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Interactive comment on "Bioclimatic traits in statistical properties of daily photosynthetically active radiation" *by* Estefanía Muñoz and Andrés Ochoa

Anonymous Referee #3

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This was an interesting paper about atmospheric attenuation of photosynthetically active radiation (PAR). The paper addresses the spatiotemporal variability in atmospheric attenuation of PAR by analyzing and characterizing the clearness index and the clear-day index calculated from long-term observational PAR data for near-globally dispersed sites. The paper provides us with the patterns in atmospheric attenuation of PAR that can be expected for various ecosystems according to their position on the Holdridge triangle or their Köppen climate classification. I enjoyed reading about the indices and the spatiotemporal patterns the researchers have found at a large scale, but the reasons for undertaking the research could be expanded upon. Below are some specific comments that I had:

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Title: The impression I got from the paper is that it characterizes the site level patterns in atmospheric attenuation that impact how much PAR reaches the ground. The title could be a bit more detailed to include the indices or atmospheric attenuation rather than just “daily PAR”.

Abstract: The abstract does not communicate why this research was undertaken. The importance of PAR is briefly described in the introduction, but there is no mention of it in the abstract. A sentence about why we should analyze the variability in atmospheric attenuation of PAR in the beginning and another sentence about why the findings or methods are important in the end could help form a complete abstract.

Introduction: At lines 21 and 22, the authors introduce the indices and mention their wide use by other researchers to "quantify the random nature of atmospheric light attenuation" without references to research. The introduction could be expanded to clarify the purpose of studying the variability in atmospheric attenuation of PAR. Some questions below might help expand the introduction: 1. Which studies used the indices to study the variability of atmospheric attenuation? 2. What did those studies find and how does this current research build on previous studies of atmospheric attenuation? 3. Has the variability in the indices been characterized according to climate in the past? If not, why do the authors believe it is important to characterize the variability in atmospheric attenuation by life zone or climate?

Line 12 on pg 6 mentions that the data was separated into rainy and dry days using precipitation. No precipitation dataset is described in the data section. Adding a description of the source for the precipitation dataset will be helpful.

Line 18 on pg 6 says: “The time series, annual cycle, and autocorrelogram of PAR, c and k were calculated and plotted for each site.” Is this referring to PAR0 or PARobs ? It might be helpful to add that the time series, annual cycle, and autocorrelogram were calculated for PAR in the methods section.

Figure 2 and the corresponding supplementary figures show what appears to be a

confidence interval for the ACF with a dotted line. Which level of confidence does that interval mark?

Technical corrections:

Figure 2 and figures S1 - S28 need legends with a clarification on which PAR measurement is plotted (PAR0 or PARobs).

It is really hard to read the numbers on the figures with the CDF labeled with numbers (figure 5 and figures S57- S84).

Throughout the paper and figure captions, the parentheses come before the variable they describe. For example: “(a-b) c and (c-d) k”. It is a bit easier to read if the variable is mentioned first: “c (a-b) and k (c-d)”.

At points in the results/discussion, the figures are introduced by describing the figure. For example: “ Fig. 4 shows the PDFs (left panel) and the CDFs (right panel) for wet (blue) and dry (red) days of c (a–b) and k (c–d).” (Pg. 8, line 17). This seems redundant. A good descriptive caption for the figure or a complete legend should take care of this and the text in the results/discussion does not need to mention it.

Line 18 on pg. 8 should read: “Figs. S26 to S56 show the results of the 28 sites analyzed.”

Regarding lines 11 - 14 on pg. 7: “We classified the pdfs of c and k in three types: Bimodal, Unimodal I (unimodal with low dispersion), and Unimodal II (unimodal with high dispersion). Sites in the extratropical northern hemisphere (except the site in the United States US-Fep) have bimodal distributions; sites in tropics, subtropics, and US-Fpe have Unimodal II distributions; and sites in tropics have Unimodal II distributions.” This appears to be in disagreement with figure 3. US-Fpe looks like it has a Unimodal I distribution in figure 3.

If possible, harmonizing the terminology that describes the PDFs between the abstract, results, figures, and conclusion would be helpful. For example, eliminating unimodal I

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and II altogether and keeping unimodal low and unimodal high to describe the unimodal PDFs throughout the paper and figures should provide consistency for the reader. I also find unimodal low and unimodal high to be more descriptive.

When talking about the PDFs on pg. 7 and 8: The current organization of paragraphs: Discusses the PDFs' latitudinal variability on pg. 7 - top of pg. 8, then talks about the Köppen classification, and then talks about the Holdridge triangle with mention of latitudinal variability. Consider moving the paragraph about the Köppen classification (lines 3 - 7, pg. 8) before mentioning the Holdridge triangle and latitudinal variability so that the discussion on the latitudinal variability is continuous. An order such as: Introduce the classification of the PDFs, then discuss Köppen classification of site PDFs, and then discuss Holdridge triangle position and latitudinal variability of site PDFs

What does "NEP-WCMC" stand for on pg 3 line 12?

There seems to be some disagreement between the abstract and the conclusion. The abstract says: "Unimodal distributions with high dispersion are concentrated in the moist forest life zone in subtropical and tropical regions and humid province; and unimodal distributions with low dispersion are concentrated in dry forest, very dry forest, and thorn woodland in tropical and subtropical regions between arid and subhumid humidity provinces." The conclusion says: "High latitudes sites exhibit bimodal distributions, arid to sub- humid climates exhibit unimodal distributions with high dispersion, and humid tropical regions exhibit unimodal distributions with low dispersion."

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