Biogeosciences
Discussions

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Interactive comment on "Are C-loss rates from drained peatlands constant over time? The additive value of soil profile based and flux budget approach" *by* J. Leifeld et al.

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The objective of this study was to examine the suitability of the profile based method for deriving long-term soil C loss by comparing it with results from chamber measurements and chemical peat properties. The study also reported estimates for the long-lasting peat carbon loss for drained temperate peatlands managed as grasslands. Their analysis suggested that temperate grassland soil will not lose their C emission function over time until whole peat deposit is exhausted. Another important observation from this study was that flux measurements provide an insight into the contemporary carbon budget of the fields where as the profile based methods integrate over much longer

periods of time. The difference between the results of the two models was clearly explained and discussed in the paper. In my opinion, this research is well designed and the information provided by the manuscript is of importance and suitable for BGD publications as it addresses relevant scientific questions within the scope of BG. The scientific methods and assumptions are valid and clearly outlined. The title reflects the contents of the paper. The overall presentation is well structured and clear. The scientific approach and applied methods are valid and the results were discussed in an appropriate and balanced way. As a result, I recommend accepting the article. Minor revisions: Abstract: 1) Line 2: Second sentence: Incomplete sentence: "In contrast to mineral soils, their high carbon density induces long lasting and high emissions. . . . . ." High emissions of what? CO_2 I assume. 2) Line 9: Not clear whether both fen sites were managed intensively and non-intensively and one of the fens sites was manages intensively and the other was non-intensively. 3) Line 11, do these numbers correspond to the two fens under study?. 4) Line 20, which two methods that "these" is referring to? Flux and profile based? Introduction: 1)Page 12344, line 19, add comma after with subsidence data. 2)Page 12344, line 21, add a coma after thirdly. 3)Page 12347, first paragraph: were any of the mineral layers sampled? Or you only sampled the organic fraction? Also a supplemental table showing the depth of the detailed samples will be a good addition. 4) Page 1237, line 10, wouldn't drying the samples at 105 cause changes in the composition of organic matter? Or at least removal of the volatiles? I would imagine 105 is a little high to dry the soils. 5) Which 7 out of the 141 soil samples were run by NMR? I am just curious because your OC, ash content and bulk density values show a lot of variability between the 4 cores especially for the region between 40 and 60cm. Based on figures 4 and 5, you didn't have a soil sample between 40 and 60 from P1 even though it's the region that is highly variable between the 4 replicate cores. Any ideas why the ash contact at this depth is very high and organic carbon is low, then it increases after that? 6)Page 1238, Line 13-15, weird sentence structure. Page 1238, line 16, how do you know that the deep layer is undisturbed? What if the deep layer was already drained when it was a top layer many years ago? Also line

21 page 12349. How do you know that these layers are undisturbed? If P4 is highly managed, how come you used it as reference? I was surprised how close the values of the two sites are to each other in terms of OC, ash content and bulk density as one was highly managed compared to the other. I would have assumed to see more changes in the values, even though the difference in losses seems significant between the two. Page 12353, line24, reword the sentence

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