate the lake name in Fig. 1?

Response: We have stated that Lough Feeagh is the main lake in Fig. 1 in the caption.

Comment:

Table 3: it was not immediately clear to me that the seasonal DOC loads given in the lower part of the table are linked to the years listed in the table header. Maybe explain that in the figure caption?

Response: this has been clarified in the Table caption.

Comment:

Table 3: please explain abbreviations D, J, F,

Response: this has been clarified in the Table caption.

Comment:

Table 3: Shouldn't the sum of the seasonal DOC loads equal the annual DOC loads? This is at least not the case here. Why?

Response: The seasonal DOC loads in winter run from December to February, part of this season is in the previous year (December) therefore the seasonal and annual don't tally.

Comment:

Use consistent abbreviations ("Fig.") for "figure". Some figures are not referred to in the text in the same order as they appear in the figure section. For example, Fig. 3 is referred to before Fig. 2 is referred to.

Response: this has been corrected in the manuscript.

Comment:

P. 2, L. 21: delete one of the "each": done. P. 4, L. 10: "trend" should be plural to be consistent with "changes" mentioned before: done. P. 5, L. 26: delete one of the "spatially": done. P. 6, L. 29 replace the first "," by "and", and remove the second ",": done. P. 7, L. 16: delete one of the "for": done. P. 8, L. 23: use "were" instead of "are": done. P. 9, L. 1: add a full stop between "rivers" and "doc": done. P. 15 , L. 27: remove the full stop between "that" and "both": done. Fig. 2: remove "(" after "standardized precipitation index" at the y-axis label of the uppermost panel.: done. p. 24, L. 4: there is a digit missing in "201" Table 1 caption: "sub-catchmen" is missing a "t": done.

Response:

The above typographical errors were also corrected.

References: Clark, J.M., Lane, S.N., Chapman, P.J. and Adamson, J.K., 2008. Link between DOC in near surface peat and stream water in an upland catchment. Science of the Total Environment, 404(2-3), pp.308-315

Ritson, J.P., Brazier, R.E., Graham, N.J., Freeman, C., Templeton, M.R. and Clark, J.M., 2017. The effect of drought on dissolved organic carbon (DOC) release from peatland soil and vegetation sources.

Ryder, E., de Eyto, E., Dillane, M., Poole, R., and Jennings, E.: Identifying the role of environmental drivers in organic carbon export from a forested peat catchment, Sci. Total Environ., 490: 28–36, 2014.

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