

Interactive comment on “Linking canopy reflectance to crop structure and photosynthesis to capture and interpret spatiotemporal dimensions of per-field photosynthetic productivity” by Wei Xue et al.

Anonymous Referee #2

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This paper, “Linking canopy reflectance to crop structure and photosynthesis to capture and interpret spatiotemporal dimensions of per-field photosynthetic productivity”, is suitable for publication within Biogeosciences, however a number of questions and clarifications are necessary. The research is a unique effort to integrate multi-scale agricultural and ecophysiological measurements that readers would find interesting. Significant grammatical errors exist – if they were corrected then the paper would be much easier to digest and would more effectively convey its message.

Specific comments:

C1

P2, L19: “. . . resolved using complex Bayesian melding”. It was assumed that “melding” should be modeling; this reference doesn’t provide evidence for why Bayesian hierarchical modeling would provide an adequate solution to solving the gaps in research.

Hypothesis 1: Reads as if was formulated after the research was completed, and should be composed in present tense. It would also be beneficial to explicitly separate the second part of this hypothesis into a new hypothesis (LAI and canopy leaf physiology as the primary(?) driver of spatial variation in GPP).

How many replications were used for each treatment? Were the treatments randomly assigned to plots? This is never addressed.

Top of page 5: It may be helpful to briefly mention why the measurement DOYs of the portable gas exchange and chlorophyll fluorescence systems did not match up and were not consistent across nutrient groups.

P4, L20-24. Need citations for these methods to estimate Reco and GPP. For equations 2 – 8, citations and/or greater justification for using the equations is warranted.

P7, L19, Eq 2: Need justification for LUE be a linear function of LAI (equation 2). The same holds for equation 3.

P7, L19, Eq 5: Based on this formulation, it appears as though LAI appears twice in the numerator – in the GPP and LUE terms from eq.2 and eq. 3. This should be justified. It would be helpful to have an explanation for why GPP is multiplied in the numerator and added in the denominator.

P8, lower half: Justify the use of a non-directional exponential semi-variogram. It would also be helpful to know the number of observations that are used to derive the semi-variogram (number of pixels?).

Was the semi-variogram applied to account for spatial autocorrelation of all the response variables or only some of them? This is detailed to some degree in the results

C2

but should be explicitly stated here.

P9, L12. The difference between the PD high and normal groups may have been statistically significant, but was it practically significant (what was the magnitude?) Unclear whether difference between low group and mid/high PD groups is important.

Fig 2: Recommend breaking sub-figures a and b into two figures, one for PD, one for rainfed. It would also be helpful to have error bars on sub-figures c and d.

P10, L7. The distinction in LAI-LUE slopes should likely be tested with an interaction parameter and F-test rather than comparing R-squared and p-values.

P10, L18. Pink pixels in PD rice are not evident.

P12, L22. Was the paired t-test using observations across the range of DOY? This seems apparent in the subsequent text but should be stated up-front.

What was the background macro- and micro-nutrient concentrations in each treatment excluding N?

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