

Interactive comment on “Investigating the usefulness of satellite derived fluorescence data in inferring gross primary productivity within the carbon cycle data assimilation system” by E. N. Koffi et al.

Anonymous Referee #2

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General Comments

The paper by Koffi et al. investigates the utility of satellite F_s measurements in constraining GPP. The motivation is that the relationship between F_s and photosynthesis is complex and that a common parameter linking the 2 together is needed to use this constraint effectively. The primary finding that simulated F_s is less sensitive to V_{cmax} than $aPAR$ and chlorophyll concentration (Cab) is an important one both for the assimilation of F_s as well as advancing our understanding of the F_s -GPP relationship. The authors note in the conclusion that this finding directly contradicts Zhang et al. [2014]

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and even address this inconsistency with a couple experiments. However, the most important factor the authors forgot to consider was that the Zhang result was based on cropland vegetation. The authors mention C_4 vegetation in general but I feel a more thorough analysis of SCOPE cropland F_s sensitivity to V_{cmax} , Cab , and $aPAR$ is needed to reconcile this important result. Otherwise, the paper is well written and the methods/results mostly convincing. I would recommend this paper for publication after these and other revisions.

Specific Comments

The author's reasoning to investigate diurnal variations at a site (as described on P719, L20) that did not observe F_s or GPP is unclear. It would be more useful to investigate one of the hundreds of global FLUXNET flux tower sites that measure GPP. If it's due to lack of driver data this reason should be explained in the text. If it's not much extra work, it would be interesting to see if model and observed F_s and GPP show similar day-to-day changes in diurnal amplitude.

There are a couple issues in the calculation of Person correlation coefficient described on P724. (1) please clarify if the pair of data chosen is based on monthly averages or single measurements; (2) negative values are signals and should be included in computation of monthly average and in correlations to avoid high bias in F_s observations; (3) the definition of “linear correlation is significant” on L18 is confusing; (4) be more specific in definition of “small” correlation on L20; (5) for the low correlation pixels, please state explicitly that the reason for low correlation are the list of cases described starting at the end of P724. In general, in Section 4.2.1 please state that filtering analysis uses two sets of criteria: high correlation and S4 model set up)

The result that Cab controls F_s but not GPP (P729, L16-20) is an important result that may help better quantify and interpret the statistics describing the relationship between F_s and GPP. Please discuss.

P730, L9-10: The result of variance across vegetation types has been shown by Guan-

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ter et al. [2012] and Parazoo et al. [2014] and should be cited.

Lack of sensitivity of F_s to V_{cmax} : Zhang et al. [2014] showed high sensitivity in croplands and for very large values of V_{cmax} . Have the authors considered cropland vegetation types in this study?

Guanter, L., Frankenberg, C., Dudhia, A et al. (2012) Retrieval and global assessment of terrestrial chlorophyll fluorescence from GOSAT space measurements, *RSE*, 121, 236-251.

Parazoo, N. C., K. Bowman, J. B. Fisher, et al. (2014) Terrestrial gross primary production inferred from satellite fluorescence and vegetation models, doi:10.1111/gcb.12652

Technical Comments

P710, L15: Reference should be Lee et al. (2013)

P718, L5: Replace workers with investigators

P724, L6-8: These sentences feel redundant and need rewording.

Interactive comment on Biogeosciences Discuss., 12, 707, 2015.