Anonymous Referee #3

Generally, the topic of the manuscript is of interest for readers of Biogeosciences.

Unfortunately, I think the paper should be rejected for the following reasons:

- The methane (CH4) and ecosystem respiration (ER) data has already been published here: Leroy et al. (2017): Vegetation composition controls temperature sensitivity of CO2 and CH4 emissions and DOC concentration in peatlands, Soil Biology and Biochemistry 107, 164-167, https://doi.org/10.1016/j.soilbio.2017.01.005
- The general approach and the results of the annual model for ER and gross primary production (GPP) has recently been published in this paper: Leroy et al. (2019): Response of C and N cycles to N fertilization in Sphagnum and Molinia-dominated peat mesocosms, Journal of Environmental Sciences 77, 264-272, https://doi.org/10.1016/j.jes.2018.08.003

Therefore, I do not see any reasons why this manuscript should additionally be published, especially as the authors fail to mention that the data has already been published elsewhere. Most aspects of the discussion are of course similar (change of methanogenic pathways, temperature sensitivity).

The only aspect which has been additionally done is discussing the approach to derive the annual values in more detail and giving actual numbers of annual CH4 fluxes. The approach to model annual balances of CH4 has, however, already been described in the second paper. Although the results are not given there, this does in my opinion not justify an additional publication as the important aspects (mean values, temperature dependency, and correlation with other variables) are already published.

Further, the approach of using temperature (and water table or biomass proxies) for ER and photon flux density for GPP is fairly common when working with manual chamber. Therefore, there are no new aspects compared to the papers quoted by the authors (e.g. Kandel et al. 2013) and others using similar approaches which would justify publication.

- This comments have also been relieved by the referee #2. Sentences have been added in the manuscript to explain the different approach of this manuscript compared to the others papers. Here, our goal was to modelize the C fluxes under different plants communities. The works of modelization have not been developed in Leroy et al., 2017 (which concern only the temperature sensitivities) and in Leroy et al., 2019, which mentioned the number reported here without any support of these numbers.