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Interactive comment on “A satellite data driven biophysical modeling approach for estimating northern peatland and tundra CO₂ and CH₄ fluxes” by J. D. Watts et al.

Anonymous Referee #2

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Due to huge carbon stock in the northern high latitude region, it is very important to get clear understanding of net ecosystem carbon balance (NECB). In this manuscript, the authors use a terrestrial carbon flux model to analyze NECB at six sites by using two sets of input data, and compare the simulation results with field observation through eddy covariance. Also, one merit of this study is to quantify the global warming potential by considering carbon dioxide and methane together. Overall, this manuscript is well organized and clearly stated.

Comments are given below for the authors and editors to consider.

First, to address the relative uncertainty introduced by using both remote sensing data

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and in-situ data, it is good to analyze the difference of input data itself, which is more straightforward to illustrate the point. Meanwhile, the uncertainty caused by input data is a restriction not only for site-level study, but also regional estimation. If the authors could provide deeper exploration of how the current results have an implication for the uncertainty of upscaling estimation, that could be more interesting.

Second, it seems the model simulation could catch the temporal patterns of different variables of the field observation in most sites. But still, there are some mismatch between model simulation and site observation in some sites (for example, KY 2009 in Fig. 2 and Fig. 4). It is better to discuss the potential reason for why there are great differences between them.

Third, I notice that your parameter values (in the supplementary material) for different sites are different even they are same biomes, e.g. Ro, Q10p etc. How did you determine the value of those parameters? Did you calibrate the model? If so, which set of data you are using for calibration and which set of data are using for model validation.

Fourth, this study is to focus on northern peatland and tundra carbon dioxide and methane flux. Only two sites have the observation beyond the growing season. It would be more interesting to have more sites which consider the greenhouse gas fluxes during the spring-thaw period as well. Some recent studies indicates that the methane flux during spring thaw period could be even larger than the growing season.

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