Response of suggestions for revision #1

This is my second round of reviewing this manuscript. It seems to me that substantial modifications have been made in this resubmission and most of my suggestions have been incorporated. However, after reading through the manuscript, I find there are still some small issues that need to be addressed and some revisions require to be made. I list my concerns below and suggest a minor revision is needed to meet the publication requirement.

Thank you very much for reviewing our manuscript again. We greatly appreciate your valuable feedback. We have made substantial revisions to the manuscript based on your comments. Here, we provide our responses to your comments as follows:

1. Line 18, please be specific about what 'pattern of higher rates' means.

Response: We have revised the sentence to "revealing the higher carbon dioxide exchange rates in summer and autumn and lower rates in winter and spring".(in line 19)

2. Lines 21-22, PAR is an environmental factor rather than a climatic factor.

Response: We have changed "climatic factors" to "environmental factors" in this section. (in line 22)

3. Line 22, should be more accurate to state that NEE is the net ecosystem CO_2 exchange.

Response: We have changed "net ecosystem exchange (NEE)" to "net ecosystem CO_2 exchange (NEE)" in this section. (in line 24)

4. Abbreviations should be used consistently and avoid repetition. For examples, in Line 78, the abbreviation of eddy covariance should be illustrated in Line 75; while in Line 76, the full name of NDVI should be given here rather than in Line 91; in Line 88, PAR has already been abbreviated in Line 84; the terms VPD and PAR appeared in Line

263 and Line 266 have already been abbreviated earlier. There should be other similar mistakes like the above mentioned, but I won't list all of them.

Response: Thank you very much for pointing out these errors. We have checked the abbreviations throughout the entire manuscript.

5. Lines 23-25, this result here is a bit incoherent, some introduction is needed to elucidate the sudden change from a site study to a spatial distribution.

Response: We have revised the first half of the sentence to: " In addition, we explored NEE and its influencing factors at the regional scale, found that air temperature …". (in line 26-28)

6. Line 24, I understand that you observed higher NEE where there are higher air temperatures. However, according to the equation (y=-16.29x-86.67) in Figure 7, this correlation should be negative rather than positive. More importantly, the correlation is not that good given the correlation coefficient is only 0.17. I suggest rephrasing or reorganizing this sentence here to better show the rigorous results and innovative conclusions.

Response: We have changed "found that the spatial distribution of NEE was significantly positively correlated with temperature" to " found that air temperature promotes carbon dioxide absorption (negative NEE values)". (in line 27)

7. Line 26, the standard deviation or the range of NEE is needed to report here rather than a single mean value.

Response: We have replaced this description with the annual average range of NEE values. (in line 29)

8. Lines 26-29, rephrase and refining are needed to make this sentence more concise. In addition, '368 g C m^{-2}'.

Response: Thank you for your suggestions. We have revised this sentence. (in line 30-32)

9. Line 29, 'This study provides …'. Besides, should avoid using the word 'essential' as this needs to be evaluated by the readers rather than the authors.

Response: We have revised the statement to: " This study provides valuable insights into the carbon cycling mechanism in sub-alpine ecosystems and the global carbon

balance". (in line 32-33)

10. Line 30, should be 'alpine ecosystems' or 'sub-alpine ecosystems' rather than 'plateau ecosystems'.

Response: We have changed "plateau ecosystems" to "subalpine ecosystems" in this section. (in line 33)

11. In Lines 30-32, the proposition here is too broad and doesn't have that many direct connections with the research results of this study. I didn't see the necessity of stressing this here. Besides, the comma should be placed after the double quotation mark.

Response: Following your suggestion, we have removed unnecessary descriptions from this section.

12. Line 36, 'The eddy covariance technique' or 'The eddy covariance method' is a better keyword here.

Response: We have changed "The eddy covariance system" to "The eddy covariance method" in this section. (in line 34)

13. Line 62, the full name of the unit is not necessarily needed here.

Response: We have removed the full name of the unit in this section. (in line 60)

14. Lines 99-101, it's better to merge the two sentences into one.

Response: We have combined the two sentences into: "Since the 1960s, the QTP has experienced a faster warming rate than lowland areas, a phenomenon projected to intensify by the end of the 21st century." (in line 97-98)

15. Lines 106-107, which are 'these ecosystems'?

Response: We have revised the sentence to: " discovered that by comparing carbon fluxes in ten high-mountain ecosystems with different grassland types, these ecosystems act as sinks for carbon dioxide". (in line 103-105)

16. Lines 118-120, it's better to rephrase this sentence to show that it's these kinds of research that is needed to be done rather than saying researchers should do this or that.

Response: We have revised the sentence to: " Long-term monitoring is necessary to understand how these forests will respond to climate change". (in line 116)

17. Line 124, what's the connection between this study and Yunnan-Kweichow Plateau. Maybe delete this part.

Response: Following your suggestion, we have removed "...and lies in the transitional zone between the QTP and the Yunnan-Kweichow Plateau". (in line 121)

18. Lines 130-132, simply state your research aim directly, the reasons should be illustrated earlier in the introduction part.

Response: We have revised the sentence to: " Evaluate the carbon exchange capacity of subalpine forests in the QTP by comparing existing data with other ecosystems in the region". (in line 126-127)

19. Line 147, '… is around (should not be below) 30 meters….'?

Response: We have changed it to "around". (in line 142)

20. Lines 149-152, better to merge the two sentences into one. Besides, should explain what 'southwest and southeast monsoons' means if you want to keep it.

Response: We have combined these two sentences. (in line 144-147)

21. Lines 152-156, refine and rephrase the two sentences.

Response: We have revised and rephrased these two sentences. (in line 147-151)

22. Line 163, it should be that the EC system is deployed at the height of 35 m rather than the data were collected from this height.

Response: We have revised the sentence to: " The EC system is deployed at a 35 m-high tower ".(in line 158)

23. Lines 169-170, what are the 'other environmental variables'?

Response: We have removed the redundant description here. (in line 164)

24. Line 170, data was stored at 30-minute intervals.

Response: We have changed "30 m" to "30-minute". (in line 165)

25. Line 184, … FC raw data…

Response: We have changed "FC raw valid data" to "FC raw data". (in line 178)

26. Lines 227-228, reformulate this sentence. It sounds like that only 27.33% of missing data were gap-filled. Should be that 27.33% of the data were filtered out and then the gaps were filled using Tovi based on Reichstein et al., 2005.

Response: We have revised the sentence to: "27.33% of missing data were interpolated using Tovi after filtering, resulting in a flux data set with complete data integrity ". (in line 221-222)

27. Lines 231-233, rephrase.

Response: We have modified the sentence to: "In terms of seasons, the average peak distances of the 90% flux contribution areas for winter, spring, summer, and autumn over the two years are as follows: 353.9, 358.2, 350.05, and 344.34m, respectively". (in line 225-227)

28. Lines 254, a supplementary file is needed to show the results that the authors compiled from the 82 sites and their locations and other environmental characteristics.

Response: "Thank you for your feedback, we have uploaded the supplementary file ".

29. Line 293, should be specific that they are CO_2 fluxes.

Response: We have changed "carbon fluxes" to "CO_2 fluxes" in this section. (in line 285)

30. Line 356, delete 'these factors'.

Response: We have removed "these factors" from this section. (in line 350)

31. Line 384, … 9.03, 2.22, 2.71, ….

Response: We have changed "9.025" to "9.03" in this section. (in line 378)

32. Line 403, … has indicated that ….

Response: We have changed "indicates that" to "has indicated that" in this section. (in line 397)

33. Figure 8, would be better to show the raw data points in this figure. It's hard to judge their relations based only on the four curves.

Response: Thank you for your feedback. We have displayed the raw data in the figure. (in line 406)

34. Lines 453-454, rephrase, the current description is confusing.

Response: We have revised the sentence to: " The research reveals that the subalpine forest acts as a carbon sink. Over the two years, the total NEE, GPP, and RE were −332, 1121, and 788 g C m^{-2} in first year, and −351, 1199, and 847 g C m^{-2} in second year. " (in line 447-449)

35. Lines 456-459, merge the two sentences and refine.

Response: We have revised the sentence to: "Combining results from other eddy covariance sites on the QTP, this study highlights that forests have the highest carbon sequestration potential, reaching 368 g C m^{-2} annually, followed by meadows (-98 g C

m^{-2}), steppes (-64 g C m^{-2}), and shrubs (-61 g C m^{-2}). In contrast, wetlands were identified as a significant source of carbon dioxide (57 g C m^{-2}). " (in line 451-455)

Response of suggestions for revision #2

The manuscript as written represents an improvement, but the presentation is difficult to read as many paragraphs are quite long and touch on many topics, data quality in my opinion is overstated, the finding that PAR is the most important control over NEE on a half-hourly basis is obvious, and because temperature and RH contribute to the VPD calculation the PCA findings are interesting but could be teased out a bit more, it seems like because temperatures never get to high that the RH term of VPD is relatively more important in controlling plant function. This would be an interesting finding but is buried somewhat in an unnecessarily convoluted PCA. The study system is important and the manuscript makes a number of interesting findings, but comprehensive improvement would make it more valuable to the scientific community.

Response: Thank you for your detailed review and constructive feedback on our manuscript. We have taken your suggestions seriously and have made significant improvements to the manuscript. Specifically, we have revised the structure to improve readability, addressed the data quality concerns. We have revised some of the longer sentences that may have caused inconvenience to readers, making them more concise, and we have checked for grammar issues in the manuscript. We have presented the results more cautiously rather than exaggerating them. We have also added an analysis of the control of plant functions by relative humidity (RH) in the results section, and the contribution of RH to NEE is emphasized in the summary and conclusion. (in line25-26,295-297, 450)Your feedback has been very helpful to us, and we have carefully addressed the issues in the manuscript to improve it.

1.Equation 4 is written incorrectly (if using exp, don't superscript, just use e instead). Equation 8 is better but in many instances you needn't use the dot to represent multiplication.

Response: Thank you for your suggestion. We have corrected Formula 4 and replaced "dot" with "×" in the formula. (in line204, 216)

2.'The final flux data achieved a data integrity is 100%' isn't accurate. I'm not sure what 'integrity' means in this context and with a slope of 5% the nighttime data need to be interpreted very carefully.

Response: Here, we filled 27.33% of missing values and obtained a complete flux dataset. The wording here in the manuscript was difficult to understand, so we have revised it to '...resulting in a flux dataset with complete data integrity'. Errors caused by slope have been corrected in the manuscript through ' double-coordinate rotation".

3.Statements like that on line 455 can't be true; NEE would certainly exhibit significant differences across seasons.

Response: Thank you for pointing out the issue. Our previous statement was redundant. We have changed it to "NEE reached its peak in autumn." (in line451)

We appreciate your guidance, all the modified contents are marked in red in the manuscript, thank you again for your thorough review and constructive suggestions.

On behalf of all the authors,

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