

Interactive comment on “Response of soil respiration and soil microbial biomass carbon and nitrogen to grazing management in the Loess Plateau, China” by Zhen Wang et al.

Zhen Wang et al.

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Response to Anonymous Referee #2

General comments:

The authors investigated how grazing intensities and grazing patterns affect soil respiration as well as the potential underlying mechanisms. Their results are interesting and can be potentially published somewhere. But for the current MS, it was quite confusion and unclear (please see some of my specific comments below). Moreover, there were many grammar errors across the whole MS, I did not list all of these errors, it was quite

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time-consuming. I deeply understand the writing difficulties for the non-native English researchers, but this MS was quite immature for submission. I suggest that authors should well prepare their manuscript for the next submission.

Author's response: Dear Referee, first of all, we would like to thank you for the time you devoted to reviewing this manuscript. We explain how we have revised the manuscript by following the referee's comments one by one. We have made major revisions on the Abstract, Introduction, Discussion and Conclusions. The revised manuscript has been polished by native English speaker, Mr. Roger Lucien Daives.

Abstract The abstract should be rewritten, particularly for the description of your results. You should focus on what you are really want to let others know from this study.

Author's response: We truly appreciate your constructive suggestions. Changes were made following your advices. We had been rewritten the abstract in the new revisions. Please see P 1 L 15 .

You have a lot of information about your experiments design, is it too specific in the abstract section? Can you describe your experiment design in a much terser way?

Author's response: Thanks. We have rewritten the experiment design in the abstract section in the revised version. Please see P 1 L21-23.

P1 L16-18. Really? I think there are already many studies investigating these variables, even several meta-analysis. You should reorganize the sentence.

Author's response: Thanks. We have re-worded this sentence as "Grazing management affects grassland carbon dynamics and soil microbial biomass, yet the effects of grazing management, such as grazing intensity and grazing regimes (GP), on soil respiration and soil microbial biomass carbon (SMBC) and nitrogen (SMBN) are not fully understood", see P1 L 15-18.

L 25. I think the word "affect" in your results section is very vague. Readers will not know whether grazing increase or decrease Rs in this way.

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Author's response: Thanks for your constructive suggestions, we have revised this sentence. Please see P 1 L25

P2 L4. Nothing new from the last sentence of your abstract. I think as a researcher in grazing ecology, one can easily hypothesized that grazing can affect C sequestration through both biotic and abiotic factors. Do you think your conclusion is very new and deserve to be published? One suggestion was that you should be very specific, then you will have your own conclusion.

Author's response: We appreciate the referee's suggestion. To make these sentences clear, we improved them as "Field experimental results indicate that the effects of grazing management on Rs and other soil microbial carbon and nitrogen processes in the grazing system depend on more grazing regime (GP) than grazing intensity; and suggest that GP should be considered in future manipulation experiments and included in carbon models to accurately simulate soil carbon dynamics under scenarios of climate change in grassland ecosystems", see P 2 L 6.

Introduction

At the beginning, I should highlight that there are many gramma errors in your whole manuscript; I will not list your errors one by one. I think this is your work, which should be finished before your submission.

Author's response: Sorry, our previous MS caused the misunderstanding by the referee. Roger L. Davies (NZCFS) has assisted in editing this research paper.

You have too many abbreviations. It is quite difficult for me to remember so many abbreviations, I need to refresh these abbreviations frequently. Moreover, many abbreviations only appeared once or twice.

Author's response: We apologize for the confusion resulting from the unclear statements in the manuscript. We have deleted some unnecessary abbreviations in the revised manuscript.

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P2 L15. A repetition of the first sentences in your abstract

Author's response: Thanks, We have changed this sentence as "Grassland covers about 41% of earth's terrestrial surface. . ." in the revised revision.

P2 L22. You have a good literature review. Then what are your research questions? The second paragraph of your introduction was very long, however, you changed your logical and focus for several times. It is very hard for readers to understand what you want to say. You should sharp your research questions and hypotheses. In your current version, you always present your hypotheses, questions and results in quite ambiguous ways. It is quite difficult for readers to find something interesting from your MS, if you determine present your results in this way.

Author's response: Thanks. We have rewritten the second paragraph in the revised manuscript. Please see P 3 L 2.

Materials and methods P5 L10. Why do you only measure soil respiration in 2010 and 2011, considering you have conducted this experiment for nine years? Do you continue with the measurements from 2011-2018, since these experiments were conducted eight years ago? The description about your Rs measurements is unclear, even though you had some citations here.

Author's response: Thanks for your comments. The rotational grazing experiment began in 2001, and the Rs and soil microbial C and N measurements were carried out from 2010 to 2011, the previous 9 years of field trials being used for other experimental purposes. We continue with the measurements from 2012-2018. Since 2012, we have added another experimental design on the original basis. For this reason, the data beyond 2012 is not shown in this manuscript. We have rewritten the description about Rs measurements in the revised manuscript. Please see P 5 L 21.

Why do you only measure Rs during the middle of May, September, and December?

Author's response: Thanks. The Loess Plateau belongs to temperate continental mon-

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soon climate. The Loess Plateau belongs to temperate continental monsoon climate. The early stage of herbage growth begins in mid May; aboveground grassland biomass peaked in mid September; grassland dormancy occurs by mid December. For these reasons, R_s was measured in mid May, September, and December. Please see P 5 L24.

Do you mean ST and SM measured for all treatments or only for the control? It was quite confusion.

Author's response: Thank you for pointing out that this was confusing. Soil temperature and soil moisture were measured for all treatments. We have changed this sentence as "Soil temperature at 10 cm depth was measured in real time using a thermocouple probe attached to every soil efflux collar during each R_s measurement. Soil moisture samples for gravimetric analysis were taken from the top 10.0 cm, close to every soil efflux collar, once a day in mid morning morn of R_s sampling days, and oven dried at 105°C for 48 h ". Please see P6 L5.

Do you mean ST and SM only measure for the dates when R_s was measured? How can you come true the random but adjacent the pots for R_s measurements? As soon as possible? How fast is it? Within several minutes, several hours or even several days?

Author's response: We are thankful for the reviewer's suggestion. Soil temperature at 10 cm depth was measured immediately using a thermocouple probe which attached to the gas analyzer adjacent to each PVC collar during the time of R_s measurement for all treatment. Soil moisture samples for gravimetric analysis were taken from the top 10.0 cm, close to every soil efflux collar, once a day in mid mornin morning of R_s sampling days. R_s measurement by gas analyzer took approximately 9 min to complete per plot. Please see P 5 L 20.

Many variables were measured repeatedly across the seasons or years, so a repeated ANOVA analysis should be used for your statistical analysis

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Author's response: Thanks. A repeated ANOVA analysis have been conducted in the revised manuscript. Please see P 7 L4.

You should have more information about the description of SEM analysis.

Author's response: Thanks. As you suggested, we have added detailed information for SEM analysis. See P7 L20, and Supplementary Figure 1. Results

Your whole results sections are quite confusion. I think there are many related studies published, you can read how they write their results section.

Author's response: We appreciate the reviewer's comments that could help us improve our manuscript. We have rewritten results sections in the new version of manuscript.

After the subtitle "SMBC and SMBN", you have a lot of description on ST, SM, AGB, BGB, or even the results from your data analysis. Do you need more subtitles?

Author's response: Thanks for your constructive suggestion. We added new subtitles as "3.3 Effects of grazing management on soil temperature, soil moisture, above-ground biomass, belowground biomass"; "3.4 Effect of grzaing management on temperature sensitivity of soil respiration"; "3.5 Structural equation models" in the revised manuscript. Please see P 9 L17.

Discussion Sorry, I do not read your discussion. There are many gramma errors, confusion sentences or even very strange descriptions impeding my review. I will stop here. I think the authors should well prepare their manuscript for the next submission.

Author's response: In the new version, we rewrote the discussion section and deleted sections to avoid the misunderstanding. Roger L. Davies (NZCFS) has assisted in editing this research paper.

Figures and tables Table 1. Repeated ANOVA analysis should be conducted.

Author's response: A repeated ANOVA analysis have been conducted in the revised manuscript. Please see P 24 L1.

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Table 2. What do “WG” and “CG” stand for?

Author’s response: “WG” stand for warm season grazing ; “CG” stand for cold season grazing. Please see lines P21 L16 in the revised manuscript.

Figure 1. Is this figure related to your study? You have legend for forest, grassland. . .If you want show a figure like this, I would suggest you show your experiments design since it was now very confusion.

Author’s response: Thanks. We have deleted this figure and added a new figure about our experiments design. Please see P 27 L 3.

Figure 3. Why did you only measure soil respiration from three months? Figures should be presented in a easier way depending on what you want to compare.

Author’s response: The Loess Plateau belongs to temperate continental monsoon climate. The early stage of herbage growth begins in mid May; aboveground grassland biomass peaked in mid September; grassland dormancy occurs by mid December. For these reasons, Rs was measured in mid May, September, and December. To make better understand the figure, we merged Figures 3 and 4 into one figure, and then we made bar graph into thick color lines. Please see P 5 L24

Figure 5. Why do your determine to use line chart here? There are many overlaps. You symbols are not very similar. It was very hard for me to understand your figure.

Author’s response: We apologize for the confusion from the chart. In order to show seasonal variations of soil microbial mass carbon and nitrogen at 5 cm and 10 cm soil depth in the warm grazing and cold grazing grassland under different grazing intensity, for this reason, we used line chart here. To make better understand the chart, we made black lines into thick color lines and added more information in chart. Please see P 30 L 1

Abbreviations were rarely used in the titles or in the first word of a sentence. How can you construct your SEM in this way? Was it based on your model comparison or

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randomly?

Author's response: We appreciate the referee's suggestion. We have made these points clear in the revised manuscript. SEM analysis was conducted according to a *Priori* conceptual model, to include all possible pathways (Supplementary Figure 1), including (1) both direct and indirect pathways of GP and GI on aboveground biomass, belowground biomass, soil temperature, soil moisture; (2) both direct and indirect pathways of GP and GI on soil microbial carbon and nitrogen; (3) both direct and indirect pathways of GP or GI on Rs via biotic or abiotic factors. To differentiate the effects of grazing management on Rs, grazing management was divided into two sections. The first SEM focuses on the direct or indirect effect of GI on Rs; the second SEM focuses on both direct and indirect effect of GP on Rs. Please See P 7 L 20.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2018-531/bg-2018-531-AC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-531>, 2019.

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