Many thanks for handling the review process for our manuscript. The time and effort devoted to our manuscript by you and the reviewers are very much appreciated.

We have revised the manuscript carefully according to the reviewers' comments and suggestions. In the following, we provide a point-by-point response. The original reviewer comments are in black regular font. Our responses are shown in blue italic font. Quotes from the revised paper are shown in blue bold-face font. Additionally, there are a number of small grammatical and wording changes throughout the manuscript that are not specifically documented below.

REVIEWER COMMENTS

Reviewer (Timothy Lahmers):

Major Comments:

1. Section 3.1: When analysis days were selected, major precipitation events were removed based on daily soil moisture tendencies. Is the 2-standard deviation threshold in soil moisture tendencies, for removing precipitation days from the analysis, sufficient? This method could still theoretically be affected by convection, especially in more arid environments where deep convection may occur even if rainfall is relatively light.

    ➔ *As many of the flux tower sites do not (reliably) report precipitation, the available observations are largely decreased if we use flux tower sites which commonly observe precipitation and other variables. Thus, major precipitation events were removed based on daily soil moisture tendencies and the 2-standard deviation is used for the threshold value. We tried masking out the major precipitation with different threshold values. 2-standard deviation works well to mask out the precipitation over various sites even though the precipitation may be characterized by convective features and other background states.*

2. Section 3.4: The authors selected a method to separate water and energy-limited environments using a correlation between soil water content and evaporative fraction. Could the authors provide prior literature or observation data to justify this method? Has this selection method been compared to other widely used proxies for aridity, such as the Budyko curve?

    ➔ *Contrasting EF sensitivities to soil moisture variations are evident in the energy-limited (zero slope) and water-limited (positive slope) regimes. Therefore, the correlation coefficient between daily EF and soil moisture can be identified by fitting a piece-wise linear function to the observed relationship between soil moisture and EF. Relevant references are added in the manuscript (Line 249)*

    - *Dirmeyer, P. A., Zeng, F. J., Ducharne, A., Morrill, J. C., and Koster, R. D.: The sensitivity of surface fluxes to soil water content in three land surface schemes, Journal of Hydrometeorology, 1, 121-134, 2000.*

    - *Dong, J., Akbar, R., Short Gianotti, D. J., Feldman, A. F., Crow, W. T., and Entekhabi, D.: Can Surface Soil Moisture Information Identify Evapotranspiration Regime Transitions?, Geophysical Research Letters, 49, e2021GL097697, 2022.*

3. Section 5: The findings of this paper are important for both the atmospheric modeling and observation applications of the PBL community. I would suggest that the conclusions include a

more substantial discussion of the implications of this work for future atmospheric model development, such as for PBL parameterizations in mesoscale models. Also, consider breaking section 5 up into two sections. Lines 400-478 are more of a summary, while lines 479-499 are more of a discussion about the significance and potential for future work based on these results. These new sections could be broken up accordingly.

➔ *Breaking section 5 into separate sections for conclusions and discussions seems to be better to isolate the context of this study and its implementation and novelty. Furthermore, the implementation of atmospheric modeling is added in Lines 554-556:*

"This study is also of potential value for future atmospheric model development, such as for PBL and convective parameterizations in mesoscale models on a sub-daily time scale."

Technical/Minor Comments:

4. The figures provide useful information to the readers; however, the labels and values shown on the x and y-axis are relatively small and difficult to read. Consider revising the figures to make key values for the reader more legible.

➔ *All the figures are modified to increase the label size for the reader more legible.*