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Discussions
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Interactive comment on "Patterns and controls of soil respiration and its temperature sensitivity in grassland ecosystems across China" *by* Jiguang Feng et al.

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General comments

In this paper, the authors used published data to analyze the variations of soil CO2 respiration rates and their temperature sensitivity (Q10) across Chinese grasslands. Furthermore, their relationships with some abiotic and biotic factors were analyzed. The results could advance the understanding of the variation and control factors of soil CO2 respiration rates and their temperature sensitivity (Q10).

Response: Thank you very much for your encouragement.

Specific comments:

Line 72: shown

Response: Thanks for your correction. We have corrected the word.

Line 137: Correct the equation 2

Response: Thanks for your good suggestion. We have corrected the equation. Please see line 154 in the text.

Line 148-151: The Q10 values were divided into five soil depth with different soil temperature

Response: Thanks for your good suggestion. We have revised the sentence. Please see line 172-173 in the text.

Line 178: shown

Response: Thanks for your correction. We have corrected the word.

Line S2: add the measuring methods

Response: Thanks for your good suggestion. We guess you mean add the measuring methods in line 187-188 in the original manuscript. Following your suggestion, we have added the measuring methods in the supplement file.

Line 192, Fig. 4: Why choose paired sample t-test to analyze the significant differences of the Q10 among the different soil depths?

Response: In this study, most studies reported the Q10 values derived by soil temperature at one or two different soil depths. For example, one study includes Q10 at 5 and 10 cm soil depth, one study includes Q10 at 10 and 15 cm soil depth, and another study includes Q10 at 10, 15 and 20 cm soil depth. Under this condition, the Q10 at the five soil depths was not paired. Therefore, when combining all Q10 from different studies and comparing Q10 derived by the five soil depths, the differences for Q10

among soil depths might be result from grassland type, rather than soil depth. There-fore, we choose paired sample t-test to analyze the significant differences of the Q10 among the different soil depths. When treating the similar data, previous studies also applied the paired sample t-test to analyze the significant differences, such as Peng et al (2009) and Wang et al (2010). However, several studies used one way analysis of variance (ANOVA) to compare the differences for Q10 among different soil depths, such as Song et al (2014), Xu et al (2015). Therefore, we also applied ANOVA to anal-yses the differences among different soil depths, which can also present the patterns of Q10 among soil depths. The results from paired sample t-test were presented in the manuscript (Fig. 4), and the results from ANOVA were presented in the supplement file (Fig. S3).

Line 209: there are no results for the temperate desert steppe in Table 1

Response: In this study, we focused on soil respiration at the annual scale. Meanwhile, we also checked the original data. Indeed, we found that there was no annual soil res-piration measured in temperate desert steppe in China when we searched references. Therefore, our results for annual soil respiration rate did not include temperate desert steppe (Table 1), and we noted this condition in the captions of Table 1.

Line 233 and Line 239: five soil depths

Response: Thanks. We have corrected the writing.

Line 248: 1.73±0.08

Response: Thanks. We have changed 2.65±0.08 to 1.73±0.08.

Line 267: Table S4

Response: Thanks. We have corrected the writing.

Line 271-286, most of the contents are descriptive and repeated with results

Response: Thanks for your comment. We have re-written this part (line 305-324).

Line 364 relatively colder and higher than what?

Response: Thanks for your comment. We have described it in detail.

Fig. 2, 5: indicate the n values for each regression analysis

Response: Thanks for your good suggestion. We have indicated the n values for each regression analysis.

Fig. 3 Line 675 (e) and (g)

Response: Thanks. We have corrected the word.

Table S1: what R2 represent for? What the ranges of soil temperature and soil mois-ture?

Response: Thanks. Here, in Table S1, the R2 represent the determination coefficient for the relationship between soil temperature and soil respiration rate based on equa-tion (1) and (2). In order to clearly distinguish this type of R2 from the R2 in regression analyses in Figure 2 and Figure 5, we changed all this type of R2 to RQ2 through the entire manuscript. We have revised the related descriptions in detail, please see the definition of RQ2 in section 2.1 Data collection and related content in the revised manuscript. For soil temperature and soil moisture, these two parameters are provided with different time scale in case studies, for example some studies provided monthly or weekly mean temperature and moisture, some studies provided daily mean tempera-ture and moisture, and some studies provided daily temperature and moisture. In this case, we could not accurately obtain the ranges of these two parameters, and we did not include the ranges of soil temperature and soil moisture in our dataset and analysis.

Table S2: show the n values. Are there values of soil temperature and soil moisture?

Response: Thanks. We have indicated the n values for each item in Table S2. Mean-while, we have added soil temperature and soil moisture in Table S2. As the two key environmental factors, these two parameters might also control soil respiration and its

temperature sensitivity (Q10). Therefore, we also analyzed the relationships between these two parameters and annual soil respiration and Q10 derived by soil temperature at the depth of 5 and 10 cm, respectively.

Table S3: show the n values. Are there values of soil temperature and soil moisture?

Response: Thanks. We have indicated the n values in Table S3. Meanwhile, we have added analysis of soil temperature and soil moisture in Table S3.

Fig. S1, S5, S6: show the n values

Response: Thanks for your good suggestion. We have indicated the n values in Figure S1, S5 and S6.

Fig. S7: is data for method comparison from the same or similar sites? Otherwise, there may be many factors affect the annual Rs and Q10.

Response: Thanks for your comment. Here, the data for method comparison is from all sites. Indeed, when combining all data from different sites, the method comparisons for Rs and Q10 are affected by many factors, such as grassland types, soil properties. As presented in the section 3.2.1 and 3.2.3, the Rs and Q10 are affected by many environmental factors. Under this condition, one of the ways to address this issue is using data from the same or similar sites to compare the differences among measuring methods. We treated the grasslands within each grassland type as similar sites. Here, in order to eliminate the influences of other factors, we also compared the measurement method effects within each grassland type. As presented in the new Figure S7, the ANOVA analyses showed that there were generally no significant differences for Rs, Q10 derived by soil temperature at the depth of 5 and 10 cm among measurement methods, whether the data was pooled across all grasslands or within each grassland type. Due to the only one sample of annual Rs measured by alkali absorption (AA), we could not compare it to the other two methods using ANOVA analysis. Considering the value measured by AA was very close to that by static closed chamber (SCC), the

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effects of measurement methods on Rs could be neglected.

References used in our responses:

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