Dear Reviewer,

We sincerely appreciate the time and effort you have put into reviewing our manuscript. Your insightful comments have been invaluable in helping us improve the clarity and rigor of our work. Below, we address each of your points in detail and outline the revisions we have made to the manuscript.

Main Comments

Reviewer Comment:
The authors aim to link seasonality, minima and maxima of SIF and vegetation indices to environmental factors (precipitation, PAR and VPD). This is I think very valuable, but the manuscript and data analysis should be improved considerably. Firstly the abstract and the title only refers to SIF, while in the text also EVI and NDVI was mentioned. However, EVI is discussed and NDVI not or much less. In the M&M the pro's and con's of EVI, NDVI, NIRv and LSWI vegetation indices are mentioned, but in the Results it is not fully justified why EVI mosty is used and not the other three.

Response:
Thank you for highlighting this inconsistency. We have revised the title and abstract to reflect the inclusion of vegetation indices (VIs) alongside SIF.

The revised title now reads:

"Seasonality and Synchrony of Photosynthesis in African Tropical Forests Inferred from Spaceborne Chlorophyll Fluorescence and Vegetation Indices."

Here is the new abstract:

Global atmospheric carbon dioxide concentrations are largely driven by terrestrial photosynthesis, of which tropical forests account for one third. Relative to other tropical regions, less is known about the seasonality of African tropical forest productivity and its synchrony with environmental factors due to a lack of in situ carbon flux data. To help fill this knowledge gap, we use spaceborne solar-induced chlorophyll fluorescence (SIF), vegetation indices—including the Enhanced Vegetation Index (EVI), Normalized Difference Vegetation Index (NDVI), and Land Surface Water Index (LSWI)—and climate data to investigate the seasonality and synchrony of photosynthesis in Africa's tropical forest ecoregions. We find West African SIF to

increase during the dry season and peak prior to precipitation, as has been observed in the Amazon. However, NDVI and EVI do not mimic the strong double-peak seasonality observed in SIF; instead, they often plateau until substantial decreases occur in the dry season. In Central Africa, we find a continental-scale bimodal seasonality in SIF and EVI, the minimum of which is synchronous with precipitation, but its maximum is likely less related to environmental drivers. Our findings highlight the complex relationships between SIF, vegetation indices, and environmental factors, underscoring the importance of using multiple remote sensing measures to monitor tropical forest productivity.

The text prior to the vegetation index equations in the following section now reads as:

2.5 MODIS Surface Reflectance and Vegetation Indices

We used the 500-m daily MCD43A4 surface reflectance product (Schaaf and Wang, 2015) to compute four vegetation indices: the Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), the Near-infrared Reflectance of Vegetation (NIRv), and the Land Surface Water Index (LSWI). NDVI has been traditionally used to assess vegetation greenness (Rouse et al., 1974), but it tends to saturate in areas with a high leaf area index such as the tropics (Huete et al., 1997b). This saturation limits NDVI's ability to detect subtle changes in the forest canopies of these ecosystems.

EVI, by contrast, incorporates additional information from the blue band and accounts for atmospheric effects and canopy background signals. Thus, EVI is less prone to saturation than NDVI, particularly in regions with dense vegetation such as African tropical forests (Huete et al., 1997a). EVI is also more sensitive to variations in canopy structure and leaf area, allowing for better differentiation between areas with similar levels of greenness but different biophysical properties. Because of these advantages, EVI is a preferred metric in studies focusing on tropical forests, where vegetation indices are often challenged by the dense, multi-layered canopies typical of these ecosystems.

NIRv is a recently developed indicator that overcomes NDVI's saturation limitations by multiplying NDVI by the near infrared band, which is highly sensitive to leaf cellular structure

(Badgley et al., 2017). Although NIRv shows promise for detecting vegetation dynamics, it is still relatively new and less well-validated in the context of tropical forest canopies.

LSWI is computed using the shortwave infrared band, and is primarily used for assessing leaf water content and soil moisture (Xiao et al., 2002). While LSWI offers useful insights into hydrological changes in vegetation, it is less directly related to leaf physiology and overall canopy structure. Although the focus of our manuscript is on physiology, we include LSWI to give additional insight into the seasonality of canopy water content, as water availability is important for leaf physiological processes.

Reviewer Comment:
Discussion of the data is generally vague and often speculative. As a consequence, the relation (i.e., synchrony) with other environmental drivers (VPD, PAR) cannot be claimed/justified. This results a bit in overselling the paper.

Response:

We appreciate your concern about the speculative nature of some of our discussions. We have thoroughly revised the Discussion section to ensure that all interpretations are directly supported by our data and analyses. We have removed speculative statements and provided more precise language when discussing the relationships between SIF, VIs, and environmental factors.

Reviewer Comment:
It is also surprising that the discussion section is focused on comparison with the Amazon, which I thought was not the aim of the manuscript.

Response:

We appreciate your feedback and the opportunity to clarify the rationale behind our discussion.

Our primary aim is to enhance the understanding of the seasonality of photosynthesis in African tropical forests and its synchrony with environmental factors. We chose to compare our findings with those from the Amazon for several important reasons:

Benchmarking Against Well-Studied Systems: The Amazon rainforest has been extensively studied, particularly regarding the seasonality of photosynthesis and its environmental drivers. By comparing African tropical forests to the Amazon, we can contextualize our results within a broader framework of pan-tropical forest ecology. This comparison allows us to identify unique patterns and commonalities, thereby enriching the global understanding of tropical forest dynamics.

Highlighting Regional Differences and Similarities: Our comparison reveals both parallels and contrasts in the seasonality of photosynthesis between the two regions. For instance, while both regions exhibit increases in SIF during the dry season, the underlying environmental drivers and physiological responses differ. Discussing these differences enhances the scientific value of our work by highlighting how regional climatic conditions influence tropical forest productivity.

Addressing Knowledge Gaps: Given that African tropical forests are less studied compared to the Amazon, drawing parallels helps to fill knowledge gaps. It allows us to leverage the extensive body of research from the Amazon to interpret our findings and propose hypotheses about the mechanisms driving photosynthesis seasonality in Africa.

Advancing Ecological Theory: Comparing these two major tropical forest systems contributes to the development of general ecological theories about tropical forest functioning. It helps determine whether observed patterns are consistent across different continents or are region-specific due to unique environmental conditions.

Informing Global Climate Models: Understanding similarities and differences in photosynthetic responses is crucial for improving the accuracy of global carbon cycle models. By incorporating data from both African and Amazonian forests, we can better predict how tropical forests might respond to climate change on a global scale.

In light of these points, we believe that the comparison with the Amazon significantly enhances the interpretation and relevance of our findings. It not only aligns with the manuscript's aim but also provides a comprehensive perspective that benefits the broader scientific community.

Once again, we appreciate your feedback and hope this explanation clarifies the importance of including the comparison in our discussion.

Reviewer Comment:
Finally, I think also more detailed and rigorous data analyses can be done, e.g., by zero-order and partial correlations. As such, as example, the response of precipitation controlled for PAR and/or VPD can be examined. I think this will add much more information to the discussion. This will allow a more rigorous and better-structured discussion. The discussion is now very descriptive, mostly vague and sometimes speculative discussion.

Response:

We appreciate your emphasis on rigorous data analysis and a well-structured discussion, which are crucial for advancing scientific understanding.

Regarding your suggestion for more detailed analyses using zero-order and partial correlations, we would like to clarify that we have indeed performed comprehensive correlation analyses between all variables of interest. Specifically, we conducted both Spearman's and Pearson's correlation analyses to examine the relationships between SIF, EVI, NDVI, LSWI, and environmental factors such as precipitation, PAR, VPD, temperature, and soil moisture across all ecoregions. These analyses are thoroughly presented in the supplementary materials, where we included 22 correlation matrices (Supplementary Figures S1 and S2).

Our choice to use both Spearman's (non-parametric) and Pearson's (parametric) correlation coefficients was deliberate, aiming to capture both monotonic and linear relationships and to ensure the robustness of our findings across different statistical assumptions. This dual approach allows us to identify consistent patterns and strengthens the validity of our conclusions.

Regarding the use of partial correlations, we considered this approach but determined that it would not substantially improve our study for the following reasons:

Multicollinearity Among Environmental Variables: Environmental factors such as precipitation, PAR, and VPD are inherently interrelated in tropical forest ecosystems. For example, periods of high precipitation often coincide with low PAR due to increased cloud cover, and VPD is a function of both temperature and humidity. Introducing partial correlations in this context could lead to misleading interpretations, as controlling for one variable may inadvertently suppress meaningful ecological relationships.

Focus on Ecological Relevance: Our primary objective was to explore the direct relationships between SIF, vegetation indices, and environmental factors to understand the synchrony and seasonality of photosynthesis. Zero-order correlations provide a clear depiction of these relationships without the confounding effects that might arise from controlling for other variables.

Data Limitations and Interpretability: Partial correlations require large sample sizes to yield reliable results, especially when controlling for multiple variables. Given the temporal resolution and the number of ecoregions studied, introducing partial correlations could reduce statistical power. Moreover, the ecological interpretation of partial correlations can be complex and may not add substantial value to the discussion.

Consistency with Study Goals: Our study is exploratory and descriptive by design, aiming to identify patterns and generate hypotheses for future research. Zero-order correlations are appropriate for this purpose, providing straightforward insights into the relationships among variables.

We believe that the extensive correlation analyses we performed sufficiently address the relationships among the variables of interest.

Reviewer Comment:
In addition, most of the ecoregions studied have 1700 mm or less of rainfall, this should also be discussed, as this is at low end for an evergreen tropical forest.

Response:

Thank you for bringing this important point to our attention. You are correct that several of the ecoregions we studied have mean annual precipitation around or below 1700 mm, which is at the lower end for evergreen tropical forests. While we mentioned the differences in mean annual rainfall among the ecoregions in our manuscript, we did not explicitly discuss the implications of studying forests with lower precipitation levels.

We agree that this aspect warrants further discussion, as it can influence the physiological and phenological responses of these forests. We have revised the discussion section to include a more detailed examination of how lower annual rainfall in some ecoregions impacts our findings on the seasonality of photosynthesis and its synchrony with environmental drivers.

We added the section below to the discussion:

4.3 Tropical rainforest with relatively low annual rainfall

Our study encompassed several tropical forest ecoregions with mean annual precipitation at or below 1700 mm, such as the Eastern Guinean, Western Congolian Swamp Forest, and Northwestern Congolian Lowland Forest. This precipitation level is at the lower end for sustaining evergreen tropical forests. The fact that these forests remain evergreen despite lower rainfall suggests that they possess unique adaptations to cope with periodic water limitations.

The lower annual precipitation in these ecoregions is reflected in their physiological and phenological responses. We observed that SIF and vegetation indices like EVI and NDVI in these regions showed a strong synchrony with precipitation and VPD (Figs. S1 and S2). This suggests that in drier evergreen forests, water availability becomes a more significant driver of photosynthesis seasonality compared to wetter regions. The strong negative correlations between SIF and VPD, and positive correlations with precipitation, indicate that photosynthetic activity in these ecoregions is more sensitive to atmospheric dryness and water stress. This sensitivity could be due to several factors.

First, trees in drier evergreen forests may have evolved mechanisms to optimize water use efficiency, such as closing stomata during periods of high VPD to reduce transpiration losses, which in turn affects photosynthesis. Second, these forests might rely on deep root systems to access groundwater during dry periods, but prolonged low precipitation can still lead to water deficits affecting canopy function. Finally, the tree species in these regions may have traits that are adapted to lower water availability, influencing the overall ecosystem response to environmental drivers.

By including ecoregions with lower annual precipitation, our study captures a broader spectrum of tropical forest responses to environmental factors. It highlights that even within evergreen tropical forests, there is significant variability in how ecosystems respond to changes in precipitation and atmospheric conditions. This variability underscores the importance of considering local precipitation regimes when interpreting remote sensing signals like SIF and vegetation indices.

Specific Comments

Line 12

Reviewer Comment:
I think also fossil fuel emissions drive CO_2 concentrations.

Response:
We agree and have revised the sentence to read:

Global atmospheric carbon dioxide concentrations are driven by changes in fossil fuel emissions and terrestrial photosynthesis, of which tropical forests account for one-third.

Line 22

Reviewer Comment:
The Northern Hemispheric biosphere is the key driver for intra-annual variation in CO_2 concentrations.

Response:
You are right, as most of Earth's landmass is in the northern hemisphere. The focus of our paper is on tropical forests and their role in terrestrial photosynthesis. Since tropical forests span both hemispheres, we choose to begin the introduction by discussing this focus. A discussion of the northern hemisphere specifically would detract from the goal of our study.

Line 24

Reviewer Comment:
Carbon store? Write "carbon stock"

Response:
We have replaced "carbon store" with "carbon stock" throughout the manuscript.

Line 25-26

Reviewer Comment:
It is rather the regional water cycle for each tropical basin. Please add some more recent references here.

Response:
We agree. The focus of this paragraph is to describe the role of Earth's tropical forests at the global scale. However, it is obviously true that they also play important roles at the regional scale. Thus, we have revised the sentence and added citations:

They also play important roles in the global and regional water cycles via precipitation recycling and cloud formation (Douglas 2018; Worden et al., 2018).

Line 34

Reviewer Comment:
I think the main conclusion is rather constant carbon gain for African intact tropical forest, which diverging from the Amazon.

Response:
Yes, this finding was one of the three main conclusions we listed. We chose not to compare and contrast with the Amazon here, as the focus of the paper is on the seasonality of productivity. Also, the previous comment requested that we veer away from such a comparison.

Studies that have focused on field plot measurements had three main findings. First, they found a significant upward trend in carbon gains (Hubau et al., 2020) that were unaffected by anomalously low precipitation and high temperatures during the 2015/2016 El Nino (Bennett et al., 2021).

Line 40

Reviewer Comment:
Is this really the case? I think you need to tone down this statement a bit as we don't have the complete evidence for this.

Response:
We appreciate your caution. We have revised the statement to be more conservative:

Thus, field-based evidence suggests that African tropical forests might be especially resistant and resilient to climate extremes, but additional research is needed.

Line 41-43

Reviewer Comment:
What is "Congolian"? Write Congo basin.

Response:
We appreciate your fine attention to detail. The Terrestrial Ecoregions of the World by Olson et al. (2001) define five different 'Congolian' forests and use 'Congolian' in their names, as can be seen in our first figure. Here we wrote 'Congolian tropical forest' as a descriptor to remain consistent with the official names for these ecoregions. Doing otherwise may confuse the reader as we do not show 'Congo Basin' on our map.

Line 51

Reviewer Comment:
What about mortality? Was this not observed?

Response:
Thank you for your insightful comment regarding mortality. You raise an important point about its role in forest carbon dynamics. Mortality primarily affects the carbon stock, which is the total amount of carbon stored in forest biomass at a given time. When trees die, the carbon they contain is eventually released back into the atmosphere through decomposition, impacting the carbon stock.

In contrast, our discussion and our study focuses on changes in the carbon sink, which refers to the net flux of carbon between the forest ecosystem and the atmosphere resulting from ongoing processes like photosynthesis (carbon uptake) and respiration (carbon release). The net carbon sink is sensitive to short-term physiological responses of trees to environmental factors and climate anomalies.

We hope this clarifies the distinction between carbon stock and carbon sink and explains why our analysis focuses on the latter in relation to climate events.

Line 53

Reviewer Comment:
What do you mean with "coastal forests"?

Response:
We apologize for the ambiguity. We have clarified this as:

Also, these previous field-based analyses aggregated measurements annually at the continental scale although the field sampling was more commonly conducted in coastal forests, which are forests located closer to the coastlines that may have different environmental conditions and forest characteristics than interior forests.

Line 56

Reviewer Comment:
SIF is, I think, an indirect observation and hence still a proxy for productivity. Can you elaborate here.

Response:
Certainly. We have expanded the explanation by adding this sentence to the paragraph:

Because SIF is emitted during the light reactions of photosynthesis, it is directly sensitive to both the quantity of light absorbed and the efficiency with which that light is used for carbon fixation. This makes SIF a more direct proxy of photosynthetic activity and plant productivity compared to traditional vegetation indices, which primarily capture canopy greenness and structure.

Line 59

Reviewer Comment:
Leaf physiology: can you be more specific.

Response:
Sure, we have expanded the sentence to be more specific on what leaf physiology is:

SIF is a small amount of energy that is re-emitted by chlorophyll (1%-2%) and is sensitive to leaf physiology, which are the functions and processes within a plant leaf, including how it absorbs sunlight, exchanges gases through stomata, transports water and nutrients, and carries out photosynthesis (Johnson and Berry, 2021; Porcar-Castell et al., 2021, 2014).

Line 66

Reviewer Comment:
VPD and temperature are linked; please make clear in the text.

Response:
Sure, we have revised the sentence to clarify this relationship:

The studies that have utilized spaceborne SIF to investigate tropical Africa have found that (1) temperature and vapor pressure deficit (VPD)—which are interlinked because higher temperatures increase VPD by raising the air's capacity to hold moisture— control the productivity of African tropical forests…

Line 82

Reviewer Comment:
Can you reformulate this hypothesis as not all forests in Africa you test are "moist", see Table S1.

Response:
Good catch, thanks. We have reformulated it and clarified the statement to tie it into the paragraph that preceded it, which discussed what we know of the Amazon tropical forest.

Thus, we suspected that leaf demography and physiology in African tropical forests might respond to changes in environmental conditions in a manner similar to those observed in the Amazon.

Line 107

Reviewer Comment:
Is 735-758 correct, i.e., it is not 743-758 nm?

Response:
It is correct, as they provide retrievals from two different windows for TROPOMI. See the abstract from Guanter et al. (2021):
https://essd.copernicus.org/articles/13/5423/2021/essd-13-5423-2021.pdf

Here is an excerpt:

"Baseline SIF retrievals are derived from the 743–758 nm window. A secondary SIF dataset derived from an extended fitting window (735–758 nm window) is included."

Line 111

Reviewer Comment:
In the Results you also present soil moisture data. It is not clear how this is calculated from the Materials and Methods section.

Response:
We apologize for the omission. We have added a description in the Methods section:

We used monthly averaged data from the ERA5-Land product (Muñoz Sabater, 2019), which is available in a spatial resolution of 0.1 degrees, for air temperature, photosynthetically active radiation (PAR) at the top of the canopy (PARTOC), VPD, and volumetric soil moisture (layer 1; 0-7 cm).

Line 127

Reviewer Comment:
You indicate 4 vegetation indices and their pros and cons. But in the Results you focus on EVI and a little bit on NDVI. Please explain/justify better your choice.

Response:
We have responded to this comment in the Main Comments section. Please see above.

Line 147

Reviewer Comment:
Why this selection of African forest types and not the one proposed by Réjou-Méchain et al. 2021, Nature?

Response:
The map shown by Réjou-Méchain et al. (2021) delineate forests according to functional type. Here are the two main reasons we used the Olson et al. (2001) ecoregion map.

1. Unfortunately, large swaths of forests are unclassified (marked as not calibrated). Excluding large expanses of forests within an ecoregion or plant functional type could have potentially biased our results. Excluding the data would have dramatically reduced the number of grid cells used in our statistical analyses, and would have introduced additional uncertainty.
2. The maps by Olson et al. (2001) have been used in about 10,000 studies, and are widely accepted. Olson et al. (2001) delineated ecoregions by considering distinct species assemblages, environmental conditions, and vegetation types. They characterized ecoregions based on unique combinations of flora and fauna, using

species distribution data—including the presence of endemic and specialist species—to define boundaries. Factors such as climate patterns, soil types, altitude, and hydrology were evaluated to reflect the ecological conditions influencing the distribution of species and ecosystems. Additionally, dominant vegetation forms (e.g., rainforest, savanna, mangroves) were used as indicators of ecological boundaries, as they reflect underlying environmental gradients and biological processes.

3. The Réjou-Méchain map unfortunately excludes two important ecoregions in West Africa, the Western and Eastern Guinean forests, which were an important scope of our study.

Line 152-154

Reviewer Comment:
Where do we see this? Some of the text here is also redundant.

Response:
This paragraph was under the 3 Results header, but it more aptly describes our classification method. Thus, we moved it to a new Methods section 2.8 and pointed the reader to the figures where the differences in precipitation variability and totals can be easily seen. This paragraph now reads:

2.8 West African and Central African Tropical forest

We noticed that the wettest ecoregions (Fig. 1) also had the highest variability in monthly total rainfall, and that there was a dissimilarity in our results among the wettest ecoregions with a high variability in monthly precipitation and the drier ecoregions with low variability (see precipitation bars in Figs. 2-3). Thus, we classified the 11 ecoregions into three groups according to their precipitation regime, monthly variability, and mean annual rainfall (Table S1). Four ecoregions in West Africa were characterized by seasonalities in mean monthly precipitation that had distinctive single wet and dry periods each year (Figs. 2-3), high monthly variability (sd ≥ 120 mm), and relatively high mean annual rainfall (> 2400 mm). We classified these ecoregions as West African moist tropical forest, which included the Cameroonian Highlands, Cross-Sanaga-Bioko Coastal Forest, Nigerian Lowlands and Niger Delta, and Western Guinean Lowlands. The six Central African ecoregions were characterized by seasonalities that typically had a double-peak pattern, low monthly variability (sd ≤ 100 mm), and relatively lower mean annual rainfall (< 2200 mm). We classified these forests as Central African tropical forests. The precipitation regime of the Eastern Guinean ecoregion in West Africa, which we classified as West African tropical forest, had mean annual rainfall (1544 mm) and monthly rainfall variability (81 mm) that was more similar to the Central African ecoregions.

Line 155

Reviewer Comment:
I thought the classification into 11 regions was done a priori and not because of the seasonality.

Response:
Right, the 11 ecoregions come from Olson et al. (2001). We further grouped these 11 ecoregions into 3 total regions for the sake of discussion. These three regions shared important characteristics, as we described in this paragraph. See above.

Line 157

Reviewer Comment:
Elaborate better how seasonality can be seen, i.e., by better referring to Figure 1. But the legend and caption in Figure 1 is not clear and needs to be improved.

Response:
Actually, we are referring to Figs. 2-3 here. We apologize. The sentence has now been revised as:

Four ecoregions in West Africa were characterized by seasonalities in mean monthly precipitation that had distinctive single wet and dry periods each year (Figs. 2-3), high monthly variability (sd $\geq$ 120 mm), and relatively high mean annual rainfall (> 2400 mm).

Line 170

Reviewer Comment:
In this section moments of the year are given. However, I think this should be done more precisely by giving months of the year and not expressions like "mid-year", etc.

Response:
The goal of this section is to provide a general description of the seasonality of SIF, environmental factors, and VIs. The peaks and minimums do not always occur in the same month in each ecoregion, and certainly not across all ecoregions. Parsing out the minimums and maximums for each year and for each ecoregion would detract from our goal to provide a general description of the patterns that are shown in our figures.

Figure 2

Reviewer Comment:

The caption is not complete as also VPD is shown here. Justify why only "TROPOMI SIF" is shown (also valid for Figure 3).

Response:

We apologize. VPD is shown in the caption, along with its unit. Perhaps the version of the PDF you received had a rendering error. We show only SIF on Figure 2 because including the vegetation indices would have rendered the figure incomprehensible, given that there would have been 7 lines in addition to the bars. For this reason, we show the vegetation indices in Figure 3. Both figures are below, as they are in the manuscript. Thank you.

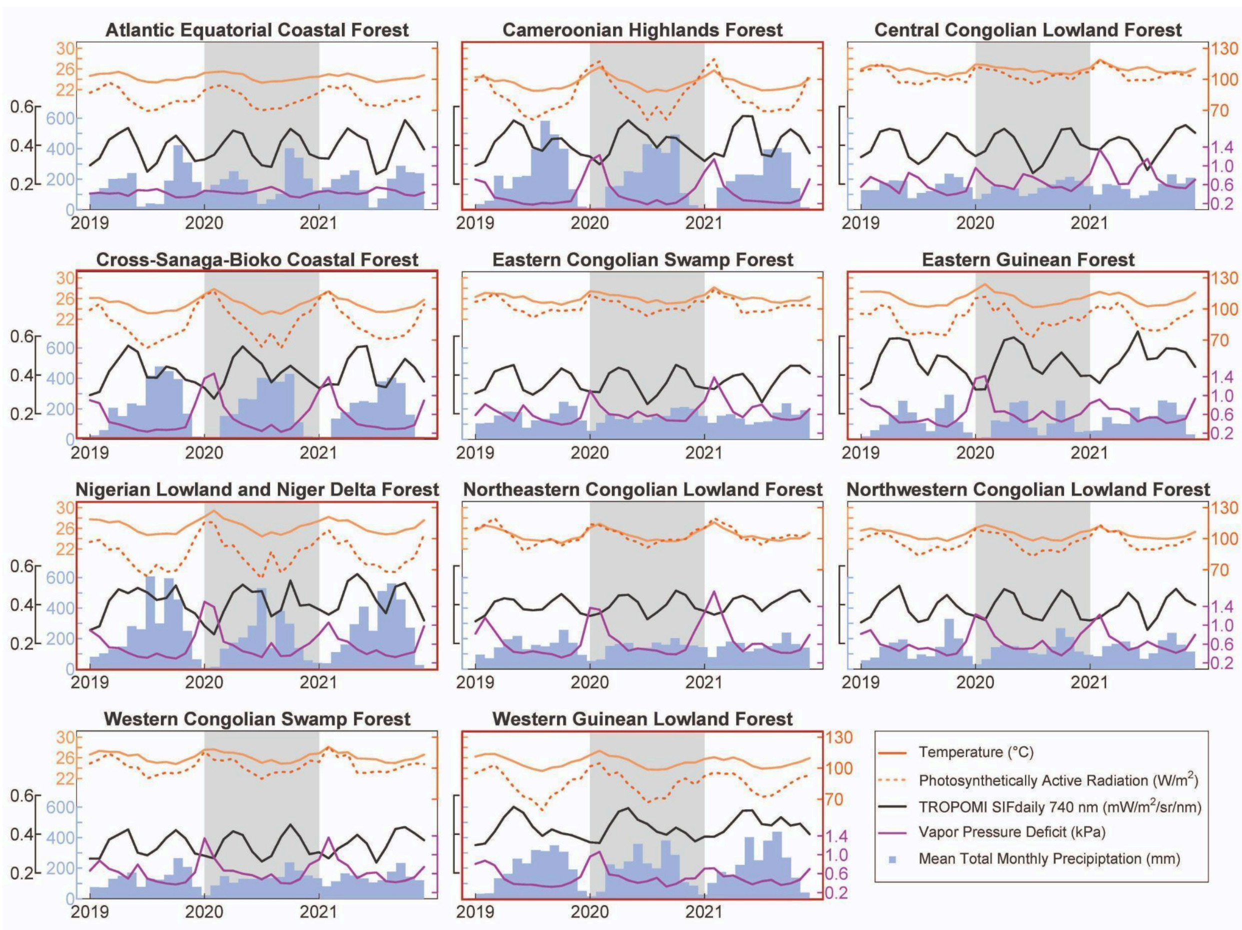

Fig. 2. Environmental conditions and solar-induced chlorophyll fluorescence for 11 African tropical forest ecoregions. Photosynthetically active radiation (PAR) is the amount of PAR at the top of the canopy (PAR_{TOC}). West African ecoregions are outlined in red.

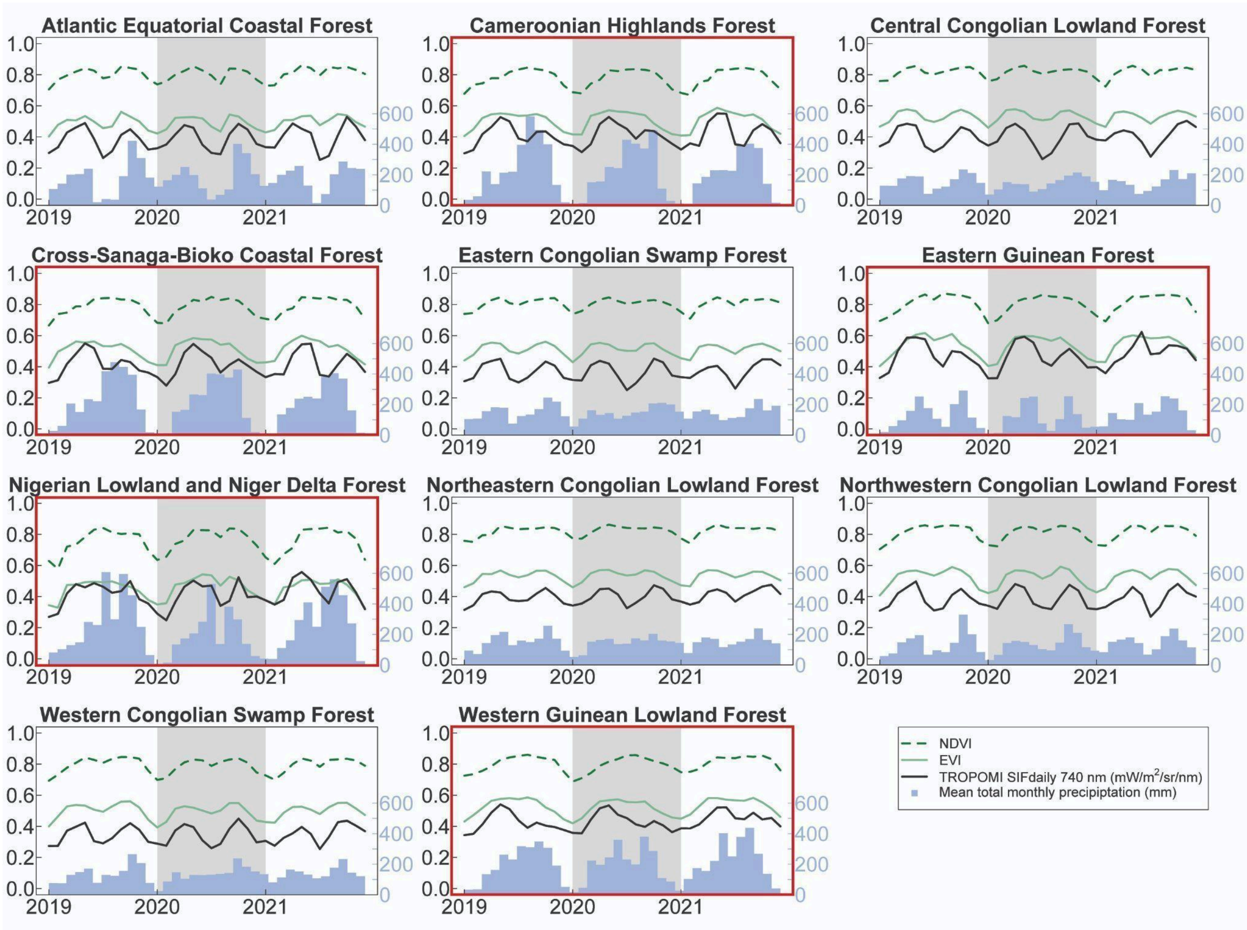

Figure 3. Monthly mean NDVI, EVI, SIF, and precipitation for 11 tropical forest ecoregions of Africa for 2019 - 2021. The shaded region delineates the year 2020. NDVI, EVI, and SIF share the left y-axis. West African ecoregions are outlined in red.

Line 194

Reviewer Comment:

In this section a mostly qualitative description is given of synchrony with precipitation, PAR and VPD. I think more efforts can be done to make these relationships more quantitative. Hence my suggestion on top for zero-order and partial correlations,… And I am sure other techniques exist.

Response:

Indeed, the goal of this section (3.2.1) was to provide a general description and interpretation of the seasonality of SIF, environmental factors, and VIs. The subsequent section (3.2.2) discusses the quantitative results of our zero-order correlation analyses (Pearson's and Spearman's). It is likely the reviewer's comment was made prior to reading section 3.2.2.

Figure 4

Reviewer Comment:
I do not understand why a difference in correlations is proposed here; why VPD + Precip is given, etc.

Response:

The goal here was to determine if SIF, EVI, or NDVI were increasingly related to VPD and less related to precipitation in forests with higher annual total rainfall and higher variability in monthly precipitation. We apologize that this was not clear. Please see the new paragraph referencing this figure and the revised caption:

To determine whether the correlations between SIF, EVI, or NDVI and VPD strengthened—and whether the correlation between SIF and precipitation weakened—as mean annual precipitation and the variability of monthly total precipitation increased, we compared the differences in correlation coefficients for VPD and precipitation across all sites. We found that, regardless of whether Pearson's or Spearman's correlation was used, the correlation between SIF and VPD strengthened while the correlation between SIF and precipitation weakened with increasing mean annual precipitation and greater variability in monthly precipitation (Fig. 4). This indicates that in forests with higher annual rainfall and more variable monthly precipitation, SIF becomes increasingly related to VPD and less related to precipitation. Conversely, NDVI showed a stronger correlation with precipitation and a weaker correlation with VPD in these same forests. However, this relationship is likely due to a saturated NDVI signal that mirrors the seasonality of precipitation in the West African moist tropical forest, as no significant correlation was found for EVI.

The caption for figure 4 had an typo, it is VPD plus precipitation. See the correction below, which also now explains r for VPD was always negative, and always positive for precip.

Figure 4. Regressions of the differences in the correlation coefficients for SIF, EVI, and NDVI vs VPD and precipitation using Pearson's and Spearman's correlation tests for each ecoregion. Differences are r for VPD plus r for precipitation (note that r for VPD is always negative and r for precipitation always positive). Top two rows are differences in Pearson's correlation coefficient, and bottom two rows are differences in Spearman's correlation coefficient.

Figure 5

Reviewer Comment:
Can you explain why these periods are chosen?

Response:
We have added the following to the caption of Figure 5:

The periods chosen correspond to the double-peak seasonality of precipitation for these tropical forests: January to April (increasing precipitation), April to July (decreasing precipitation), July to October (increasing precipitation), and October to January (decreasing precipitation).

Figure 6

Reviewer Comment:
The caption of this figure needs to be improved to read the figure independently.

Response:

Thank you for pointing out that this figure is lacking a better description. It has been revised as:

Fig. 6. Month in which minimum and maximum SIF, EVI, precipitation, volumetric soil water, and VPD occur in tropical African forests. For columns 2 and 4, the x-axis is month and the y-axis is the number of grid cells.

Line 269

Reviewer Comment:
It is surprising to see that the discussion is now mostly geared towards a comparison with the Amazon. Is this really the scope of the paper? And then suddenly the discussion is on PAR and VPD, while this was not emphasized in the introduction of the paper or the results section.

Response:
Yes, here our goal is to discuss the larger-scale implications of our findings in the context of the global tropical carbon cycle, of which are overwhelmingly composed of the Amazonian and African tropical forests. Note that the lead author of this manuscript has published extensively on SIF and environmental drivers in the Amazon, and so it is especially advantageous to describe our findings in the larger context of what is known of Earth's largest tropical rainforest.

We retitled this section and added a leading statement:

4.1 Contrasting SIF dynamics and precipitation regimes in West African and Amazonian moist tropical forests

Here, we situate our findings within the broader context of what is already known about other moist tropical forests—particularly those in the Amazon—to discern universal patterns and region-specific dynamics. This comparative perspective enhances our comprehension of how different moist tropical forests respond to variations in precipitation, vapor pressure deficit

(VPD), and photosynthetically active radiation (PAR), thereby contributing to more accurate models of global tropical forest behavior under changing environmental conditions.

Line 305

Reviewer Comment:
But where are the physiology and phenology data? You refer here to the vegetation indices? This is not clear.

Response:
Here we are referring to the spaceborne data, SIF (physiology) and EVI (phenology). We have clarified this statement:

"For instance, spaceborn-we observed that the physiology (SIF) and phenology (EVI) of the entire Central African tropical forest region acts in concert…"
