Response to Reviewer:

(Retype your comments in *italic font* and then present our responses to the comments)

Thanks to the authors for considering my comments, which have mostly been addressed well.

Response：Thank you so much again for providing positive feedback and detailed suggestions to improve our paper. We have carefully revised our manuscript, and adequately addressed all the questions and concerns that the referees have raised. Our responses are given below.

I have three remaining concerns:

1. The 5 km product is now derived from the 500 m product using bicubic interpolation (i.e. cubic convolution) rather than nearest neighbour resampling. Whilst clearly an improvement, this is still problematic: bicubic interpolation takes account of a 4 x 4 window of pixels, which at 500 m, is equal to 2 km x 2 km. So, there is still a large discrepancy here. What is needed is to aggregate the pixels by calculating the mean of a 10 x 10 (= 5 km x 5 km) window (i.e. mean value downsampling). Then, nearest neighbour resampling can be carried out on this aggregated dataset to reproject it into whatever grid is required. As I mentioned in my last review, Google Earth Engine already has a function to accomplish this (i.e. the 'reduceResolution' method – please see under the 'Reduce Resolution' heading of https://developers.google.com/earth-engine/guides/resample).

Response: Thanks for your comments again. We carefully considered your suggestion. We aggregate the pixels by calculating the mean of a 5 km x 5 km window. Then, nearest neighbour resampling can be carried out on this aggregated dataset to reproject it into the spatial resolution of 5km. The final resulting 5km dataset has been successfully stored in GEE (includes one LAI layer) and is accessible via the following link https://code.earthengine.google.com/?asset=users/JR_W/wgs_5km_8d_NeaNei.

2. The authors have addressed my comment about PAI vs. LAI to some extent, in stating that 'since in-situ measurements may be sensitive to all elements of the canopy, the resulting estimate should technically be called the term plant area index'. However, more detailed discussion on how this influences the results is warranted. It's thought that woody material accounts for up to 35% of total plant area in forests (https://doi.org/10.1016/S0034-4257(99)00056-5), and recent work has shown that PAI may overestimate LAI by as much as 61% (https://doi.org/10.1016/j.ecoinf.2023.102441). Because of this, the conclusions drawn from assuming that PAI = LAI could easily be incorrect and influence interpretations on how well the products are performing. Since you are most interested in the relative improvement over the MODIS product, rather than the absolute validation results, the issue is not a major one (both products are being evaluated against the same reference data, and we can assume PAI is well correlated to LAI), but it does require some discussion. Additionally, I am of the opinion that we should call a spade a spade (and so it would be better for PAI to labelled PAI throughout to make it clear to the readers and avoid confusion), but this is obviously at the author's discretion.

Response: Thanks for your suggestion again. We are primarily concerned that presenting LAI as PAI could lead to confusion among readers. Considering that most articles utilizing the GBOV site for verification refer to it as LAI, we have decided, through our discussions, to maintain this terminology without making any changes.

3. It's written that 'the Inverse Distance Weighting (IDW) method is utilized on the spatial scale to calculate the weighted average of all eligible pixels (belonging to the same land cover type) within a certain spatial range of the target'. What is the 'certain spatial range'?

Response: The 'certain spatial range' meaning is a spatial window size. The size of this spatial range is determined by calculating the size of the RMSE in previous studies (Wang et al., 2023).

In the algorithm for employing spatial information, the power exponent α and the half-width of the search window can control the influence of surrounding points on the interpolated target point and determine the utilization of the spatial information, respectively, and further affect the calculation results. In general, the smaller the half-width of the search window, the stronger the spatial correlation is, but the less spatial information is available. The larger the half-width of the search window, the more the spatial information can be employed, but the weaker the spatial correlation is. A higher power exponent results in less influence from distant points. Therefore, considering the balance between computational efficiency and accuracy, the optimal size of a half-width of the search window and a power exponent can be obtained. Fig. 12 shows the RMSE by varying the power exponent and the half-width of the search window. When the power exponent is equal to two, the gray line is essentially below the other lines. If the power exponent is constant, the RMSE decreases at first and then increases as the half-width of the search window increases. Hence, we determined the power exponent of 2 and the half-width of 4 pixels in our experiments.

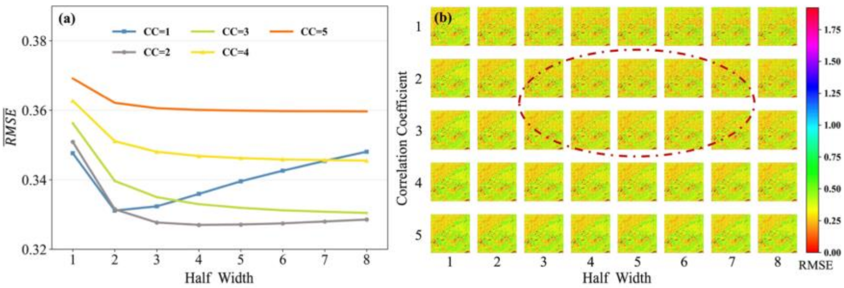

Fig. 12. (a) $R\bar{M}SE$ was calculated from the average of RMSE in the spatial distribution. (b) Spatial distribution of RMSE by changing the correlation coefficient (CC, power exponent α) and the half-width of the search window. The power exponent α controls the weight decay rate of the candidate pixels, and the half-width of the search window is the size of the neighborhood centered on the target pixel. We use power exponent α of 2 as the power exponent and 4 pixels for half-width in the algorithm.

In order to avoid the reader's misunderstanding, we have revised these sentences：

"Subsequently, the Inverse Distance Weighting (IDW) method is utilized on the spatial scale to calculate the weighted average of all eligible pixels (belonging to the same land cover type) within the half-width of 4 pixels and the power exponent of 2 (Wang et al., 2023) of the target pixel."

"On the temporal scale, the Simple Exponential Smoothing (SES) method is employed to calculate the weighted average of all eligible pixels within the smoothing parameter of 0.5 and the half-length of 3 (Wang et al., 2023)."

References:

[1]. Wang, J., Yan, K., Gao, S., Pu, J., Liu, J., Park, T., Bi, J., Maeda, E. E., Heiskanen, J., Knyazikhin, Y., and Myneni, R. B.: Improving the Quality of MODIS LAI Products by Exploiting Spatiotemporal Correlation Information, IEEE Trans. Geosci. Remote Sens., 61, https://doi.org/10.1109/TGRS.2023.3264280, 2023.