

Geosci. Model Dev. Discuss., author comment AC2
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Reply on RC1

Chengyong Wu et al.

Author comment on "Improved CASA model based on satellite remote sensing data: simulating net primary productivity of Qinghai Lake basin alpine grassland" by Chengyong Wu et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-258-AC2>, 2022

Dear expert,

Please excuse me for replying to you so late.

We are grateful for your comments, and understand that your main concern are introduction and methodology of the preprint.

For the introduction part, including comments that you said (the first part, the content of L46 and L66 in other minor concerns), some literatures may be omitted, which we will try to cite according to your advice. Thank you.

For the methodology, I think that you mainly concern the uncertainty of RS product and model. We had a preliminary discussion about their uncertainty (section 5.5 and 6) and put forward some further research plans. The uncertainty and its quantification is a relatively large research topic. I'd like to take this opportunity to sincerely invite you and relevant experts all over the world to solve this topic together, which is very helpful to the popularization and application of RS data driven CASA.

You kindly suggest that it should choose Chinese RS products (SOL, land surface temperature, etc.) generated from the view of parameter localization. Yes, using these data to estimate Chinese NPP will improve the accuracy of estimation results. However, some of them cover a certain geographic extent and a certain period of time, which restrict their application in other region and other period.

You said that "NDVI could be estimated from MOD09A1...". Yes, NDVI could be estimated from MOD09A1 product, which means that researchers are required to calculate NDVI and then might generate a new uncertainty. MODIS Vegetation Index Products, including MOD13Q1 (250 m), MOD13A1 (500 m), MOD13A2 (1 km) and monthly MOD13A3 product (1km) etc., provide the layer of NDVI, EVI and quality(or quality assurance) describing the uncertainty of each pixel, etc. The algorithm of MOD13Q1, MOD13A1 and MOD13A2 product chooses the best available pixel value from all the acquisitions from the 16 day period. In generating the monthly MOD13A3 product, the algorithm ingests all the MOD13A2 products that overlap the month and employs a weighted temporal average (<https://modis.gsfc.nasa.gov/data/dataproduct/mod13.php>). So MODIS Vegetation Index Products can be used to extract NDVI, instead of calculating it from MOD09A1 again. In a

month, there are two period MOD13Q1 products. We take the average value of them to estimate monthly NPP. Because the field data was obtained in July, the date of RS (MODIS) product was also in July, the estimated NPP can naturally compare with the field NPP.

You commented that "The samples of NPP field observation was located around the lake, with no samples in western mountain area ..." is right. As you know, the western mountain area of Qinghai Lake Basin has a greatly varied terrain and high altitude, which means that a cold climate, high-altitude hypoxia and bad traffic results in difficulty sampling. It's even possible to get High Altitude Disease while sampling. This is one reason why we attempt to use RS to drive CASA model.

We are pleased to adopt other good suggestions. Thank you.

The multi-source data driven CASA model has some disadvantages, as we discussed in the preprint. Satellite RS can rapidly obtain land surface data, and many quality-controlled RS products are available online. So we attempt to use entire RS data to drive CASA model that still has some inevitable disadvantages and need to be perfected under the help of you, relevant experts all over the world, and GMD, which is very helpful for CASA model development and the research of estimation NPP.

In case any advice give, please do not hesitate to contact me. Thank you very much.

Kind regards,

Chengyong Wu