

The submitted paper “Evaporation Dynamics in Monsoon-Dominated Regions of the Korean Peninsula”, by Kim, et.al, attempts to demonstrate that the complementary relationship of Evapotranspiration (CRE), does not hold true for monsoon-dominated region. A fundamental condition for CRE to be validated is that moisture availability in the land surface and the ambient air, contributing to actual evapotranspiration (AET) and potential evapotranspiration (PET) respectively, should be correlated. This correlation exists in regions where the impact of advection is minimal. However, in monsoon-dominated regions, the external moisture input into the atmosphere disrupts the moisture dynamics between the land surface and the atmosphere, thus invalidating CRE.

This point is effectively highlighted in Figure 10, which is the figure I found commendable in the article. It shows that actual evapotranspiration (ETa) from the flux tower does not correlate with the vapor pressure deficit in the atmosphere, thereby disproving CRE in monsoon-dominated regions. While the violation of CRE in regions with significant advection can be inferred from the derivation of CRE, the novelty of Figure 10 lies in using evapotranspiration data, calculated from the flux tower. This provides a more direct measure of ETa compared to previous studies that relied on ETa, estimated from the water balance models at a regional scale.

However, apart from this, the research paper is poorly written. The figures are not well-conceived, the text is confusing regarding the use of different evapotranspiration (ETs), and numerous other issues are present. Therefore, I suggest to the editor that this paper is not currently suitable for acceptance in this reputed journal. I will highlight the major concerns point by point below:

- 1) The abstract lacks clarity and specificity regarding the major research findings.
 - a) For instance, the statement, “*This study investigates the dynamics of evapotranspiration in a monsoon-dominated region of the Korean Peninsula, focusing on the challenges associated with measurement, identification, and prediction of potential and actual evapotranspiration,*” **does not align with the paper's content, as the discussion on these challenges are not evident throughout the whole document.**
 - b) Additionally, the claim, “*This research confirms the existence of complementary relationship behavior in regions with strong correlations between soil moisture and air humidity, such as deserts and tropical areas,*” **is misleading because the study is exclusively focused on the Korean Peninsula only.**
- 2) The introduction is lengthy and detailed, obscuring the core reason for the paper's necessity.

- 3) The purpose of each figure in the article is unclear, and their contribution to the overall conclusion is not well-articulated. It appears that the author included all figures without considering their specific relevance or how they support the main conclusions.
- 4) The text is unclear about the use of PET and WET. It appears that potential evapotranspiration (PET) was calculated using the Penman-Monteith method, and wet evapotranspiration (WET) was derived from the Priestley-Taylor (P-T) equation. However, the role of the pan evapotranspiration data collected at Jeonju is ambiguous, as it is only mentioned in the context of calculating the pan evaporation coefficient.

A significant issue is the choice not to use pan evaporation (EPan) as the measure of PET, as done in studies like Ramirez et al. (2005), which is also referenced in this study. Using EPan as PET would establish it as the upper limit of evapotranspiration in the region. Currently, WET from the P-T method is acting as the maximum limit. While this might not be the major issue as we can still interpret the results, but the author needs to warrant all the rationale behind such selection and usage also highlighting how (if) it impacts the analysis.

5) Regarding the main highlight of the paper, Figure 13, there are several concerns:

a) It appears that each dot represents a daily observation. Most studies on the complementary relationship of evapotranspiration (CRE) use annual scale observations for different basins. The choice to use a daily scale needs clarification. The introduction should specify whether the author intends to validate CRE on a daily scale.

b) Typically, the x-axis in the CRE hypothesis or Budyko framework reflects long-term water availability, as it represents climatic conditions and aids in predicting actual evapotranspiration (AET) based on the region's characteristics. This is usually represented by the ratio of long term mean annual precipitation (P) to PET (Budyko) or the potential humidity index (ϕ) as the ratio of annual precipitation to WET (Ramirez et al., 2005). The author, however, calculates the moisture availability index as the ratio of AET to PET (lines 186-187) in daily scale (as I understood). The rationale for this choice should be explained (also related to point a).

c) To better understand how AET and PET change with moisture availability, it may be necessary to include at least one additional variable in computing moisture availability, rather than current formulation of moisture availability (MA) as the ratio of AET to PET. Relying solely on calculating MA from the ratio of AET to PET and trying to explain the dynamics of AET and PET based on that ratio might

obscure the relationship between AET and moisture availability (MA). For instance:

(i) The blue line in the graph indicates that PET/WET (y axis) is nearly equal to 1 for all AET/PET values (moisture availability), which suggests that PET is approximately equal to WET across different moisture conditions.

(ii) The red line shows that AET/WET is almost linearly proportional to AET/PET (moisture availability), implying that PET is proportional to WET, unless the temporal scales of x-axis and y-axis are different (similar to (i)). This approach obscures how AET responds to moisture availability. Therefore, the x-axis could represent long-term moisture availability or catchment characteristics more effectively, and alternative methods of representation of moisture availability should be considered.

d) Since the author utilizes AET from the flux tower as the measure of regional actual evapotranspiration, it is essential to highlight the potential fetch area of the flux tower, as it depends on the wind direction and speed. In the map, the flux tower appears to be located quite close to the dam. If the scales on the figure are accurate, it needs to be clarified whether the flux tower measures ET from the dam or the surrounding vegetation (forest) most of the time.

Apart from the major concerns, there are several minor issues:

1. The detailed explanation of how PT and PM evapotranspiration are calculated in Section 3 could be omitted unless there are deviations from standard practice. Given the extensive literature on these calculations, this section might be unnecessary unless it introduces novel methods or significant deviations.
2. The author should be more careful in sentence construction throughout the paper. For example:
 - Line 66-68: The sentence, "However, their study was constrained by the use of historical observational data, which may contain measurement inaccuracies and spatial variability, and the applicability of Bouchet's hypothesis to diverse climatic conditions beyond the studied regions remains uncertain without further validation," lacks clarity. **It is not clear how the current research addresses these constraints, particularly regarding observational data inaccuracies, uncertainties, or spatial variability.**
 - Line 455: The statement, "Notably, the study verifies the presence of complementary relationship characteristics in regions demonstrating strong correlations between soil moisture and air humidity, such as deserts and tropical areas, where annual climate fluctuations and seasonal winds exhibit less significance," is confusing. **Since the study focuses only on the Korean Peninsula, it is unclear how it verifies CRE in deserts and tropical areas. If the author intends to reference existing literature, this should be explicitly stated and clearly articulated.**