

## ***Interactive comment on “Effects of rodent-induced land degradation on ecosystem carbon fluxes in alpine meadow in the Qinghai–Tibet Plateau, China” by F. Peng et al.***

**F. Peng et al.**

pengguy02@yahoo.com

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Dear the anonymous referee #1

General Comments This paper attempts to analyze the effects of rodent-induced land degradation on ecosystem carbon fluxes in alpine meadow. This manuscript would be of interest to readers of Solid Earth, BUT the article would not be acceptable for the journal in the present form. I suggest minor revision. In general, the English should be improved.

[Response] Thanks so much for your positive assessment on the manuscript. We have carefully studied the comments and suggestions, and revised the manuscript accordingly.  
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ingly. We hope the revisions would be satisfactory for publication in Solid Earth.

Abstract Please this is not clear ... is confusing. You say “We conducted a field experiment with six levels of land degradation (D1–D6, degradation aggravates from D1 to D6) to investigate the effects of . . .” I understand that D1 is the least degraded and D6 the most degraded. However, in the text it is said that . . .”Soil respiration, ER, GEP and aboveground biomass (AGB) was significantly higher in slightly degraded (D3 and D6) than in severely degraded land (D1, D2, D4 and D5) . . . it’s confusing... seems contradictory . . . In line 11-12, “Net ecosystem exchange had . . .”, please use acronyms . . .NEE.

[Response] We are so sorry for the negligence about making clear description of different levels of land degradation. Actually, we did not preset the standard for different levels, we just selected six habitats where rodent holes (either shallow or deep) are different in them. In the study, we categorized the different lands according to the number of rodent holes and community coverage. This information has been added in the Materials and Method section. To make the abstract smooth, we re-wrote the abstract.

INTRODUCTION The introduction is short. It is very well put, but you limit your introduction to China. Solid Earth - SE is an international journal. I recommend you add something about carbon and land degradation studies in dryland. In this regard, I recommend that you read the works of Parras-Alcántara, L., and Cerdà, A., so that the paper is not a regional study.

[Response] Thanks for your suggestion. We have carefully read some articles referring to the land degradation in other parts out of China, especially Parras-Alcántara and Cerdà’s work in Spain and Dregne’s review on land degradation worldwide. We have revised the whole part of the introduction according to another reviewer’s suggestion, especially the first paragraph where many unnecessary % were put.

Site description I recommend adding a small location map.

[Response] Done as suggested.

The text indicates: "... Mean annual potential evaporation is 1316.9 mm". ...evaporation or evapotranspiration?. The text indicates: "... Cryosol according to World Reference Base"... the reference is incomplete.... World reference base for soil resources....2006, 2010, 2014...The text indicates: "... Permafrost thickness observed near the experimental site is 60–200 m". ...Pang et al. (2009)...not shows this data..(Qiangqiang Pang, Guodong Cheng, Shuxun Li, Wengang Zhang. Active layer thickness calculation over the Qinghai–Tibet Plateau. Cold Regions Science and Technology 57 (2009) 23–28

[Response] We re-check references. It is the potential evapotranspiration. The reference of soil classification is World Reference Base for Soil Resources 2006, which has been added in the new version. Sorry for the wrong number about the permafrost thickness. Personal communication with a director in Beiluhe observational station (Prof. Liu Yongzhi) told us the permafrost could reach to 200 m. While permafrost in the study area is about 30-70m in published papers that was also used in the new version.

Experimental design Really. . . what criteria was been used to establish the degradation level (D1-D6)?... As has been made?...In Table 1 and in the text it is not clear. ....Please explain.

[Response] Sorry for not making it clear. The first country-by-country assessment of land degradation classified four grades of land degradation for different land uses (Dregne et al., 2002). In practice four levels of desertification in grasslands, slightly, moderate, severe and very severe degraded land are usually used in China (Xue et al., 2009), and the four levels of degradation are primarily identified by the different plant coverage. In current study, we did not actually set up the standards for each degradation level but we selected six habitats with different number of rodent holes and community coverage, and then we measured average plant height and identified

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major species in each habitat. In the new version, we try to revise the experimental design to make it clear. We hope it will be satisfactory.

Measurement protocol I recommend simplifying. You can put a table with the method and its literature, adding a specific feature of the method.

[Response] Thanks for your suggestion. We have adopted a table including all devices and procedures in measuring soil chemical properties and ecosystem CO<sub>2</sub> fluxes.

Results Temperature The text indicates: "...The average soil temperature was 10.02 ±1.70, 9.64 ±2.81, 12.33 ±4.02, 11.0 ±2.78, 12.40 ±3.95 C from D1 to D6". . . I imagine that they are the average of all considered months, but ± what it is? Standard error, standard deviation, variation. . .etc, explain in data analysis or get it right in the figure 1.

[Response] Sorry for not making it clear. The values are the average of all considered months in D1-D6. ± stands for the standard error of soil temperature in different months in D1-D6. In the results section, soil temperature was the average of different months with standard error while they were the average of subplots in D1-D6 in each month. According to another reviewer's suggestion, the specific values of soil temperature are not necessary therefore we removed them in the text.

Soil chemical properties and biomass I think that it would be interesting to include SOCS (Soil organic carbon stock) in Table 2. So that the SOCS content depends on gravel content and bulk density. And these variables are important especially in degraded soils. Do not understand how this study the physical soil properties are not incorporated. With respect to physical properties, I recommend reading paper of Parras-Alcántara, L., With respect to Table 2. . .what it is ±X?...explain. . . standard error, standard deviation, variation. . .etc. I think that the C:N ratio, especially in degraded soils, could be an indicator of soil quality .... (suggestion).

[Response] Thanks for your suggestion. We admit that physical soil properties are as

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important as chemical properties and biomass when investigating land degradation. However, for the study area, soil temperature was the major control of soil respiration (Peng et al., 2014). The mother matrix for soil is of fluvial origin and sand content was about 90%. We carefully read about the study of Parras-Alcantara and cited his work in referring to the decline in C and N with development of land degradation.  $\pm X$  stands for standard error and information has been added in the caption of the figure. Results of C:N ratio also was added in Table 3.

DISCUSSION Be careful with the acronyms, when they are made above, do not write the whole word again. For example, page 3011 line 3 (total nitrogen TN), in page 3010 line 3, TN. Please review the text.

[Response] Sorry for using the whole word again. Some editors think acronyms should not be used when starting a new sentence therefore in the manuscript whole word was used even acronyms have been set in previous part. In the revised version, acronyms were used when they have been defined in previous part.

Effect of land degradation on soil properties Be careful, when we are referring to storage should talk about stock ... I think it is more accurate (more correct).

[Response] Thanks so much for your reminding. We did not study the soil bulk density in D1-D6, a field survey revealed that the spatial bulk density does not change significantly due to the fluvial origin of the matrix. In the revised version, the first paragraph in the discussion section focused on C and N loss including density and stock change. In some parts, C and N concentration were emphasized in the discussion.

Effect of land degradation on C fluxes The text indicates: . . "Soil temperature explains most of the variation in Rs" . . .Why? . . .can you explain better..

[Response] Thanks for your careful check on the study. After re-check of the fitting between soil temperature and Rs in Fig. 4a, we overlooked the P value which is  $>0.05$  therefore soil temperature tends to have no influence on Rs. In the new version, we

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focused on the relationship between Rs and AGB. And the assertion "Soil temperature explains most of the variation in Rs" has been deleted.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/6/C1377/2014/sed-6-C1377-2014-supplement.pdf>

Interactive comment on Solid Earth Discuss., 6, 3003, 2014.

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