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Biogeosciences Discussions



# *Interactive comment on* "The full greenhouse gas balance of an abandoned peat meadow" *by* D. M. D. Hendriks et al.

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This paper is a very nice, comprehensive study of the carbon and greenhouse gas balance on a poorly studied ecosystem type. It contributes new exciting insights into the decadal impact when rewetting formerly drained peatlands - a new management measure of high political and environmental importance.

The paper is clearly written and adequate in length, number of tables and figures. Some editorial comments and suggestions for clarifications are made below.

General comments about clarifications, calculations and methods

The authors use an INNOVA 1312 for CH4 and seem to have found a method to overcome the strong interference of CO2 and water vapour with the CH4 signal. As the

authors measure very high fluxes on some sites, which are almost world record, a very good technical documentation is needed that the flux is real. I therefore suggest to expand the section about the INNOVA and to describe in more detail how the drying and scrubbing was made, and that no bias in the measurement was produced due to systematic increases in water vapour and CO2 during chamber closure.

Annual NEE: The period from 20 August to 1 October 2004 coincides with the end of the growing season, which differed considerably in 2004 and 2005 (Table 5, section 4.3). The cumulated NEE over the period of the gap in 2005 can therefore not be used to fill the gap in 2004 because C uptake is underestimated. Instead, I suggest as an alternative method to calculate light and temperature response curves of the suitable data around the gap in 2004, and using a model to fill the gap (e.g., Bellisario LM, Moore TR, Bubier JL (1998) Net ecosystem CO2 exchange in a boreal peatland, northern Manitoba. Ecoscience, 5(4), 534-541).

Annual CH4 fluxes: The regression analyses of the CH4 fluxes should include information about number of data points used and significance of the regressions. The $R^2$ of the regressions is low. Consequently, the regressions seem not to be entirely adequate as the only tool for calculating annual CH4 fluxes. I suggest to include more variables in the regressions if significant, and to compare the results with alternative interpolation methods (e.g. simple linear interpolations) to demonstrate that the order of magnitude of the calculated CH4 fluxes is realistic. This is particularly critical for the saturated land and the ditches where occasional very high fluxes may significantly affect the regressions and annual budget.

Specific comments

Abstract The study includes the water balance and C losses by water. This is an interesting extra information, which lacks in most studies and could be included in the abstract. Page 278, lines 14-18: Values should be rounded to significant digits. Page 278, line 23: Should the unit be g CO2-equiv. m-2 yr-1?



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Introduction Page 279, line 3: Please quote references for the CH4 and N2O statements. Page 279, line 27: please specify what " reducing management " means : extensification? Restoration? Page 280, line 8: Year round measurements of CH4 and N2O have been published, e.g. for N2O: Regina et al, European Journal of Soil Science, September 2004, 55, 591-599. Page 280, line 10: Better quote original papers that did the comprehensive studies.

Site description Please include a link to table 1 and the following information: soil classification according to World Reference Base (FAO), C/N ratio of the peat, the temporal course of the water levels at the sub-sites (or in results section), and, if available, the fractional cover of the dominant vegetation functional groups. The water table information is critical to understand and interprete the results.

Methods and instrumentation The method for TOC analysis is not described. Was dissolved inorganic carbon determined as well? Page 282, lines 2-11: What else did you measure in the water samples apart from CH4? Please specify the parameters of the gas chromatography analysis. Page 283, line 7: specify the soil depths in detail. Page 284, line 2: how did the relatively tall vegetation described earlier fit in a 30 cm high chamber? Page 283f: Closed chamber measurements: Please give details about number of replicates per subsite, timing and measurement frequency (how often, how many per year, and maybe show graph with measured values through the year if there is a seasonal variation in fluxes). Page 284, line 20: please give the time of the biomass sampling. Was this at peak biomass?

Results Page 286, lines 23-26: Give criterium for removal of data points out of this continuous set of half-hourly data. I suggest that C transport to water and results of water analyses are reported in a separate section. Page 288, line 28: it is unclear what the references stand for and how they relate to your findings (better leave them for the discussion). Page 289, lines 1-5: are the 28 measurements different times, how many replicates? For what periods, how many times were the saturated land and ditches sampled? In all seasons? (See comment made above). Page 289, line 13/14: As you



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work on a managed peatland the water level may be manipulated to certain levels and therefore not follow the typical seasonal pattern observed elsewhere. Please specify (see comment made above).

Editorial comments

1. Sort the tables and figures in the order of the first mentioning in the text. 2. Do not repeat numbers displayed in tables in the text (e.g., page 285, lines 15-23, page 288, lines 10-17). 3. Use consistent units, preferably g C m-2 yr-1, i.e., do not mix m-2 with ha. 4. Explain abbreviations when they occur first (e.g. GWP, PAR) 5. Plage 285, line 7: remove “is”. 6. Page 285, lines 14, 15: Should “E” be “ET - evapotranspiration” and “transpiration” evapotranspiration? 7. Page 290: best show results in a table. It is difficult to get a good overview of the data out of this text. 8. Figure 7: Include measured values, or show the model fit elsewhere. This figure is a bit trivial as it mainly shows the temperature response of CH4 from the subsites. Showing the model fit to the observations and the annual balances may be more appropriate. 9. page 291, line 5: Give the reference for GWP.

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Interactive comment on Biogeosciences Discuss., 4, 277, 2007.