We greatly appreciate the reviewer for providing valuable and constructive comments on our manuscript. Each comment has been thoroughly considered. In the following section, the original comments are presented in black, and our responses are provided in blue. To facilitate navigation, codes such as C1 (comment 1) and C2 (comment 2) have been included. As per the standard procedure of the journal, we are presenting only our replies to the reviewer in this round, without including the revised manuscript.

C1: The manuscript provides a theoretical derivation of the PT coefficient and evaluates the results by using wet-surface measurements. The manuscript provides some in-depth understanding on the variation of PT coefficient and shows that the value is also essential for hydrological simulation and projections. The manuscript is written in a organized structure and the contents is supported by in situ measurements. However, there are still one major issue need to be clarified.

Response: Thanks for your positive evaluation of our work. Please see our reply below.

C2: We all know that the Priestley-Taylor model has limitations in its application. The PT model should be applied at the appropriate temporal resolution, however, such an issue has been ignored in the present manuscript. In Table 3 and Figure 4, the results show significant differences in seasonal data and yearly data. Thus, the obtained values should also be different at different temporal resolutions. Thus, it would be nice to understand whether the derived relationships also fit at the temporal resolution of weeks or ten-days, or at least to indicate that the results are reasonable at ?? temporal resolution.

Response: Thank you for your comment. We have applied the derived expression on a ten-day scale using measurements collected over Lake Taihu. The data has been averaged for each ten-day period (1st to 10th day, 11th to 20th day, …, 351st to 360th day) within a year. Subsequently, we have averaged the data across all years and sites to establish a climatology dataset at the ten-day scale, resulting in a sample size of 36 (excluding the last five or six days of the year). The observations reveal that the values of $d\alpha/dT$ and $d\alpha/dQ$ on the ten days are -0.010 /°C and -15.84, respectively (refer to Figure R1). The derived values of $d\alpha/dT$ and $d\alpha/dQ$ are -0.011 /°C and -18.12, respectively, demonstrating close alignment with the observations. This consistency indicates that the derived relationships hold validity across a broad range of temporal scales, from ten-day to annual. The detailed results have been included in the Appendix.

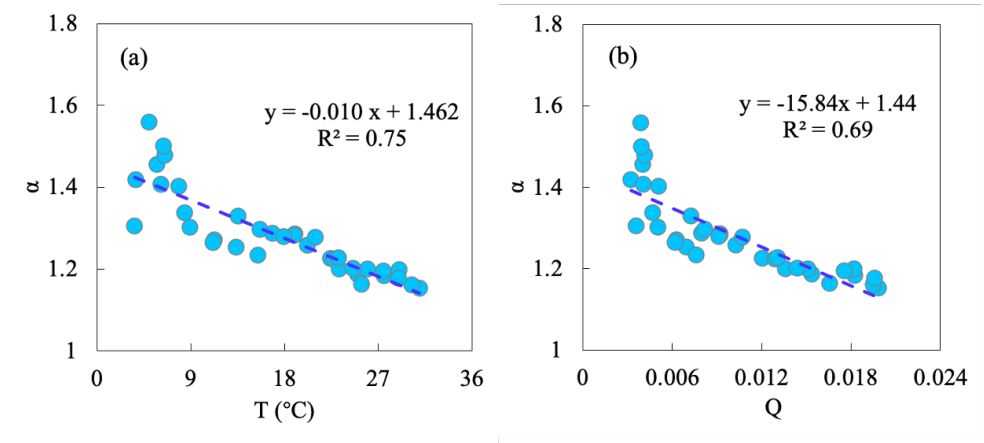

Figure R1. Relationships of α and (a) temperature (T) and (b) specific humidity (Q) on the ten-day scale using water surface observations collected over Lake Taihu. The value of dα/dT or dα/dQ is represented by the slope of the linear regression (dashed line).

C3: Further, the authors select global flux sites data in the evaluation and the days with soil moisture lower than 50% of the maximum soil moisture are removed. Then, how to obtain monthly data at these flux sites. Some details should be given to clarify this issue.

Response: Apologies for any confusion in the text. Initially, we identify non-water-limit site-days based on the criteria outlined in the main text. Subsequently, we do not average the daily data to a monthly scale due to variations in data sizes across different months for a specific site. Instead, we organize the selected daily data by vegetation types, as the primary objective of utilizing land fluxes data is to assess the derived relationship spatially rather than temporally. These specifics have been elucidated in the revised manuscript.

C4: In the equations, all the variables have no units in the manuscript and the abbreviations of CSIRO also have no full names. I suggest the author to include a table to include the unites of each variable and to show full names of the abbreviations in the appendix.

Response: Thanks for your comment. We have now included the units for each variable at their initial appearance in the manuscript. Additionally, the complete names of the institutions associated with the CMIP6 models have been provided in the appendix for clarity and reference.