# Response to Reviewer 3 Comments

**1. Summary**

Thank you very much for taking the time to review this manuscript. Please find detailed responses below and the corresponding revisions/corrections highlighted in the re-submitted files.

| **2. Questions for General Evaluation** | **Reviewer's Evaluation** | **Response and Revisions** |
|---|---|---|
| Does the introduction provide sufficient background and include all relevant references? | Can be improved | The authors addressed the reviewer comments |
| Is the research design appropriate? | Can be improved | The authors addressed the reviewer comments |
| Are the methods adequately described? | Must be improved | The authors addressed the reviewer comments |
| Are the results clearly presented? | Can be improved | The authors addressed the reviewer comments |
| Are the conclusions supported by the results? | Can be improved | The authors addressed the reviewer comments |
| Are all figures and tables clear and well-presented? | Yes | No response is required |

**3. Point-by-point response to Comments and Suggestions for Authors**

**Major Points - Comment 1:** Introduction Section: The rationale for selecting Portugal as the study area could be strengthened. Briefly highlighting specific regional characteristics (e.g., pronounced climatic gradients, significant water resource pressure, strong agricultural dependency) would enhance the contextual relevance and motivation for the study.

**Major Points - Response 1**: The relevance of Portugal as a case study has been further reinforced by adding the following short sentence in line 115 (Introduction Section):

Line 115: "Therefore, the objective is first to develop a comparative analysis of the spatial patterns of the potential and reference evapotranspiration for mainland Portugal, a Mediterranean country particularly vulnerable to constraints affecting atmospheric evaporative demand and, consequently, surface water availability. For this purpose, daily data for a time span between 1980 and 2023, with a spatial resolution of 0.1°, was used".

The authors stress that the previous text is slightly different from the original version as a consequence of another reviewer's comment. The Portuguese climatic characteristics, particularly aspects related to the climatic gradient, were briefly explained in the paragraph beginning on line 154 (Study Area), and a short sentence was added on line 161 to emphasize the contextual relevance for the study, Line 161: "These specific climatic characteristics reinforce the importance of conducting a comprehensive evaluation of the different methods to estimate evapotranspiration."

**Major Points – Comment 2:** Trend Analysis Section: The methodology section for trend detection does not sufficiently address whether an autocorrelation-corrected version of the Mann–Kendall test was used, how seasonal cycles were handled in the monthly series analysis, or if any control for multiple testing was applied. These omissions could lead to an overestimation of significant trends. The authors should review and clarify these aspects.

**Major Points - Response 2:** The test was applied to the annual series, i.e. to the annual evapotranspiration series for each month individually and to the annual values. These series must be independent. The following sentence was added in lines 371 and 372 for clarifying the issue: "The Mann–Kendall test was applied at each one of the 902 grid points to the yearly series of monthly and annual Eto (each series with a length of 44 years). A significance level ….".

**Major Points - Comment 3:** Result Comparison Section: The manuscript discusses both Ep (potential evapotranspiration) and Eto (reference evapotranspiration). However, subsequently using the Penman–Monteith derived Eto as the "reference" or benchmark to evaluate Ep products/models raises concerns regarding comparability and definitional biases. If the intention is to assess the substitutability of Ep models for Eto estimation, the authors should clearly articulate the purpose and justify the feasibility of this approach in the Methods or Discussion section.

**Major Points – Response 3:** For the time being, the study only aimed at comparing the different approaches and models for the evapotranspiration, recognizing that potential and reference evapotranspiration are among the most commonly used standardized concepts of evapotranspiration. Further developments will analyze the effect of those approaches and models in water budget models at the watershed level**.**

**Minor Points - Comment 1:** In the literature review, reference numbers should not be inserted directly into the text. Please reformat citations to use the author(s) name(s) followed by the citation. For example, change "As such, the work of [16] compared..."to "As such, the work of XXXet al. [16] compared...". Please check and revise this throughout the manuscript.

**Minor Points - Response 1.** The authors believe that they have followed the formatting rules previously adopted in other contributions to the same journal. Additionally, the other reviewers did not raise this issue. However, if necessary, the authors will, of course, review the formatting of all references.

**Minor Points - Comment 2**. Although in the abstract, the first time an abbreviation was used, it was presented in the form of "full name +abbreviation". However, when they first appear in the text, they should also be presented in full form, followed by the abbreviated form, such as "Ep", "Eto". Please have the author check and make the necessary revisions.

**Minor Points - Response 2:** The authors have revised the text and believe that the reviewer's comment has already been addressed.

**Minor Points - Comment 3.** The time period for the Bristol dataset in Figure 2 and its caption (1981–2024) differs from the core study period (1980–2023). This discrepancy should be reconciled, or a clear explanation for the difference should be provided.

**Minor Points - Response 3**. There is not data before 1981. However, this slightly smaller period with data availability only applies to the Bristol product. Having in view that only a comparison was intended to do based on that product, the authors considered that it would

be more relevant to adopt a period as long as possible for the general study. However, the authors added the following sentence in line 184 clarifying the issue. "This period differs slightly from the study one, previously mentioned. However, this difference does not affect the intended comparative analysis, as both periods refer to relatively long time spans. Within the scope of this study, the product from the above mentioned repository was also analyzed and is referred to as Bristol."

**4. Response to Comments on the Quality of English Language:** No improvement is required.

**5. Additional clarifications:** The authors would like to emphasize that the revised text includes additional corrections and changes resulting from the other reviewers' comments, which have changed the line numbering in the revised document. The line numbers mentioned above are the original ones.