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Interactive comment on "A daily, 250 m, and real-time gross primary productivity product (2000–present) covering the Contiguous United States" *by* Chongya Jiang et al.

Chongya Jiang et al.

chongya.jiang@gmail.com

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Thank you for reviewing our manuscript "A daily, 250âĂŁm, and real-time gross primary productivity product (2000–present) covering the Contiguous United States". We have tried our best to address your comments and to improve our manuscript.

1. This study proposes a new diagnostic estimation of gross primary productivity at a continental scale using remote sensing data. The proposed method is good for many researchers, etc., since it provides high spatial (250m) and temporal (daily) resolutions. Another advantage of this approach is its simplicity (a very small number of parameters). Also, model description, evaluation, and data availability were well-written, I

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believe. I have some minor comments (and questions).

We greatly appreciate your positive comments.

2. Uncertainties estimation. Adding uncertainty information is very nice, and one of the most important contributions of this study. I found clear description on GPP uncertainties, however, it is not easy to find information on each input parameters. Please add information how to define uncertainties in each input data.

Uncertainty of PAR estimation is described at L159–160 in the original manuscript: "Four different PAR estimations are then obtained by Eq. (9), and their ensemble mean and standard deviation are considered as the final estimation and uncertainty, respectively". Uncertainty of SANIRv estimation is described at L212–213 in the original manuscript: "SANIRV is supposed to be smooth within a short time period, therefore, the standard deviation within the $\pm$3-day temporal window is calculated as uncertainty". Uncertainty of C4 fraction estimation is described at L244–245 in the original manuscript: "The RMSE between predicted and reference CDL C4 fraction is calculated as uncertainty". Uncertainty of slope coefficient is described at L271–272 in the original manuscript: "The RMSE between SANIRV-derived and AmeriFlux iPUE for C3 and C4 are calculated as uncertainties of cC3 and cC4, respectively".

L52-53. As far as I heard, there are several new reanalysis datasets for meteorological datasets with higher spatial resolutions. Please update the description here. I think this approach is not based on GCM, but reanalysis (of course, reanalysis is based on climate model, but reanalysis is more appropriate word. Please modify.

Thanks for the suggestions. We have changed "50 km" to "> 10 km". We have replaced "GCMs" by "reanalysis approaches".

L77. Maybe no explanation of a symbol, REDref. Please check the manuscript.

Thank you for the remaindering. We have added it to the sentence "MODIS provides long-term and real-time (2000 – present) observations of red (RedRef) and NIR (NIR-

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Ref) reflectance".

L97. 'When vegetation in absent, iPUE is zero, and NIRvref should be zero." I don't think NIRref should be zero, since soil shows different NIRvref value. Suggest rewording.

NIRv,ref is near-infrared reflectance of vegetation. We have revised it to "When vegetation is absent, iPUE is zero and NIRV,Ref is expected to be zero".

L166-169. For quality control of surface reflectance data, did you use information on MOD09(MYD09) quality flag information? I could not find the description. If no, why?

Thanks for this comment. We did apply QC. We have added one sentence: "Only pixels with QC information of 'corrected product produced at ideal quality all bands' were used."

L176. Sensor view angle is a cause of Terra, Aqua reflectance differences. Solar zenith and azimuth angles are also important as well as sensor view angle?

Thanks for the suggestion. Terra's average overpass is around 11am, whereas Aqua's is around 1pm. They have similar solar zenith angles, but could differ in solar azimuth angle. We have revised this sentence: "the remaining cloud contamination and sun-target-sensor geometry could cause differences between morning and afternoon observations".

L196-207. Not clear, please improve it to understand it more easily.

We have revised it as follows: "For a specific pixel, soil background NIRV (NIRV,Soil) is supposed to 1) smaller than seasonal mean NIRV,Ref which includes vegetated period, and 2) smaller than 0.2 indicated by a global soil spectral library (Jiang and Fang, 2019). Therefore, NIRV,Soil is supposed to within a range of [0, min(mean(NIRV,Ref), 0.2)]. The mode of daily NIRV,Ref averaged over 2000 – 2019 within this value range is considered as NIRV,Soil. An example is given in Figure S5. Theoretically, NIRV,Soil for evergreen species cannot be obtained from time series NIRV,Ref because of the

persistent vegetation cover. Pixels with NIRV,Soil value larger than 0.1 and seasonal coefficient of variation (CV) of NIRV,Ref smaller than 33% are empirically considered as evergreen species, and their NIRV,Soil values are set to 0."

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