RC2: 'Comment on egusphere-2025-2560', Anonymous Referee #2, 18 Aug 2025

This manuscript (EGUSPHERE-2025-2560, Enhancing Evapotranspiration Estimates Under Climate Change: The Role of CO_2 Physiological Feedback and CMIP6 Scenarios) addresses a critical gap in evapotranspiration (ET) estimation under climate change by integrating CO_2 physiological feedbacks with CMIP6 multi-scenario projections to update the Penman-Monteith (PM) model. The focus on nonlinear vegetation-atmosphere interactions also provides valuable insights for hydrological uncertainty analysis under global change. In general, this is a well-written manuscript, and it could be improved by polishing the analysis and figures. I recommend the publication of this work once a series of revisions have been carried out.

Reply: Thank you for your professional comments. Based on your suggestions, we will make appropriate and detailed revisions in the new version of the manuscript.

1.Abstract Graph: The abstract diagram is too simple. Flow charts can be added to show the experimental ideas and writing background (such as how to derive new indicators, how to analyze, etc.) to enrich the content of abstract graph.

Reply: Thank you for your suggestion. We will add technical process diagrams and result diagrams to the abstract graph to enrich its content in the new version of the abstract graph.

2.Figure 5-8: There are different colors in the background. Unify their background colors (e.g., light gray/white) to avoid visual distraction and ensure coherence.

Reply: Thank you for your advice. We will update the relevant images (Figure 5-8) and unify their background color to white in the new version to avoid visual distraction and ensure coherence.

3.In Section 2.1, the manuscript does not clearly explain the specific details of the time range division for CMIP6 data, such as whether the connection logic between the "historical period" (1861-2100) and the "future period" (2015-2100) are uniformly applicable to all GCMs. It is recommended to supplement the clear definition of the data time range to avoid confusion among readers regarding the analysis period.

Reply: Thanks. We will add content about the time range division of CMIP6 data to the corresponding position in Section 2.1 in the new version, including a clear explanation of whether the connection logic between the "historical period" (1861-2100) and the "future period" (2015-2100) is uniformly applicable to all GCMs; detailed content can be found in the revised draft of the new version.

4.In Section 2.3.2(Line 194), the description part uses ET0 to refer to evaporation, but the corresponding formula does not have this variable, only Ep. It is suggested to unify the implied evaporation reference in this description and the formula.
Reply: Thank you for your professional comments, based on your suggestions, we will make the appropriate revisions to make the reference accurate and uniform.

5.In Section 2.3.4, the specific steps of how this the updated PM-RC- CO_2 model coefficient was derived from the four selected GCMs are not detailed. It is recommended to add a brief description of the calibration process, such as whether the coefficient is an ensemble mean of GCM-specific results or derived from a specific GCM to improve method reproducibility.

Reply: Thank you for your constructive suggestions. This parameter is derived from the average of multiple model sets(four GCMs), and relevant description will be added in the corresponding position of section 2.3.4 in the new version.

6.The part 3.3 of the results is relatively single. It is recommended to enrich the analysis content and add some charts, such as the proportion of different land use types. This can more intuitively reflect the characteristics of underlying surface and provide more comprehensive background support for evapotranspiration (Ep) related results.

Reply: Thanks for the suggestion. Based on your comment, we will add Figure 9-10 and its corresponding analysis that is conducted by land use type in section 3.3 in new versions.

7.Discussion(Line 427): Is the EP here the same as Ep in the previous paragraph? If so, it is recommended to change it to Ep to avoid misunderstanding.

Reply: Thank you for your careful advice. Your understanding is correct. To avoid misunderstanding, we will unify relevant references as your comment in the new version.

8. Section 5 (conclusion) mentions that "regional uncertainty stems from the heterogeneity of vegetation response", but does not specify which regions are more significant. It is suggested to add an explanatory sentence corresponding to recommendation and opinion 4 to make the conclusion more specific.

Reply: Thank you for your professional advice. Referring to the new content added in section 3.3 of the main text (enriched based on your comment 4), we will add corresponding content in the conclusion.