

## ***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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We agree that the unusual weather conditions are an issue that needs to be further addressed. At the current time, and on the basis of the available data, it is unclear how these extremely wet conditions influenced the scale of the CO<sub>2</sub> emissions from this site. We will incorporate this into the introduction and discussion as the reviewer suggests. We will aim to place greater emphasis on the bigger picture in the revised manuscript, including some comparisons of the scale of CO<sub>2</sub> fluxes at this site with those from arable croplands on mineral substrates.

Page 2 Lines 15-16: it would be interesting to compare these losses with conditions

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previous to disturbance.

We do not understand what this refers to at this point in the discussion paper. One of our future research objectives is to compare the results of the CO<sub>2</sub> flux measurements at this agricultural peatland site with eddy covariance datasets obtained at semi-natural (i.e. undrained) and restored (or at least regenerating) peatlands in this region. However, we are not in the position to present such a comparison at the present time.

Page 3 Line 27: if this was the wettest, was it representative of the usual CO<sub>2</sub> emission from this ecosystem?

This is clearly an issue for this measurement period. At the current time and in the absence of other measurements it remains speculative as to how these wet conditions will affect the CO<sub>2</sub> emissions from this site. We hope to address this issue over the present growing season, assuming that conditions will be more representative of longer-term weather patterns. However, we note that the concept of a representative year is somewhat hard to define, and that recent weather conditions in this region have been both atypical and highly variable for a number of years now. We would be happy to include a Figure to illustrate this and additional comments speculating on the representativeness of the reported flux measurements.

Page 9 Lines 6-9: What percent of the time did you measure Net Radiation?

The NR-Lite net radiometer was installed at the site for the duration of the measurement period and was logging data (as continuous thirty minute averages) for the entire measurement period. However, for the crop period, it was not possible to install the NR-Lite instrument directly over the crop canopy we were trying to measure (page 9 (or 4201), lines: 10 to 11). This was due to the need for the farmers to spray their crop on a regular basis using large agricultural machinery. To get some representative measurements to evaluate the surface energy balance closure for the main crop period, we installed the NR-Lite directly above the crop canopy on a temporary mast for the five day period between 20 to 25 July 2012 (page 9 (or 4201), lines: 10 to 11). As such,

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this was the only period that was used to evaluate the energy balance for the crop growth period. Once the site was harvested, it was possible to install the NR-lite over a representative area on a permanent basis. Thus, net radiation measurements were made throughout the measurement period, were representative of the crop canopy for around 8% of the sixty day crop period, but were made continuously throughout the fallow period (i.e. 100% of the fallow period or 50% of the total measurement period).

Fig.4 & Fig. 6: sign convention: the usual sign notation is for GPP to be always positive is the ecosystem is uptaking C, the central part of the curve of Fig. 6 (when NEE is negative, so there is C uptake) shouldn't GPP be positive here?

In Fig 4, the plot shows NEE. It is agreed that we could add text to the figure to make clear that the negative values represent periods when the crop system was uptaking CO<sub>2</sub> as crop photosynthesis was outpacing respiratory losses. GPP values are indeed given as positives in the text; however, for the purposes of Fig 6, the daily GPP values have been plotted as negative values. This is a common way to see these data presented. It enables the reader to better appreciate the opposing influences of GPP and ER on the net CO<sub>2</sub> exchange. We are happy to amend the figure caption to this effect.

Page 11 Line 24: nocturnal, typo?

Yes, this is a typographical error and will be corrected to nocturnal in the revised version of the manuscript.

Page 13 Line 19: why do you sue  $u^*$  here? Didn't you say it was not needed? Mention this in the methods.

We did not identify a reduction in nocturnal ER at this site at low  $u^*$  values, at least over the measurement period reported. However, as reductions in nocturnal ER during thermally stable periods represent one of the most important potential biases to EC flux measurements, we decided to see if the application of a  $u^*$  filter would impact the estimated CO<sub>2</sub>-C budget. We will mention this in the methods section of the revised

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manuscript.

Page 13 Lines 21-22: what less conservative refer to? Specify in more details the filtering criteria used.

In this case, less conservative is in reference to the fact that we filtered the data using cumulated flux footprint estimates calculated along a longer fetch distance. In other words, we relaxed the upwind distance from the tower that we assumed to be representative of the target surface of interest (although this made little difference to the time-integrated estimate of CO<sub>2</sub> exchange). We will specify the details of this filtering in more detail in the revised version of the manuscript.

Page 13 Lines 24-24: are these uncertainties of NEE or of GPP & ER? The source of uncertainties in each of them is different, it requires to be mentioned.

We have only provided an estimate of the uncertainty in the estimate of NEE and have not provided estimates for GPP or ER. We will make this clear in the revised version of the manuscript.

Page 14 Lines 21-23: this is not the main point of the paper, remove footprint estimation from the discussion and focus on the big picture implications.

We will remove this from the revised version and focus more on the bigger picture in the discussion.. This will include additional commentary on the weather conditions encountered over this measurement period and the representativeness of the flux measurements, and will include a comparison with fluxes from crops on mineral substrates.

Page 15 Lines 20-25: it would be interesting to mention the difference in C content of the soils in the UK and Finland, and the temperature regimes in each of them, to be able to understand the source of this difference.

We agree that this would add to the paper. We will address this in the revised version of the manuscript.

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Page 18 Line 18: indicating this reference as (Taft et al., 2013) is not really appropriate, as it is not published (not even in revision); more appropriate to indicate it as unpublished data or personal communication.

Taft et al. will be referenced as 'unpublished data' in the revised manuscript.

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