

# Unravelling the physical and physiological basis for the solar-induced chlorophyll fluorescence and photosynthesis relationship using continuous leaf and canopy measurements of a corn crop

## Response to reviewers' comments

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### Anonymous Referee #2

Yang et al. used a unique dataset comprising both active and passive measurements of fluorescence to explore the physical and physiological relationship between SIF and GPP. Considering the large amount work on the SIF-GPP relationships during the last few years, the work conducted is therefore relevant and it will be of interest for the scientific community working on remote sensing of GPP using SIF. The manuscript is a nice addition to the current body of literature and I think it is worth publishing. A few minor suggestions may be taken into account to improve the manuscript.

*Response: We thank the reviewer for the encouraging feedback. We have revised the manuscript according to both reviewers' comments.*

Line 167: Are the coefficients in Equation 2a obtained from Vina and Gitelson (2005)? If not, please add correct reference.

*Response: The coefficients are not explicitly given in Vina and Gitelson (2005), but they can be obtained from the linear regression line on Fig. 3C in Vina and Gitelson (2005). We obtained these coefficients from Vina and Gitelson (2005) and also from Miao et al., (2018), in which the exact coefficients are given. The difference of the two sets of coefficients is very small (1.373 RededgeNDVI-0.172 vs. 1.37 RededgeNDVI-0.17). In the revised version, we have added this reference Miao et al., (2018) apart from Vina and Gitelson (2005).*

Lines 277-279 (Figure 3d-f): The data points are more disperse in the morning than in the afternoon. Please briefly discuss the possible reasons.

*Response: More disperse data points suggest lower correlation between SIF and GPP in the morning. We have discussed one possible reason in section 4.3, which is the fraction of diffuse light. However, we also believe that there are other possible reasons. For example, LUEp is generally more variable in the morning due to the quicker change of environmental conditions, such as air temperature and humidity, whereas LUEf may not change correspondingly. The different response of LUEp and LUEf to the rapidly changing environment may have caused the lower correlation.*

Figure 9: Shaded leaves exhibit higher light use efficiency of sustained heat dissipation than sunlit leaves, which is inconsistent with measured results (Figure 7). Briefly discuss the difference.

*Response: Thank you for this comment. The model does not simulate a different response to environmental variables between sunlit and shaded leaves (it considers just one type of leaf). The very small difference in simulated heat dissipation is because the sunlit leaves have a higher temperature than the shaded leaves. This affects the sustained heat dissipation in the model. We made a mistake in using the color map and have corrected it.*

Line 464 (Figure 10b): The correlation coefficient between PRI and APARcanopy is 0.28, not -0.28 in Figure 10b, right?

Response: The correct value is 0.28. We have revised Fig. 10b in the revision.

In addition, many sentences can be improved, for example: Line 452: per leaf unit area → per unit leaf area

Response: We have checked and improved the overall quality of our writing.