

Responses to the comments of Referee#1

Dear Reviewer,

Thank you for your valuable feedback on our manuscript. We appreciate your constructive comments that have been instrumental in refining the manuscript. It has improved the clarity and accuracy of our study on subalpine forests in the Qinghai-Tibet Plateau. Below, we address each of your specific comments and modifications made in response:

Specific comments:

L14-15 The abstract starts with "The subalpine forests in the Qinghai-Tibet Plateau act as carbon sinks in the context of climate change and ecosystem dynamics." I think the tone should be adjusted because we cannot conclude this point before we conducted this work.

Response: Thank you for the reviewers comment. We appreciate the point raised, and we have incorporated the suggested change into the manuscript. The revised sentence now reads: "The subalpine forests of the Qinghai-Tibet Plateau are one of the crucial components in the carbon cycling system in the context of climate change and ecosystem dynamics."

L20-21 The time of NEE reached the peaks, in fact, is not stable. So, I think the time (as high as $10.78 \mu\text{mol CO}_2 \text{ s}^{-1} \text{ m}^{-2}$ (12:30, autumn)) here has no meaning.

Response: Certainly, your point about the instability of the time when NEE reaches its peaks is valid. We acknowledge that including this information in the abstract is inappropriate. Therefore, we have removed this description from the abstract.

L25-26 As the study is based on the site-level EC observations, we cannot directly conclude "Increasing altitude negatively impacts carbon absorption at the regional scale".

Response: We have removed the inappropriate conclusion from the abstract, as it is not directly supported by the site-level EC observations. Additionally, in the analysis of Figure 7, we conservatively stated that the elevation of these sites "may influence NEE" across the entire Qinghai-Tibet Plateau.

L29 Add the time unit to NEE.

Response: Thank you for your suggestion. We have added the time unit to NEE in the manuscript.

L92-94 The variability in NEE is not affected by climate factors, but also influenced by the biotic factor such as NDVI or LAI. The work by Tang et al. 2022, Forest Ecology and Management can be supplemented here.

Response: Thank you for pointing out the shortcomings in the introduction. We have addressed this by adding the following content: "Furthermore, research suggests that the NEE is influenced by biotic factors such as NDVI (Normalized Difference Vegetation Index) and LAI (Leaf Area Index)," referencing the work by Tang et al. 2022 in Forest Ecology and Management.

L106 Delete "in their study".

Response: We have removed the phrase "in their study" from this paragraph.

L219 It is defined as the ratio of net primary productivity to gross primary productivity. Here, NEP

is not net primary productivity (NPP). Need to revise.

Response: Thank you for bringing this to our attention. We have corrected the error, and the revised sentence now reads: "It is defined as the ratio of net ecosystem productivity (NEP) to gross primary productivity."

L239-240 The highest recorded VPD was 1169.8 hPa (on July 5, 2022), and the lowest one was 60.8 hPa (on August 26, 2021), with an annual average of 446.4 hPa. I think the unit of VPD is wrong here. Please also see the figure.

Response: Thank you for your feedback. We have addressed the unit error in this paragraph and corrected it.

Figure 3 The diurnal dynamics of NEE, GPP and Re seems surprised. For example, Re nearly kept a line across seasons. I also cannot understand the forest remains to be strong carbon sink in winter. I think the GPP should be zero as the temperature is below zero.

Response: Thank you for your insightful comments. Regarding your concerns, we would like to provide the following explanation: Our monitoring results indicate that the diurnal dynamics of NEE, GPP, and RE exhibit significant variations, but when observed at a seasonal scale, they also show considerable differences, as illustrated in Figure 5. During winter, carbon flux values are much smaller compared to other seasons. Despite the fact that the daily average temperature in winter is often below zero, there is a wide range of temperature fluctuations within a day (as reflected in Figure 4). Daytime temperatures generally remain above 0°C, indicating that the subalpine forest is still undergoing weak photosynthesis and is not completely dormant. Although NEE, GPP, and RE are much smaller in winter, the results show that their seasonal averages are greater than zero. The predominant tree species in this forest are conifers, which allows the forest to maintain a weak carbon sink even during the winter months.

L327-328 The work by Wang Yanan et al. 2023. Ecological Indicators can be discussed to enrich this part contents.

Response: Thank you for the valuable suggestion. We believe that discussing the work by Wang Yanan et al. 2023, Ecological Indicators, can significantly enhance the content of this section. We have incorporated the following content: "For instance, PAR represents the portion of solar energy that can be utilized by plants and is an essential component in chloroplast reactions. PAR drives a nonlinear response of GPP to Solar-induced fluorescence (SIF) across different seasons, resulting in a strong positive correlation between GPP and SIF (Wang et al., 2023b)."

L391 Yuanyuan et al., 2018; L412 Y et al., 2022 these wrong citations need to be revised.

Response: Thank you for bringing these citation errors to our attention. We have revised the incorrect citations as follows: "Yuanyuan et al., 2018" has been corrected, and "Y et al., 2022" has been appropriately revised.

Once again, we express our sincere appreciation for your commitment to ensuring the quality and validity of scientific research. Your expertise and thoughtful suggestions have played a crucial role in refining our manuscript. We believe that the revised version now more effectively communicates the key findings and contributes meaningfully to the scientific discourse in our field.