

## ***Interactive comment on “A multi-scale comparison of modeled and observed seasonal methane cycles in northern wetlands” by Xiyan Xu et al.***

**Anonymous Referee #2**

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General Comments: I liked to read this paper as they used an improved CLM-BGC model to estimate the methane fluxes from northern wetland and compared the model-estimated methane fluxes with static chamber measurements, eddy covariance and aircraft measurements. However, I see some major short-comes which need to be addressed in a revision. Specific comments: 1. In this study, the major improvement of the CLM4.5-BGC is related to the methane transport through aerenchyma. In the Equation 2 (Line 210), several parameters were used to calculate the aerenchyma area. However, the author only analyzed and discussed the variation of “S”. Why? I missed to see the discussion at this point. How about fN (belowground fraction of current NPP)? Is this a fixed parameter or it will change during different growing stages? If it is a fixed parameter, you should also discuss the related uncertainties. 2. In the Section 3.1 (Line 350-362), the author compared the model-estimated results with TD

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and BU estimation from Kirschke et al., 2013, which was unexpected. It seems that the whole manuscript was talking about the methane fluxes from northern high latitude (mostly in Alaska). And the wetland types in the tropical regions are very different from the ones in high latitude region. I suggested to remove this part or only focus on the northern wetland, and make the whole manuscript more consistent. 3. In the Section 3.2.1, there should be further discussion about the overestimation, underestimation and misrepresentation of seasonal emission from CLM compared with site-level observation, especially for Figure 2a, b, d, h and k. Otherwise, it was hard to say CLM has the capability to reproduce the methane fluxes. 4. It is good to make the unit consistent throughout the manuscript, especially in Section 3.2.2. It made readers very confusing to have different units even within the same paragraph. 5. In Section 3.3, I was just curious about the analysis of temperature and precipitation. Did the author analyze the temperature and precipitation over Northern wetland (only inundated area)? Line 525-527, it is hard to read the bias from the Fig. 6.

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