

## ***Interactive comment on “Fungi regulate response of N<sub>2</sub>O production to warming and grazing in a Tibetan grassland” by Lei Zhong et al.***

**Lei Zhong et al.**

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Dear M. W. I. Schmidt,

Thank you for your suggestions. We have revised our manuscript “Fungi regulate response of N<sub>2</sub>O production to warming and grazing in a Tibetan grassland”, based on your comments. We have carefully addressed each comment and our responses to these comments are listed below. The attachments are the manuscript which had improved as your suggestions. We hope that all necessary revisions have been made. However, we would be prepared to make further revisions and modifications if required.

Responses to the Reviewer’s comments:

[Comments] The methods used seem appropriate in general, however some questions

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arise with regards to measurements and sampling. The paper leaves open why the difference was set to 1.2\_°C and 1.7\_°C during day and night respectively in summer. Furthermore, it is not clear what the effect of 1500 W are in winter. The authors mention that some thermometers are broken, but it would have been nice to get at least the data from the working thermometers. Zhong et al. (2018) mention from the beginning and in the title, that the effect of winter grazing was under investigation. However, for half of the time there was summer grazing on the sites. Please describe this treatment further.

[Responses] For “why the difference was set to 1.2\_°C and 1.7\_°C during day and night respectively in summer.” Before we set up the field site, we have done an experiment to make sure the set of warming treatment can be successfully used for stimulating climate warming in alpine meadow grassland, and proved the set of temperature was good. The FATE heating system was described by Kimball et al. (2008).

For “the effect of 1500 W are in winter”, In summer, the power output of the heaters was manually set at 1500 W per plot was enough to increase the soil temperature as our treatment’s set. But the temperature is very cold in winter, so some infrared thermometers were not working. To make sure the warming treatment was the same in summer and winter, the power output of the heaters was manually set at 1500 W per plot to make sure the increased of soil temperature were also 1.2 °C during the daytime and 1.7 °C at night in winter. We have improved it, please see lines 157-158.

For “half of the time there was summer grazing on the sites.” Sorry, our previous description caused the misunderstanding by the referee. In the new version, we clarified why we used summer grazing and winter grazing. On the Qinghai-Tibet plateau, winter grazing is very commonly and alpine meadows are generally classified into two grazing seasons, i.e. warm season grazing from June to September and cold season grazing from October to May even the grassland was covered by snow (Cui et al., 2015). Winter pasture contributed about 40% of the grazed area in Qinghai-Tibet Plateau (Fan et al. 2010). The grazing treatments from 2006-2010 in the same experimental platform showed the effects of warming and grazing on ecosystem during the growing seasons

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(Luo et al. 2010; Hu et al. 2010; Wang et al. 2012), here is that shown after the summer grazing was replaced by winter grazing, does the alpine meadow grassland ecosystem was still affected by grazing (Zhu et al. 2015; Che et al. 2018). We had improved the description of the winter grazing treatment and make it more clearly, please see lines 160-175.

[Comments] General: Samples were taken on one only day. Would it be possible, that due to special environmental circumstances on that day, the results were in some way not representative?

[Responses] In ecological studies of grassland, a series of studies only samples one time to show the effects of treatments on ecosystems (Zhong et al. 2015, 2017; Che et al. 2018; Marusenko et al. 2013). This is very commonly in ecological studies of grassland. And before we soil sampling, we also had checked the weather condition in the previous week, and make sure the weather condition of sampling time is commonly and the samples were representative.

[Comments] The authors do not explain why they chose to simulate winter grazing and not summer grazing. If it is the reason mentioned in line 370, the authors should explain it already in the introduction. Consider using less acronyms, it is sometimes hard to follow the story. Rethink if 'treatment' (e.g. summer grazing treatment) really needs to be used that often. In the introduction: Maybe elaborate more on the state of art and on similar studies done in other parts of the world.

[Responses] Sorry, our previous description caused the misunderstanding by the referee. In the new version, we clarified why we used winter grazing. On the Qinghai-Tibet plateau, winter grazing is very commonly and alpine meadows are generally classified into two grazing seasons, i.e. warm season grazing from June to September and cold season grazing from October to May (Cui et al., 2015). Winter pasture contributed about 40% of the grazed area in Qinghai-Tibet Plateau (Fan et al. 2010). The grazing treatments from 2006-2010 in the same experimental platform showed the effects of

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warming and grazing on ecosystem during the growing seasons (Luo et al. 2010; Hu et al. 2010; Wang et al. 2012), here is that shown after the summer grazing was replaced by winter grazing, does the alpine meadow grassland ecosystem was still affected by grazing (Zhu et al. 2015; Che et al. 2018). We had improved the description of the winter grazing treatment and make it more clearly, please see lines 66-175.

[Comments] 259: What does (w/w) mean?

[Responses] It is an abbreviation for "by weight," it is quite commonly used to describe the soil moisture.

[Comments] 290: What does the sentence mean? There were no differences in the contribution of FNEA and FDEA to TNEA and TDEA in any treatments. There are differences, aren't there?

[Responses] Yes, there are differences on the contribution of FNEA and FDEA to TNEA and TDEA in treatments, we had removed this sentence to avoid the misunderstanding, please see lines 305.

[Comments] 306: What does 'high complex compound substract substrate' mean?

[Responses] It is means the organic matter, for easier understanding, we had changed it as high organic substrate, please see lines 320.

[Comments] 336/369: Please elaborate on 'field data from 2011-2012'? It is not clear to us what this refers to. [Responses] The field data from 2011-2012 means the N<sub>2</sub>O emissions in the year of 2011-2012 in our site. We had improved these sentences, please see the lines 349-351 and 396.

[Comments] 341: We do not understand the sentence starting with "In our site: : :". Maybe you can clarify /reformulate that.

[Responses] We changed it as in our results to avoid the misunderstanding, please see lines 360.

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[Comments] 364f: We do not understand the sentence starting with “Additionally: : :”. Please elaborate on why the effect of sheep is limited compared to other livestock?

[Responses] “Additionally” means the other reasons. For “Please elaborate on why the effect of sheep is limited compared to other livestock?”. Sorry, there is a mistake in this sentence, we have corrected it, please see lines 391-392.

[Comments] Figure 1 and 4: The distribution of the letters indicating the significant differences is inconsistent, why do you only show it in section b of figure 1 and in section e of figure 4? Also think about using other symbols, since these letters might be confused with the letters for the figure subdivision.

[Responses] We have removed different letters from the Figs. 1b and 4e. We also showed the two-way ANOVA results in Table 1 to give more details of statistical analysis in our manuscript. Please see lines 583-645.

[Comments] Figure 5: From this figure we read that fungi and bacteria come from the hard rock substrate, that the denitrification happens in the subsoil and the nitrification in the topsoil. Is that right? Furthermore, we do not understand why W and WG are yellow shadowed and why ‘bacteria’ is written in purple, while the arrow is green. Also, it is not necessary to make the figure in 3D.

[Responses] The contribution of fungi and bacteria to nitrification and denitrification all showed the results of topsoil, because the soil of this study was belong to topsoil and collected at a depth of 0–20 cm. We had improved the figure 5 to avoid the misunderstanding, please see figure 5.

[Comments] Typos/ remarks concerning structure: 54f: ‘Potential’ is used too many times.

[Responses] The word is necessary, it can avoid confusion with N<sub>2</sub>O flux.

[Comments] 153: This sentence is formulated rather complicated, maybe you can split it in two sentences. The term ‘grazing treatments’ is repeated a lot in those lines,

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maybe you can replace it?

[Responses] We had improved it, please see lines 160-162.

[Comments] 220: Denitrification enzyme activity

[Responses] Corrected, please see lines 231.

[Comments] 278: forgot N in unit

[Responses] Corrected, please see lines 294.

[Comments] 279: forgot N in unit

[Responses] Corrected, please see lines 294.

[Comments] 316-318: Does this conclusion not contradict to line 103? 322: nitrification and denitrification.

[Responses] We had improved this sentence to avoid the misunderstanding, please see lines 326-330.

[Comments] 334: fungal N<sub>2</sub>O production potential.

[Responses] Corrected.

#### Reference

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Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-552/bg-2017-552-AC7-supplement.pdf>

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-552>, 2018.