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Interactive comment on "Fungi regulate response of N_2O production to warming and grazing in a Tibetan grassland" *by* Lei Zhong et al.

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Thank you for you suggestions. We have revised our manuscript "Fungi regulate response of N2O 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 the 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] 1. The description of experimental desigh is not clear, particularly, there is a confusing in introducing winter grazing treatment. What is the reason for the selection

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of winter grazing treatment in present study? Tibetan grassland is experienced to be covered by snow, frozen soils, and the grass should be withered in winter. In the same plots, the ecological effects of winter grazing should be interferenced by previous different grazing treatments (lines 153-156). How to avoid it?

[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 even the grassland was covered by snow (Cui et al., 2015). Winter pasture contributed about 40

We had improved the description of the winter grazing treatment and make it more clearly, please see lines 159-174.

[Comments] 2. Potential total nitrification/denitrification for N2O emission rate from incubation experiment is not a “real” rate of N2O emission under the field conditions. In terrestrial ecosystems, soil temperature, moisture, pH, soil N availability, and DOC etc. are generally considered as the major factors of controlling N2O emissions. For this study, the lack of field simultaneous monitoring data of N2O rates is a critical issue. Although the authors tried to cite the previous results for discussion, the conclusion obtained from an incubation experiment is still not general acceptable.

[Responses] We fully agree with the referee that the fungal and bacterial enzyme activities cannot be shown as the result of N2O emissions. The measurements under laboratory incubation reflected the potential ability of the soil fungal and bacterial activities in nitrification and denitrification because such laboratory incubation could avoid the impacts of various confounding factors and well clarify the mechanism responsible for N2O produce process. For the lack of field simultaneous monitoring data of N2O rates, because our study was focused on the microbial mechanism responsible for N2O produce process but not for the N2O flux, so we think the field N2O emission

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is not necessary. There are also a series of studies showed the microbial mechanism responsible for N2O produce process and conclusions by incubation experiment, eg. Zhong et al. (2015, 2017); Huang et al. (2017); Marusenko et al. (2013); Attard et al. (2011) and so on. At revised version, we clarified that our measurements in the laboratory indicated the potential emission to reveal the mechanism responsible for N2O produce process but not the field emission.

[Comments] 3. The underlying mechanisms that fungal and bacterial pathways for controlling N2O emissions remain unknown. The authors need to elaborate the relative contributions of fungi and bacteria in nitrification and denitrification processes of N2O productions.

[Responses] It is the two reasons that lead to the changes of fungal and bacterial pathways for N2O emissions by warming. Firstly, the increased of soil temperature directly reduce fungal activity but increase bacterial activity, because fungi prefer the cold environment compared with bacteria. Secondly, warming indirectly reduce fungal activity but increase bacterial activity through increased soil inorganic N and decreased soil organic N in our site, please see lines 350-355, because fungi prefer higher organic N environment while bacteria prefer higher inorganic N environment. All these changes caused the contribution of fungi in nitrification and denitrification was reduced by warming, but the contribution of bacteria in nitrification and denitrification was increased by warming (Fig.5), then due to the fungal and bacterial pathways for N2O emissions was changed in different directions under warming. We have improved the manuscript and make sure the underlying mechanisms is clearly, please see Lines 353-366.

[Comments] 4. Line 130-131: The symbol oC is not correct.

[Responses] Thank you for your suggestion. We had corrected itïijŇ please see lines 136-137.

[Comments] 5. There are several mistakes in English writing, which should be revised throughout the text.

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[Responses] In the new version, we almost rewrote the manuscript and asked a native English speaker Miss Ri Weal to polish the language errors. We hope the new version is easy to read and follow.

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Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2017-552/bg-2017-552-AC6-supplement.pdf

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