

Dear reviewer,

Thank you very much for reviewing our manuscript (essd-2022-199). We appreciate your approbation to the manuscript and also your valuable comments. We response to your comments one by one as follows:

1. Line 141-142: Please elaborate on what you define as the "degree of drought" to further subclassify the vegetation regions. If you refer to the Annual Drought Index or any other parameter (mentioned below in the M&Ms), please explain this to make it clear to the reader.

This is based on the official vegetation regionalization of China. The “degree of drought” usually referred to a drought index, the Selianinov drought index, in the Vegetation of China and the Vegetation Regionalization Map of China. The drought index $K=0.16*\text{accumulated temperature of a year } (>10^{\circ}\text{C})/\text{precipitation of the period when temperature } >10^{\circ}\text{C}$. It is not the same factor as used in the manuscript used (the Drought Index appeared later).

To make it clear to the reader, we modified the text: Therefore, in accordance with the degree of drought, the Selianinov drought index used in the Vegetation Regionalization Map of China (ECVMC, 2007b), TP vegetation was further divided into three subregions from southeast to northwest: East TP Alpine Scrub and Alpine Meadow Subregion, Middle TP Alpine Steppe Subregion and Northwest TP Alpine Desert Subregion.

2. Line 190-194, Data analysis: I am missing the description of the “statistical analyses” mentioned in this paragraph as well as the packages and software used to make the analyses. What was the purpose of making the linear models at the site level? Please elaborate.

Also, why did you use the averages of the leaf traits per site when you have a variety of life forms and life strategies, which will translate into contrasting differences in the leaf traits, particularly in the morphological ones?

First of all, we would like to say that the manuscript is a data description paper, which focusses more on data description rather than data analyses. However, some simple statistical analyses have been conducted too. The site-based traits were simply analyzed and mapped using the Origin 2022, which was indeed not noted in the “Data analysis”. Simple linear models were used to assess the relationships among key leaf traits at the site level to reveal the trade-off between different traits in the special alpine ecosystem.

Furthermore, the purpose of our data description manuscript is to provide readers with a general pattern of trait relationships. Thus, we choose to quantify the trait relationships at the averaged site level rather than in functional groups. We are using the trait data to do more analyses, and a manuscript entitled “The unique pattern and variation mechanism in key leaf traits on the Tibetan

Plateau” is being prepared and will be submitted soon. All of the features of leaf traits of the Tibetan ecosystems, their variations and relationships in growth forms, life forms at species and site levels, are all being analyzed.

Anyway, to make the purpose of the statistical analyses clearer, we improved the subsection “3.4 Data analysis”: Beside the data description of leaf trait characteristics, six key leaf functional traits (LT, LDMC, SLA, LCC, LNC and LPC), which reflect the key ecological significances of plants grew in high altitude and extremely cold environment, were selected in this paper for further simple statistical analyses. The mean, minimum, maximum, standard deviation (SD) and coefficient variation of traits at each site were calculated, to generally show the pattern of leaf traits of the Tibetan ecosystems. The linear relationships between leaf traits of site average were analysed and mapped using the Origin software (The Origin Lab, 2022?). The detailed analyses of all of the leaf traits, their variations and spatial patterns, within and among functional groups and at species and site levels, will be further analysed in another paper.

3. Section 5.3 Leaf trait relationships (L 248-260): Could you explain why you have selected to analyze the relationships between these traits? For instance, it would be nice to see some explanation (even if it is a brief one) linking this aspect of variation in certain traits (e.g., LT, LDMC, LMA) to the mechanisms of variation among different plant functional types and environments surveyed in this study.

The six fundamental leaf traits we selected for analyze the relationships due to their ecological significance in the face of high altitude and extremely cold environment (have been added in subsection 3.4 mentioned above): LT, affecting the water supply and storage of leaves and the exchange process of matter and energy in photosynthesis; LDMC, reflecting the ability of plants to acquire surrounding environmental resources; SLA, considered as the first choice index for studying plant physiological and ecological strategies under specific environmental conditions; LCC, the main structural material of plants; LNC, characterizing the ability of plants to absorb and utilize nutrient elements; and LPC, the second largest element affecting plant growth. Again, the main aim of this paper is to present some basic information associated with leaf trait dataset to readers. The detailed analyses linking trait variation to environmental variables among different functional types are being analysed in another paper.

4. Lastly, I greatly encourage the writers to revise the usage of the English language.

The submitted manuscript has been check its usage of the English language by a native English speaker (whose background is likely biology). During the revision, we will seek for another expert from the research field of ecology to further improve the English language of the manuscript.

5. As for the data set (Excel file), I suggest the following minor corrections: Line 55, for the species *Artemisia frigida* in Site TP2018080501. Could you explain why it is classified as a “Coniferous forest”? I would suggest that the term “alpine scrubland” is more appropriate according to the vegetation types and floristic composition described for this site. Also, the elevation seems quite high for a forest.

As a side note, is there any information on the soil types at each of the sampling sites? Because that would also be useful information to fully understand the floristic composition and distribution for people not familiar with Chinese flora.

We have carefully checked the sampling site (2018080501), and there is no *Artemisia frigida*. *Juniperus convallium* is the dominant species in this site so the vegetation type was classified as “coniferous forest”, a subalpine coniferous forest. The Vegetation of China described that on sunny slopes of the Tibetan Plateau below 4500 m in altitude with good environmental conditions, some big alpine and subalpine forests such as *Juniperus tibetica* or *Juniperus convallium* are developed. Thus, it is convincing that the vegetation type of this site we investigated belongs to coniferous forest.

As for the information of soil types at each sampling point, we will extract it from the existing database of Soils of China. We actually measured the soil properties such as the elemental contents of C, N, P, but these data will be used in another paper.

All of your helpful comments will be considered accordingly in revising the manuscript. Please do not hesitate to contact us, if you have any further questions about the manuscript and the answers.

Sincerely yours,

Yilin Jin and Jian Ni

On behalf of all the co-authors