

## Reply on RC2

Anonymous Referee #2

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Referee comment on "Vegetation photosynthetic phenology metrics in northern terrestrial ecosystems: a dataset derived from a gross primary productivity product based on solar-induced chlorophyll fluorescence" by Jing Fang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-452-RC3>, 2022

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This study developed a photosynthetic phenology metric dataset from 2001 to 2020 with SIF-based GPP and the retrieval of phenology. This has important implications for the modeling and analysis of the global carbon cycle. However, I believe the comparison and validation approach proposed is flawed in this manuscript, making a reliable assessment challenging. Consequently, the current manuscript is not suitable for publication in the ESSD journal.

The specific suggestions are as follows:

### Main comments

(1) the comparison for phenology metrics: The vegetation greenness and photosynthesis are not always coupled (this is mentioned in the Introduction section). This study conducted a comparison between GPP-based and VI-based phenology metrics to prove that the GPP-based metrics outperform. In my opinion, this is not directly comparable. In contrast, GPP-based phenology metrics are based on vegetation photosynthesis activity, whereas VI-based phenology metrics (NDVI, EVI) are based on vegetation morphology, structure, and greenness. NDVI/EVI (greenness index) cannot well account for most productivity variation than GPP products. In addition, the remote-sensing VIs are derived from observation while GPP is derived from simulation. So, I suggest authors can replace VIs with multiply GPP products (excepting MODIS-GPP in this manuscript), and further comparing with SIF-based GPP.

(2) validation: The derivative datasets from EC-GPP were used for the validation. The derivative datasets from EC-GPP fall into the category of photosynthetic phenology. Hence, a tendentious validation generates a bias toward phenology metrics in the two categories. This verification is more suitable for photosynthetic phenology than for structure. The results that the accuracy of GPP-based phenology metrics outperforms the VI-based ones are not solid. Suggest authors validate photosynthetic phenology results using photosynthetic phenology observation.

(3) writing: The English writing doesn't meet the requirement of ESSD, an international academic top journal. Many redundant sentences need to be reorganized.

### **Specific comments:**

L100: Li and Xiao (2019) noted the global SIF products, not the GPP products. Do you want to cite this article?

Li, X.; Xiao, J. Mapping Photosynthesis Solely from Solar-Induced Chlorophyll Fluorescence: A Global, Fine-Resolution Dataset of Gross Primary Production Derived from OCO-2. *Remote Sens.* 2019, 11, 2563. <https://doi.org/10.3390/rs11212563>

L107: the references do not contain Li and Xiao 2019b. I guess Li and Xiao (2019) should be cited here according to the meaning of the sentence.

L108: Also, Li and Xiao (2019) should be cited here

Li, X.; Xiao, J. Mapping Photosynthesis Solely from Solar-Induced Chlorophyll Fluorescence: A Global, Fine-Resolution Dataset of Gross Primary Production Derived from OCO-2. *Remote Sens.* 2019, 11, 2563. <https://doi.org/10.3390/rs11212563>

L109-111: The original spatial resolution of LULC is 500m. Please provide the details of up-scaling.

L128-L129: The distribution of the EC tower can be shown on the map.

L134-135: It is to clarify whether NDVI, EVI, and NIRv have been synthesized to 8d resolution to match GOSIF-SPP and MODIS-GPP.

L155-156: Please provide the detailed methods for time series interpolation.

L162-163: Need reference.

L164-166: (3) and (4) can be merged into one category.

L172-174: Need reference.

L174-175: Please provide necessary the details of the data processing, parameters setting, and model description. More details can be pointed to a particular article.

L176: Are "penalty factor and the minimum segment" the parameters of the PELT model? What do they affect? As mentioned above, an overview of the model and its parameters are necessary.

L197-199: Is the same method applied to EC-GPP?

L206-207: This sentence is too vague. Please clarify the specific objectives of uncertainty analysis. Moreover, please add the details of R and RMSE, the critical statistical indicators.

L216: As an innovation of this study, the difference in phenology retrieving methods for phenological identification should be discussed.

L268: "artificial crop rotation pattern" is not a specialist vocabulary.

Table 1: clarify three thresholds. Figures and tables are able to "stand alone" from the body of the paper.

Fig1: clarify all abbreviations

Fig2: Add significant test and sample sizes, and clarify all abbreviations. Additionally, correct the dotted line as the solid line in the caption.

Fig3: Add the necessary latitude such as the North Pole and tropic of cancer. Add a brief explanation of the calculation method in the caption.

Fig4: clarify the abbreviations, legend unit, and x-axis label.

Fig5: Clarify the abbreviations and legend unit. Moreover, suggest author put this figure into the supplementary material due to its less information and the similarity to Fig4.

Fig6□The similar hue in blue and green is difficult to distinguish the increase or decrease of phenology metrics.