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Solid Earth
Discussions

Interactive comment on "Grazing effects on soil characteristics and vegetation of grassland in northern China" *by* Z. Wang et al.

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The authors wish to thank the two anonymous referees for providing detailed suggestions for improving our manuscript to make it clearer and more informative. The following responses and changes relate to the suggestions made by the two referees:

Anonymous Referee 1 (1)Comments: The materials and methods should present a better description of the sample procedure and laboratory analysis procedures. Authors also should provide more information about studied soil. Response: We agree with the suggestions. Changes in manuscript: We revised the description of the field sampling procedures and laboratory analyses methods according to the referee's suggestions. Additional information relating to the soil at the study site has been added to Table 1 and on page 2287, line 7-10. For soil sampling, 70 intersecting points were

randomly chosen (Figure 2), two soil samples were taken at each point to a depth of 10 cm using a soil auger (5-cm diameter) and samples were bulked to obtain a composite sample. (2)Comments: Other major thing that authors did not provided and described classical statistical procedure that was used for a comparison of presented results. This deficiency almost disabled any further quality monitoring of the paper. Response: We agree with the referee's suggestion. Changes in manuscript: Additional information concerning the statistical analysis was added to the manuscript. Differences in soil properties and vegetation characteristics among grazing intensities were evaluated using one-way analysis of variance (ANOVA). Values of sampling points from each transect were averaged within each grazed plot and then ANOVA was performed. Tukey's Studentized Range (HSD) Test for multiple comparisons was used with P = 0.05. All statistical analyses were conducted with SAS 9.2. (3)Comments: Furthermore, other aspect of concern is huge number of investigated parameters that is very hard to explain in one paper. For instance, authors produced 21 semivariogram. Lot of these data (phosphorus, C/N, C/P and N/P ratio) authors didn't even mention in the discussion section, which reduces the attractiveness and quality of paper. The results deserve a better discussion. I would therefore suggest a major review. Response: We agree with the comments about the large number of investigated parameters in our study. Changes in manuscript: We deleted parameters P, C/N ratio, C/P ratio and N/P ratio. (4) Page 2284, Line 21. Should add "in most of investigated soil properties" after "soil heterogeneity" Line 22. No information is given in the review about spatial variation of soil P and SWC reported by earlier workers. Please provide some information and add literature sources. Response: We agree with the referee's suggestions. Changes in manuscript: We added the phrases suggested by the referee on page 2284, lines 21-22. SWC was originally presented in the manuscript (page 2285, line 12), but we added more information about earlier work concerning soil P and SWC. (5) Page 2285, Line 13. Please put the full word instead of the abbreviation at their first appearance Line 21 – 23. Please specify this statement. Soil in general or just some specific soil property? Response: We agree with the referee's comment. Changes

in manuscript: We reviewed the published paper by Kröpel et al. (2013) that showed the vegetation indicator they measured was total vegetation cover, while soil properties were total N, SOC ((6) Page 2287, Line 1-2. In which period? Line 2. Please provide years in brackets after “Long term mean annual”. Line 6. Please put references after each classification. It is better to determine a soil type according a WRB. Line 8. Please provide information about texture in Table 1. Line 20. Please avoid writing in third face Response: We agree with the referee’s suggestions. Changes in manuscript: We made changes in the manuscript according to the referee’s comments. (7) Page 2288, Line 6 – 9. Unclear Clarify. How much soil samples were taken from each plot and how much in total? Line 12 – 13. Please provide information of surface area in brackets. If divide 10 m2 area on 25 parts then each of that 25 parts cannot have 2m2. Please clarify this. Line 14. Unclear. Did authors make sub-subgrids at each subgrid? Did subgrids were randomly taken? Line 18. Please provide source. Response: We agree with the referee’s comments that clarification is needed. Changes in manuscript: There were 70 soil samples at each grazing site with a total of 210 soil samples. We revised the description of the vegetation sampling procedures to make them clearer. The subplot is an area 10×10 m2 in each plot, which was divided into 25 2×2 m2 subplots. For vegetation sampling, 12 10×10 m2 grids were randomly chosen, and each of the grids was divided into 25 2×2 m2 subgrids (Figure 2). One of the 4-m2 subgrids was used to measure canopy height, and two 0.25-m2 sub-subgrids were used to measure species richness and aboveground biomass. (8) Page 2289, Line 3. Authors should provide information about classical statistical operations. Which procedure they used? Which post-hoc test was used, ect...? Line 7. Please provide source as you do for ‘Gamma Design Software’ Line 11. Please provide information what authors mean under "best fit"? Please clarify. Response: We agree with the referee’s suggestions. Changes in manuscript: The statistical analysis procedures used were according to Gamma Design Software (Robertson, G.P. 2005. GS+ 7.0: Geostatistics for the Environmental Sciences. Gamma Design Software, Plainwell, Michigan, USA). “Best fit” means the determination of the equation that best describes data relation-

ships and yields the highest degree of prediction based on comparing predicted values from the equation with actual data, using R2 and RSS to determine best fit. A better description of the semivariogram analysis was added to the manuscript. (9) Page 2290, Line 7. Authors should provide statistics in Figure 3 to support their statement. Line 8. Define “small”. Line 19. Paper has a focus on the chemical characteristics of soil and moisture content. Therefore consider that the chapter title is incorrect. It should write: Soil chemical properties and soil water content. Or even better is to merge this section with the lower one and call it: Soil properties and their spatial characteristics. Line 21 – 25. Please describe results according your CV values. CV value which is lower than 10Response: We agree with the comments of the referee. Changes in manuscript: The statistical variability was added to Figure 3. We added the letter value for MG to clarify what is meant by “small”. We also changed the subtitle of section 3.2 according to the referee’s suggestion. We reviewed the article suggested by the referee and described the results according to the CV and also added this reference to the Discussion section. (10) Page 2291, Line 4. “O” is missing in “Kolmogorv”. Line 8 – 9. This goes in Materials and Methods section. Line 13. Authors should define on what site and soil characteristics they observe large nugget value. Line 16 – 18. Provide source with explanation of "moderate and strong spatial dependence". If authors have values of nugget/sill ratio from 0.51 to 1.00 then they have weak and moderate spatial variability. Please consult study about this issue (Chien, Y.J., Lee, D.Y., Guo, H.Y., 1997. Geostatistical analysis of soil properties of mid-west Taiwan soils. Soil Sci. 162, 291–298.) and make adjustment in the whole paper including Table 3. Response: We agree with the referee’s suggestions. Changes in manuscript: We made changes in the manuscript recommended by the referee. We reviewed and referenced the article by Chien et al. (1997) and made the necessary changes in the manuscript, including the elimination of data for total P, C/N ratio, C/P ratio, and N/P ratio. Line 23. Please make a review in Discussion section about results of ranges in semivariogram (Table 3). Ranges are important for determining the proper spacing of sampling and can be usefully for future investigations. Line 26-27. Please rearrange

this sentence. Ranges in semivariograms indicate the distance after which data are no longer correlated. Range in semivariogram can provide great information for assessment of present sampling design and for future investigations and therefore number of samples, but cannot be a certain factor for determination of degree "spatial variability". Response: We agree with the referee's suggestions. Changes in manuscript: We added the review results for semivariogram ranges in the Discussion section. (11) Page 2292, Line 18. Did authors observed changes in species composition in grazed plots? Please make discussion about that. Response: Yes, we observed changes in species composition in the grazed plots. Changes in manuscript: We added discussion concerning how species composition is affected by grazing intensity. (12) Page 2293, Line 19. There is not even one word written and discussed about spatial distribution of phosphorus, C/N, C/P and N/P. Do authors think that there were irrelevant for this study? Suggests that authors remove these parameters (P, C/N, C/P N/P) from their results and rather put maps of remained soil properties derived from ordinary kriging or some other interpolator. This paper has 21 different semivariogram which makes paper huge. It is better to focus on important parameters and remove those that are even not mentioned in discussion section. Instead this is better to provide spatial visualisation of remained parameters. Response: We agree with the referee's suggestions. Changes in manuscript: We removed P, C/N ratio, C/P ratio and N/P ratio from the manuscript. We also added maps of important soil properties (Figure 7). (13) Page 2295, Line 22. Conclusion section is at this moment more a summary of the study results than real conclusions. Suggest to rewriting and adding a most important finding that will not be similar like a finding of others described in introduction section. Line 24. Please, avoid "We". Please write: Study results indicate that reducing livestock..... Page 2296 Line 15. Response: We agree with the referee's suggestion. Changes in manuscript: The Conclusion section was rewritten according to the referee's suggestions, and the most important findings of the study were added. (14) Add a Bestelmeyer et al (2009) at the reference list Response: Yes. Changes in manuscript: This reference was added to the Reference section. (15) Table 1. Provide texture of studied soil and write number of

samples in table caption. Remove sufficient comma after abbreviation of total nitrogen. Response: We agree. Changes in manuscript: Soil textural characteristics were added to Table 1, and the number of soil samples was indicated in the table caption. (16) Table 2. Please make range more visible and add two rows with min and max values. Please provide results of Kologmorov-Smirnov test as separate row in Table 2. Also provide CV Skewness and Kurtosis of soil characteristics that have log transformation and show them in brackets near original results. Response: We agree. Changes in manuscript: We separated the range values into individual columns for minimum and maximum and added SD, sample size and median to Table 2. (17) Table 3. Please write in table caption which parameters are calculated from the transformed data and which from original. Apply that also for Figure 6. Authors should check a way how they calculate nugget to sill ratio. These values does not represent nugget divided with sill. For proper calculation and describing spatial dependence see paper: Cambardella, C. A., Moorman, T. B., Parkin, T. B., Karlen, D. L., Novak, J. M., Turco, R. F., Konopka, A. E. (1994). Field-scale variability of soil properties in central Iowa soils. Soil science society of America journal, 58(5), 1501-1511. Response: We agree with the referee's suggestion. Changes in manuscript: We revised the description of the nugget value in the manuscript according to the reference by Cambardella et al. (1994). In addition, the correct nugget/sill values were inserted in Table 3. Also, Figure 6 was re-graphed, and semivariograms for P, C/N ratio, N/P ratio and C/P ratio were removed. Also, Figure 7 depicting the spatial visualization of SWC, SOC and TN was added to the manuscript. (18) Fig 2 needs some corrections. Please make sampling point on intersection area. Lot of dots is marked above or below intersection area. Response: We accepted the referee's suggestion. Changes in manuscript: We marked all the sampling dots on the intersection area in Figure 2. (19) Fig 3. Remodel this graph so you can add statistical analysis that can confirm your results from text. Response: Yes. Changes in manuscript: We re-graphed Figure 3 and added the statistical significance to the figure. (20) Fig 4. This figure should have explanation what these letters means. Also write what statistical test authors used. Also do the same for Figure 5. Fig5b should

have a first uppercase letter that describe y-axis on graph Response: Yes. Changes in manuscript: We added the explanation of the letters related to statistical significance in the captions for Figures 4 and 5.

Some changres in the figure captions:âĂČ Figure 2. Soil and vegetation sampling points at one of the study sites. Figure 3. Aboveground biomass at sites exposed to three grazing intensities (UG = ungrazed, MG = moderate grazing, HG = heavy grazing). Different letters mean significance at P<0.05. Figure 4. Green biomass (a), grass composition proportion (b) and non-grass composition proportion (c) at sites exposed to three grazing intensities (UG = ungrazed, MG = moderate grazing, HG = heavy grazing). Bars represent + standard error. Different letters mean significant difference at P<0.05. Figure 5. Species richness (a) and alpha diversity (b) at 0.25-m2 scale for sites exposed to three grazing intensities (UG = ungrazed, MG = moderate grazing, HG = heavy grazing). Bars represent + standard error. Different letters mean significant difference at P<0.05. Figure 6. Semivarograms for soil water content (SWC) (a), soil organic C (SOC) (b), soil total N (c) for sites exposed to three grazing intensities: ungrazed (UG, first column), moderate grazing (MG, second column), and heavy grazing (HG, third column). Figure 7. Spatial distribution of (a) soil water content (SWC), (b) soil organic carbon (SOC) and (c) soil total nitrogen (TN) under three different grazing intensities: ungrazed (UG, first column), moderate grazing (MG, second column) and heavy grazing (HG, third column).âĂČ

Major changes in the figures:

Interactive comment on Solid Earth Discuss., 7, 2283, 2015.

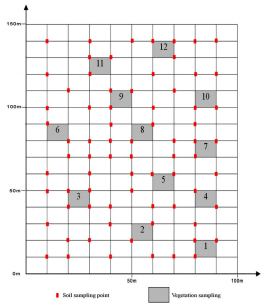

Fig. 1.

Figure 3.

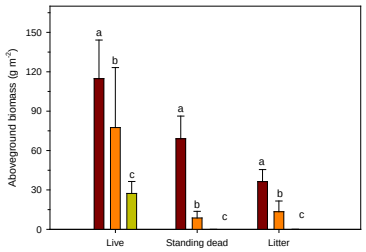

Fig. 2.

Figure 6.

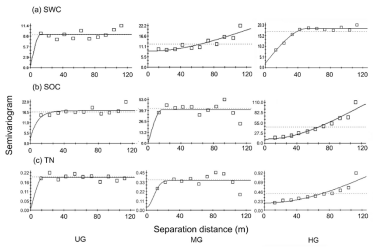

Fig. 3.

Figure 7.

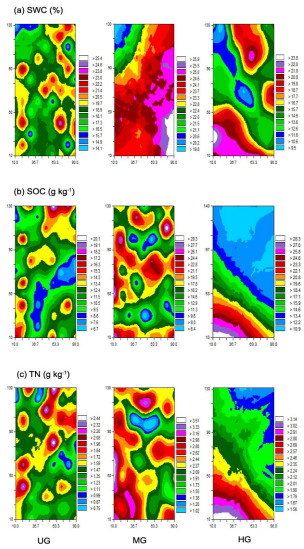

Fig. 4.