Biogeosciences Discuss., 10, C820–C825, 2013
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Biogeosciences
Discussions

Interactive comment on "Carbon dioxide fluxes at an intensively cultivated temperate lowland peatland in the East Anglian Fens, UK" *by* R. Morrison et al.

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Received and published: 5 April 2013

GENERAL COMMENTS:

This study reports on the first eddy covariance flux measurements of a cultivated lowland peatland in the UK. The study shows large losses from the system during the 120 day period of the study. Controls on ER from soil temperature and moisture were evident. On the whole the study is reported nicely and the manuscript clearly written (though see corrections below). I would recommend that the authors consider how the management of the water table could be optimised to maintain growth and limit respiration losses.

I do however have a few concerns about this study that I feel need to be addressed more rigorously:

1) The QC control seems fine in the text, but Figure 3 hints that the distribution of filtered data is highly uneven between crop and fallow periods (With the crop having an 1/8th the data of the fallow). If this is indeed the case (and there is currently not enough information is available to really determine this), then this must be presented more openly and the impacts on the study clearly discussed. The use of averaging in Figure 4 does nothing to address this issue, and could be misleading to the reader. Perhaps additional plots could be shown.

2) The discussion of this study generalises the results, but does not deal with the fact that this is only 120 days from a particularly wet year. The impact of high levels of rain (as flagged up in the rest of the article) needs to be addressed in the discussion.

3) The study and data are interesting, though it is a shame that the study is only for 120 days. If the analysis is of the impact of agriculture, then the impact of this land use throughout the is highly relevant and the real fluxes associated with this land use are much higher. The authors hint at extending the study to different land covers, and/or longer times " EC measurements of CO2 exchange are ongoing at this site and will aim to capture CO2 dynamics over a greater number of different crop cycles and meteorological conditions." Whilst this article stands on its own, I think it would have had greater impact a whole year was considered, or different crops compared. Perhaps a simple model could help extrapolate these result (to a first order approximation)?

SPECIFIC COMMENTS:

P4195, Ls14-16: The strength of EC is often considered NOT to be annual sums, where small biases can cause issues.

P4197, L1: (and also for the discussion). You need to compare this subsidence rates to you findings. Can you determine the subsidence rate due to soil drying and that due

to C fluxes?

P4197: L3. More details about these land boundaries are needed. What about the ditch, is this large enough to impact the fluxes? Why did you pick just this one land parcel and how does it differ from the second one? Perhaps include a map.

P4197, L14: Add the detail in here so that you can discuss the spraying/harvesting methods in the discussion, e.g. how were these done (machinery and likely impacts)? Did the spraying have a noticeable impact on the fluxes? What depth was the disking?

P4197, L27: Describe roughness and general topography any slopes (from the location I am assuming very flat!)

P4199,L15:. Why not use your flux footprint to do this filtering? It would avoid situations when >25 % of the flux footprint was not in your study land parcel. Though I do not expect that this would significantly alter the results.

P4200, L18-21: Though estimating cumulative sums is difficult with EC (see earlier point about) this uncertainty has to be treated in a bit more detail. The simple statement of a +/- 20% measurement error is weak. At the very least this estimate needs references backing it up, and an acknowledgement of the limitations of this uncertainty estimate. These errors appear to be applied to all the cumulative sums of all the EC estimates and presented as if they are meaningful. If the authors wish to continue using this estimate then the discussion needs a frank appraisal of the limitations of this uncertainty.

P4201: L2-4: Be clear why you are doing this summing in quadrature for daily, or long sums? If for longer sums what about biases? Total uncertainty has to be different from the +/- 20%, please clarify.

P4202, L17-18: Did you do a water mass balance to determine this? Please show as this sentence appears to be at odds with the previous sentence that suggest land drainage was externally controlled. I would expect the water balance not to close due

to the external drainage management.

P4203: Ls 21-25: Discuss why. I assume links to Ra.

P4204: L2: Disturbance effects on the soil?

P4204: NDVI or LAI time series would be valuable. Also did you look at the bowen ratio?

P4206,ls10-14: This appears to be an assumption that the inport is small. I would be slightly surprised if « 43.5 g Cm-2 was imported in plugs. But agree that this can be neglected from the analysis. A back of the envelope calculation on this is needed to support this assumption (C in a plug * plugs per m-2).

P4206: L16: The discussion should include comparison/corroboration with the overall subsidence rates.

Figure 1: What are the error bars? Range, SD, St Error of mean? Be consistent show the range of cumulative P? Why have you included 2011?

Figure 2: A low level of light 100 μmol m-2 s-1 for 10 hours a day would be 3.6mol m-2 d-1 by my calculation. Check your units and conversions. Indicate fallow and growing periods

Fig 3: I am assuming this is for unfilled data (please state). For even length measurement periods, why the large disparity in "n". If this is due to the QC, then the fact that the crop period is 90% gap filled has to be discussed in more detail as this could introduce a lot of errors. Given the use of an open path system I would be expecting lots of gaps due to precipiation.

Fig 4: Indicate when fallow starts?

Why is there little sign of a diurnal on day 22/6 (unclear) and after 31/8 (presume fallow).

Standard errors of mean I assume? Are these errors and plots based on filled data?

I would like to see some actual 30 min data, as this averaging hides much of the response to changing met and post precipitation responses. I would like to see both the filled and un-filled data 30 minute data here.

Also since ER has been shown to be closely linked to soil moisture, consider adding soil moisture to the plot. Also split into GPP and ER?

TECHNICAL CORRECTIONS:

P4194, L11: 152.89 g C m-2 d-1 seems too large, check units. But perhaps normalising to per day units would be useful since rotation length is fairly site specific.

P4196: Add in details at what depth and how closely the water table was maintained (and by who did this)

P4199, L27, coverage for 30min, or raw?

P4200, l11: Outline the partitioning method very briefly.

P4200,L23: Would it not be better to consider pre-gap-filled data for this?

P4202,L12: Very vague, bright (what is bright? No clouds, or high ppfd?) for periods (how long? mins, hours, day, days?). Clarify please.

P4202,L17: Since soil moisture is so important describe dip-well measurements and add to the soil moisture plot. As already noted, who and how the water table(?) depth was maintained.

P4203, L6: Be clear what you mean by period add numbers to the variation and what it high wrt.

P4210,Ls 13-18. Convert to consistent units. Also why not incorporate this data into this analysis, the data is there! What crop was on the site during the chamber measurement period?

Fig 5: use the symbol mμ not u in axis labels.

Fig 6: Shading is very useful. Make it consistent across plots.

Fig 7: Better as a table?

Interactive comment on Biogeosciences Discuss., 10, 4193, 2013.