Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-82-RC1, 2019

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "CO_2 and CH_4 budgets and global warming potential modifications in *Sphagnum*-dominated peat mesocosms invaded by *Molinia caerulea*" *by* Fabien Leroy et al.

Anonymous Referee #1

Received and published: 19 April 2019

The manuscript presents results of mesocosm study of two sets of vegetation samples, representing two stages of fen development: Sphagnum-dominated community and the one invaded by Molinia caerulea. The empirical models predicting gross primary production, respiration and methane emission are calibrated. The larger productivity and greenhouse gas emissions from Molinia are demonstrated. Despite well-known limitations of using mesocosm-derived vegetation characteristics for natural ecosystems, the study provides useful contribution to our knowledge of carbon budget of wetlands.

I have no general concerns on the paper. There are some specific comments, that hopefully can serve to improvement of the paper quality:

Printer-friendly version

Discussion paper

1) I recommend to add a photo of mesocosm experiment setup.

2) *"Molinia caerulea appeared in May and increased up to 60% of mesocosms . . . "* What is the variable with the value 60%? Area, mass?

3) *"Here, CO_2 and CH_4 fluxes were measured once or twice per week during the growing season (April-October 2015 and April-June 2016) and every two weeks during the winter (November 2015-March 2016)".* Please speculate on the possible effects of diurnal cycle on long-term averages of carbon budget of samples, which you are missing with this measurement frequency.

4) In eq. (2), I guess, ER should go to zero when Mcleaves=0, as respiration is hardly possible without leaves.

5) *"The only significant differences concerns the GHG fluxes with more important fluxes in Sphagnum + Molinia ..."* Not clear what do you mean by "important" here.

6) *"To calculate annual emissions, we run our models with 15 minutes time step using continuous weather and vegetation data."* Please justify the application of models (1-9) calibrated on daytime measurements only (or may be not only daytime, but you don't indicate the times of measurements in 2.1-2.2 sections) to the annual period.

7) In eq. (6), methane emission is dependent on temperature as T^f, whereas in numerous wetland models temperature effect on emission (production) is represented by $q_{10}^{(T/10)}$ term. Please, justify your choice.

8) In Table 1, there are no cases denoted by "*" and "**".

9) In eq. (1) and (2) I would denote a, b and c differently, as they get different values.

10) *"In both vegetation covers, the ER was maximum in July and minimum in January-February (Table 1, Fig. 1a)."* Table 1 does not provide information on seasonality.

11) *"These increases are linked to Sphagnum growth and the number of Molinia caerulea leaves, respectively."* Why GPPmax should depend on leaves area, whereas

the latter is already included in (4) as separate multiplier?

12) *"Parameter d connected to the WTL had an opposite sign in the two vegetation covers. This difference was difficult to interpret as the large variation of parameter e shifted the relationship between parameter d and the WTL."* Please be more elaborate in this explanation, as it is not readily understandable at the moment.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-82, 2019.

Printer-friendly version

Discussion paper