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Discussions

Interactive comment on "High net CO_2 and CH_4 release at a eutrophic shallow lake on a formerly drained fen" *by* D. Franz et al.

Anonymous Referee #2

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General Comments

This manuscript introduces a new data set on CO2 and CH4 eddy covariance fluxes above a formerly drained and recently rewetted fen area in northeastern Germany. The observations cover one year of flux data and show the area, part of which is permanently flooded, being a large greenhouse gas source. Since wetland restoration is an important and often controversial topic and flux measurements for this type of ecosystems are still scarce, the data set presented here does not only fit well into the scope of BG but has much relevance for the wider audience, too. In addition to this aspect, the study is innovative with respect to the spatial data analysis as it uses a footprint model to distinguish between the emissions from two different surface types using only one tower.

The data are well documented and apparently of high quality, and the paper is very well written – in fact far above average of first time submissions to this journal, as far as I have seen them! The manuscript has thus the potential to become a valuable (and probably much cited) contribution to BG. However, some sections of the Results, as well as parts of the Discussion, require some clarifications, and therefore I recommend that the authors be encouraged to carry out a (minor) revision that takes the following specific points into account.

Specific Comments

Line 218: What does 'enhanced' mean here – is this still simply a lookup table method or does it include something else?

Line 251: The outer pair of brackets is not needed here.

Line 300: The statements about the water level are confusing when comparing them with line 112 in the site description. There the water depth was said to 'range from 0.1 and 0.7 m' (does this refer to spatial or temporal variation?) and here the temporal fluctuations are shown to be 0.36 and 0.77 m as visible from Fig. 2. How do these two statements fit together?

Line 304: Why were median fluxes instead of averages or totals given here? I think this is not very common and should therefore be briefly explained.

Line 309ff: Why were the CH4 fluxes normalized but not the CO2 fluxes?

Line 363: Insert "for the AOI" before "than".

Lines 384ff: Would convection also affect the CO2 emissions from the lake? Please discuss whether this is possible – or why you think it's not.

Line 417: Replace "typically" with "typical".

Line 451: Add "and a higher rate of CH4 oxidation in the aerated top soil" after "CH4".

Lines 495ff: This is one of the (few) weak points of this study: With only one year of data that happened to be characterized by "unusual meteorological conditions" the question arises as to what extent the observation of the wetland being a large GHG source can be transferred to other sites and other years. Other studies have shown multi-year trends in GHG budgets following wetland restoration. I suggest that the authors discuss this in more detail, taking for example the papers by Waddington and Day (2007, JGR) or by Herbst et al. (2013, this journal) and/or the respective references therein into account.

Line 514: I suggest adding a phrase like "...and the interannual variability if short-term studies like this one are involved" to the end of this sentence.

Lines 517ff: What I miss in the conclusions is some statement or estimate that relates the finding of this study to the situation of drained fen grasslands, at least on the basis of literature data. Does the described method of rewetting (involving the flooding of substantial parts of the area) make the GHG budget worse than that of a drained fen? Or just worse than that of a more cautiously restored fen (with less surface inundation), but still better than that of the drained situation?

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