

Interactive comment on “Greenhouse gas emissions from rewetted bog peat extraction sites and a *Sphagnum* cultivation site in Northwest Germany” by C. Beyer and H. Höper

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Intro: - Focus train of thought more clearly and more logically on the topic of the investigation. - is changed accordingly + Attune questions and hypotheses better to each other. Why do you not formulate all this only in the form of hypotheses? - is changed accordingly + Please give reasons why it makes sense to investigate the variants presented here together. What do they have in common? - use of abandoned cut-over sites. Is mentioned in the text. + Indicate exact figures gas about gas exchange rates and C losses of drained bogs. - This should be in discussion section. + Please clarify the connection between plants and bog rewetting (p. 4497, lines

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14-16). - This was removed. Materials and methods: - Please specify the name of Drosera and “mushrooms” (p. 4498, line 17). - Drosera and fungi were not closer specified. - What was the purpose of the biomass determination and its separation? Please check and clarify. - It was used to determine the amount of Sphagnum and grass as well as how much carbon was accumulated since the establishment of the Sphagnum test site. This was also used to validate the gas flux measurements. Beside, in the Leegmoor we were not allowed to take biomass samples. - Did the mentioned authors really employ the same approach for modeling ecosystem respiration and GPP (p. 4500, lines 18-25)? Please clarify. - We used similar chambers and the same equations. Otherwise differences are mentioned. - Please clarify what shall be achieved with the reduction of the measured PAR values (p. 4500, lines 25-26). - PAR was measured outside the chamber. Thus, model calibration with these values would lead to underestimated negative values of alpha. - Please explain in greater detail how the monthly and annual balances were calculated (p. 4501, line 9). - is explained. - Remove the DOC literature value from your C balance calculation since you don't check if it also applies to your ecosystems. - is removed. Results: - In general, numbers which can be found in tables or figures are exceptionally represented once again in the text. - In general, we deliberately did not repeated numbers in the text, if they are already included in tables, in order to save space. In some cases, however, numbers are represented in the text, in order to assist the reader to understand the statements. - In order to promote clarity you should present the results in the following sequence: + site factors + control factors like weather and water table + nitrous oxide and methane + carbon dioxide + carbon and climate budget + Statistical analysis of the relations between control factors and gas exchange. This also applies to figures and tables. - is changed accordingly - Instead of current table 1 create a new table which contains an overview of the most important site and control factors of all sites. - We created a new table with soil properties, vegetation and water level. - Figure 3 must be revised so that the variants could be clearly distinguished. - colors are changed. - Remove the water tables from figure 4, since this is already shown

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in Figure 1. Instead of this, add the CH₄ fluxes of variant LM. It is necessary for comparison of fluxes with temperatures and water level. CH₄ fluxes of LM are not interesting. Discussion: - In order to promote clarity you should subdivide the discussion in the following sections: + Reliability of the research methods + Importance of site and control factors + Evaluation of the effectiveness of the methods for bog revitalization (This also includes an direct comparison between drained and rewetted bogs) + Can the results be generalized? (This also includes a comparison with other studies and a discussion about the long-term gas flux dynamics after reflooding). It is changed accordingly, but 5 sections (the 4 suggested sections + Sphagnum cultivation). - A meta analysis of own data and information's from literature is mentioned several times in the discussion (p. 4509, line 23, p. 4510, lines 16-17, p. 4512, line 13). However, it remains unclear what is meant since the results of this analysis are referred to nowhere. Please clarify. It Results are presented in Fig.5. - Why do you mention as controlling factor of GPP since it was not measured (p. 4508, lines 13-14)? Please clarify. It This was mentioned in order to point out that, on the one hand, there are also other influencing factors, and, on the other hand, in our examination the PAR was an appropriate explaining parameter. Importance of autotrophic and heterotrophic respiration during the year: On which facts based your statements (p. 4509, lines 1-8). Please clarify. It Our statements were based on the facts that the autotrophic respiration and the GPP depends not only on temperature and PAR but also vegetation (in spring the vegetation is not fully developed and in autumn senescence occurs; both leads to a smaller LAI, both leads less respiration), while the heterotrophic respiration depends on temperature. This explains that the annual courses of Reco and GPP follow basically the courses of temperature and PAR, but not always. - The strong impact of the dry period on GPP at the LS variant: Does this really show the efficiency of the model since PAR was the only independent variable (p. 4508, lines 15-22)? On the contrary, does this not reflect the correct choice of the measuring campaigns? Please clarify. It Temperature and PAR were the short-term variables, while other factors, e.g. wl were long-term variables. The models were calibrated about every four weeks

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to account for the long-term variables. Therefore, the dry period led to lower GP_{max} and alpha values. Of course, it also reflect the correct choice of the measurement campaign, which is coincidentally, since the measurement campaigns were usually held exactly every four weeks. - Statement, that the own results fit more to natural bogs than of rewetted bogs (p. 4509, lines 27-29. P. 4510, lines 1-4). There are no real differences between the presented values. Therefore the statement must be checked. It natural bogs in Germany: -157 to -8 g CO₂-C m⁻² a⁻¹. rewetted bogs in Germany: -148 to 192 g CO₂-C m⁻² a⁻¹. Our values: -201.7 +/- 126.8 to 29.7 +/- 112.7 g CO₂-C m⁻² a⁻¹. Thus, our values are closer to natural bogs. - Statements about methane emissions from natural and rewetted bogs. Have you considered that AUGUSTIN and JOOSTEN (2007) only dealt with newly reflooded peatlands, whereas you investigated mostly sites with a long-term rewetting history (p. 4511, lines 1-4)? Please check your statement again. It Beside bogs with a long-term rewetting history we also considered recently rewetted bogs. There was no time-dependant relation visible. Conclusions: Please formulate real conclusions instead of a summary. It Is changed accordingly

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