



Interactive comment on “Contribution of the nongrowing season to annual N₂O emissions from the continuous permafrost region in Northeast China” by Weifeng Gao et al.

Anonymous Referee #1

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The manuscript (MS) investigated N₂O emission from swamp forest soils in permafrost region during the nongrowing season, and evaluated its contribution to annual N₂O emission. Since permafrost regions have long winter periods, the importance of assessing N₂O emissions during winter is understandable. The theme of this MS seems to be within the scope of BG. However, there are some serious concerns on this MS, especially for measurements, presentation of data, and discussion. So, I think that fundamental revisions are necessary for the publication of this MS. Please consider the comments below for your revision of the manuscript.

[General comments] 1. This MS evaluates the contribution of nongrowing season to

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annual N₂O emissions, but during the winter period, N₂O emission was not measured for almost the entire period from December to February. Although the authors state that winter period is longer than soil thawing period and therefore has more cumulative N₂O emission (L482-490), there are no measurements that adequately cover this period. By linear interpolation, it is estimated that N₂O emission continues to occur during this unmeasured period (Figure 1). However, could significant N₂O emission occur during soil freezing? The authors should clearly explain the question of the legitimacy of the integrated release estimate caused by the lack of frequency of measurements.

2. Although the MS focuses on N₂O emissions during the nongrowing season, there are many descriptions that focus on the growing season (e.g., L295-298, 511-532); the discussion should be substantially reconstructed to focus on the description of nongrowing season.

3. "N₂O emission is low in winter because the temperature is low". To state this, there is no need for redundant discussion as in this MS. Figures 3 and 4 are a rehash of the data presented in the previous section, but there is no significance in averaging the N₂O emissions for each period and verifying the correlation with temperature again. Throughout the discussion, there are many overlapping statements. Environmental factors other than temperature are almost completely absent from the discussion. Although measurements were taken at three sites, there is no comparison between the sites. In light of the above, the discussion should be thoroughly restructured.

[Specific comments] L120-129: It is described as a “permafrost region”, but there is almost no information about permafrost (e.g., thickness of permafrost layer, active layer depth, soil thawing period, etc.) L170-171: Did you place the collar in a different location for each measurement? L201-205: Were soil samples taken for each gas measurement? Figure 1: What do the error bars indicate? L310-334: Soil C/N, TOC, and TN have been shown to be controlling factors for the temporal variations of N₂O emissions, but do these values change over time like N₂O emissions? In this analysis, is there any spatial variation between iterations mixed in with the temporal variation? To

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verify the temporal variations, we should average the replications and then correlate them with environmental factors. In addition, the seasonal changes in environmental factors are not shown, so it is difficult to judge the correlation. L403-412: I think it should be shown in the results.

Sincerely yours,

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-305>, 2020.