Responses to comments: our replies are all in blue color.

Referee #1:

Dear,
We would like to thank you for taking your time to evaluate our work and foremostly for your interesting and useful comments and questions.
We tried to answer your interesting questions and comments (all answers and changes are in blue color).

The presented work shows a very interesting study based on the analysis of measurements obtained in an eddy covariance flux observation site. It is remarkable the use of field data for the study. The use of other reference measurements is lacking, taking advantage of the fact that the study is located in an experimental area, leaf-level measurements could have been used.

We agree that leaf-level measurements are important to better interpret canopy SIF measurements. However, due to lack of time and technical issues, we could not set up leaf-level measurements. These measurements will be provided in the future as we are highly interested in comparing leaf-level and canopy measurements.

Line 354. "In Figure 1c, shows a good correspondence" It will be desirable to provide a quantitative value, perhaps an error estimate, or the difference between the variables compared (with the data from the NIR_v and the R-NIR in the same graph).

This was a formulation mistake and this part was reformulated (Line 351) as “At the seasonal scale (daily averages), in Figure 1b and 1c, the results show that the R^2 between SIF_y and $F_{yieldLIF}$ was 0.58, indicating that SIF_y and $F_{yieldLIF}$ were better correlated at the seasonal timescale”.

Understanding that the main topic is the structural effects and shadows, please explain why there were not used measurements of the fraction of vegetation shaded along daily and seasonal periods. In line 370 it is commented that the rbg camera was used to determine the sunlit leaves, but there were no further used to normalize or correlate with other variables to reinforce or discard some assumptions and unknowns exposed. For example, on line 368. "The diurnal variations... determined from the RGB". Or line 355. "The magnitude of both variables... of the given period". Did you try to normalize the values by the SZA, or by the sunlit or shaded vegetation fraction?

In this work, we aimed to study canopy structure and sun geometry effects on ground-based measured SIF and to propose a way to correct these structural effects on the SIF signal. Firstly, we explored the RGB images of the FOV of SIF3 captured on sunny days along the season to estimate the sunlit and shaded leaf areas. These data were used to explain visually the effects of shaded leaves on the diurnal SIF measurements. Secondly, as our RGB images were limited in terms of temporal sampling when upscaled at daily or seasonal scale, we could not make use of these data as inputs in the statistical analysis. Further, we introduced φ_k, which is a new remote sensing indicator that represents the structure and the sun-canopy geometry effects on the SIF signal (structural component of SIF), and we assumed that for a broad and useful use of SIF signal there is a need to find a remote sensing proxy of φ_k. This is why reflectances and sun-canopy geometry were used in the Random Forest models to predict φ_k. in other words, our approach was not to normalize SIF using local measurements, only available for our study site, but rather to try to find a remote sensing proxy that could be used even at the satellite scale.

Further, we also aimed to gain a better understanding of the discrepancies between the measured apparent SIF yield (SIF_y) and the chlorophyll fluorescence yield measured by LIF ($F_{yieldLIF}$), and whether these discrepancies can be explained by acquisition conditions and canopy characteristics. Our results show that, at this stage, passive SIF measurements cannot be properly standardised. The development of a standardisation method requires further work.

Lines 377-389. The SIF is correlated with the dynamics of the PAR. Obviously, PAR is one of the main factors, but the photosynthetic surface has to absorb the light. This raises the question of why PAR is used to normalize SIF to obtain SIF yield, without applying any correction factor and assuming that the entire area covered by the FOV is fully illuminated vegetation. (SIFy = SIF/PAR) and no (SIFy = SIF/APAR)

This is an interesting question. However, the reason that PAR was used to normalize SIF in our study has been explained in L118-L123: "In addition, the computation of total absorbed photosynthetically active radiation (APAR) requires measurements of the incident, transmitted, and reflected PAR, which cannot be measured with satellite or airborne platforms, and are not always available for ground sites (even those belonging to major carbon flux observation networks, such as the Integrated Carbon Observation System, ICOS). This is the reason why for decades the apparent ΦF was estimated by normalizing the top-of-canopy SIF signal converted in quanta energy by the incident PAR (Daumard et al., 2012; Goulas et al., 2017)". The limitations related to using PAR to normalize SIF were also discussed in L473-L479: "At the diurnal timescale, far-red SIF is strongly affected by canopy scattering and by the distribution of sunlit and shaded areas at the top and within the canopy (Dechant et al., 2020; Zhang and Zhang, 2023). This study showed that those factors strongly affected SIFy (SIF normalized by PAR). Further, as SIF_y was estimated using PAR, but not absorbed radiations, SIFy estimation did not consider the conditions of radiation extinction within the canopy. Therefore, the canopy structural effects can strongly blur the information on the physiological functioning of the vegetation provided by SIFy, and hence lead to low correlations between SIFy and $F_{yieldLIF}$".

Lines 414-416. If NIR_v and r-NIR give almost the same trends in the results, why do you recommend using NIR_v?

In this result (Figure 3) we chose using NIR_v and we show the same analysis using R-NIR instead in Figure S8 because NIR_v is a well-established indicator, as shown in the literature. It is important to note that our study was carried out during the vegetation growing season and during this period NDVI was stable. This could explain why NIR_v and R-NIR had the same trends.

Figure 1 and 3. The letters should be in the same place (e.g., top left of the graph boxes).

The letters in Figure 1 and 3 were put at the top left of the graph.