Thank you to the authors for thoroughly considering the referees' suggestions and putting significant effort into revising the manuscript. Most of the referees' comments were addressed, and the manuscript was adapted accordingly, substantially enhancing its quality.

The introduction is now more coherent and much easier to read. It effectively sets the scene, places the study in the context of existing and relevant literature, and highlights the motivation for the work. The explanation and rational behind the signatures in the methods section have improved considerably. The introduction of the result section reads well, highlighting first impressions and visual aspects of the timeseries, which are then later quantified using the suggested signatures. The revision of the discussion section adds substantial value to the manuscript, providing a much deeper discussion of the results and within the context of existing work. Additionally, the authors clearly illustrate limitations of the study and justify the importance of the AET signatures by comparing insights gained from signatures with "traditional" metrics.

I have only a few minor suggestions that require small edits:

Abstract

- The abstract is especially in the second half a bit confusing. Several sentences start with "signatures", "other signatures" or similar. It would be easier to read if the signatures would be mentioned as the subject of the sentence, e.g. "Indices of water stress and AET asynchronicity with potential evapotranspiration are better matched" (L. 19).
- A sentence addressing the results of introducing AET signatures and their usefulness is missing. The following sentence from the abstract is a nice one to conclude the abstract "This study, the first to systematically define AET signatures, offers a way of assessing various aspects of AET dynamics across temporal scales", but one on the usefulness or added value of introducing AET signatures is missing similar to the one in L. 21/22 starting with "Overall,…".

Methods

L. 87 (and others). It is a bit unusual to have equations placed in parentheses within the flow of the main text. I find it easier to read if positioned as in equation 1.

L. 94. "The TSP is determined from monthly timestep data by examining the median AET for each of the 12 calendar months and identifying the month with maximum median AET." Then the basis for calculating the monthly median are daily AET values, isn't it? I find "determined from monthly timestep" a bit misleading. I understand that it is a monthly signature because you analyse monthly medians, but those are determined from daily (or smaller) timestep data. I think all needed is a smaller reformulation.

L. 125. I appreciate the need for deciding on a threshold to be able to demonstrate the 8th signatures functioning. Still the question arises, if there is any reasoning for why you decided for 5 mm/day and 10 days? Is it based on experiences working with the dataset that you noticed, for instance, that AET only "reacts" above 5 mm/day of rainfall or similar?

L. 180. I find it a bit weird to call a subsection of "Material and Methods" simply "Method". I suggest naming it a bit more precisely, e.g. "Evaluation metrics" or "Method to characterise AET_{RS} performance", "Traditional efficiency metrics" (as in 3.5) or similar.

L. 185. I miss references for NSE and KGE.

Results

L. 207. "The comparison of $AET\tilde{a}nnual$ between flux tower and RS products shows that for all sites except for three sites (i.e., Robson Creek, Cow Bay and Cape Tribulation) in the tropical northern Queensland, the RS $AET\tilde{a}nnual$ aligns relatively closely with the one to one line with flux tower $AET\tilde{a}nnual$ (NSECMRSET = 0.61 and NSEMODIS = 0.42), although some scatter and slight underestimation are evident. In contrast, for the three tropical northern Queensland sites, there is a strong overestimation of RS $AET\tilde{a}nnual$, despite differences in aridity among these sites." These two sentences are a bit difficult to read. I made some suggestions (red) to improve readability.

L. 211. What do you mean with "despite differences in aridity among these sites"? I don't understand which differences in aridity you mean as they are all located at the wetter end.

L. 225. "Here, CMRSET tends to 225 show the same timing (7 out of 17 flux towers) or closer timing (e.g., one month offset - 6 out of 17 flux towers) of TSP as flux towers at many flux tower sites, whereas those calculated using MODIS AET are significantly offset with flux tower TSP." I disagree with these observations, unless the legend is mixed up in 4b (it is indeed swapped compared to Fig. 3a,b and Fig. 4a). With the current legend, MODIS triangles are closer to the one-to-one line and CMRSET squares cover larger space and greater distances from the line.

Technical

L. 13. "This study focuses on the first of these three applications."

L. 155. underwent

Eq. (1). you did not explain "γ_p".

L. 202. Remove the comma in/after "$AET_{Fluxtower,}$".

L. 346. Van Dijke