

Biogeosciences Discuss., author comment AC6
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Reply on RC3

Mark Pickering et al.

Author comment on "Sun-induced fluorescence as a proxy for primary productivity across vegetation types and climates" by Mark Pickering et al., Biogeosciences Discuss.,
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- *Minor comments*

Land cover data – Is it really the case that the pixels selected had 'no change' over 2007 – 2014? Classification errors can cause estimated land cover fractions to change slightly from year to year. Also, land cover is changing. What was the threshold for no change? If a gridcell changed by 1%, from let's say 95% to 96%, or vice versa, was it excluded? Or did you mean there was no change in the majority land cover classification?

Yes, this is a good point to raise. We are aware that land cover could change over the period and partly affect the results, but this would overall be considered negligible at the spatio-temporal aggregation scales we are considering. More specifically, what we meant is that there was no change to the majority land cover classification over the time period. We will clarify this in the text (**bold**):

L117: To ensure a high homogeneity in the selected data, the dominant vegetation type must cover at least 75% of a pixel and with no change **in the majority land cover classification** over the considered years, 2007-2014.

- Line ~40: There was a good LUE model review paper recently, see Yanyan Pei et al (2022).

Thank you, we will add this reference.

- *Line 69-70 – This linearity can be said for spaceborne SIF sometimes, but certainly not tower or leaf-level SIF measurements. Youngryel Ryu showed that at the short term, SIF is more related to APAR, and the Marris study and Helm study show that SIF and GPP can be decoupled at both short- and long-term scales and at both the leaf and canopy scale.*

We agree and we will ensure to be clearer on stating that the linearity is only sometimes for and for spaceborne spaceborne measurements. We suggest the rephrasing (changes **bold**):

'Indeed, there is a substantial body of evidence that shows that SIF, **measured from space-based instruments**, is positively correlated with leaf photochemistry, **often** exhibiting a generally linear relationship in both space and time, and across spatio-temporal scales

- Line 83 – The argument for not using TROPOMI is confusing. Apart from OCO2/3, it has the highest spatial resolution and certainly the highest resampling with near daily global coverage. GOME-2 is far inferior in these respects, so I recommend the authors better justify their use of GOME-2. There is certainly nothing wrong with the authors using their downscaled GOME-2 product, I am happy to see it.

TROPOMI is certainly the most interesting instrument, but it was lacking the temporal archive length to sample the multiannual variability, especially at the start of our study. The work will certainly be able to be continued later on with TROPOMI, but we deemed it was useful to show what could be done with a downscaled product of the sub-optimal GOME2 instrument. We will try to ensure the justification for not using TROPOMI here is clear.

- *Downscaled product - Can you include your equations here? Also a brief description of your data sources for each variable would be helpful. From what I remember, the method follows $SIF = f(VI) * f(T) * f(W)$ using MCD43C4 (VIs), MYD11C2 (LST), MOD16A2 (ET).*

We will add the details as requested. We had initially considered to remove them for brevity, but we now realize they help in the general understanding