Reply to Reviewer 3

General Comments:

1. This study used the PML-V2 model to develop ET and GPP datasets in China. The PML-V2 is calibrated and validated based on the data from 26 eddy covariance flux towers. The GPP and ET data developed in this study are compared with other global ET and GPP products and water balance data at the regional level. This study did a good job on model validation, but there still exist some issues in this stage.

Response:

Thank you for your very positive overall evaluation of the manuscript. We have carefully checked and re-edited it. In the following, we reply to all comments in a point-by-point response. All comments are shown in blue. Sentences from the manuscript are in italics and the revised contents are indicated in red.

2. As a data description paper, the methodology is an important section to let the audience know how the data is developed. However, the model description is not very clear and well organized in this paper. Although the PML-V2 model is already described in other papers, I think more details are still needed and could be put in the supplementary. Whether the code of the model is open source? If yes, a link to the model program should be provided. Why the PML-V2 (China) can simulate daily scale data while PML-V2 (Global) cannot? Are there any improvements in the model?

Response:

All the details of the PML-V2 model have now been reorganized and put in the supplement part. The PML-V2(China) source code is available through the public GitHub repository (https://github.com/SylviaHeee/PML-V2-China). First, PML-V2(China) uses a new parameter set for the country-wide simulation based on the daily EC observed, while PML-V2 (Global) uses the global parameters resolution that performs not well compared to PML-V2(China) at the plot scale and also at the basin-scale, shown in this manuscript. Second, PML-V2(China) uses daily input data while PML-V2 (Global) uses those at the 8-day scale. Third, the country-specific meteorological forcing, i.e., the China Meteorological Forcing Dataset (CMFD), is used to drive the PML-V2 in China, which is more accurate than those forcings extracted from global forcing products. Fourth, PML-V2(China) uses land surface temperature data, ERA5-Land, as the input surface temperature instead of air temperature like PML-V2 (Global) choosing to calculate the outgoing longwave radiation. Firth, PML-V2(China) utilizes the MODIS leaf area index data after the improved Whittaker filter and reveals the characteristics of the planting system.

3. The authors claimed the PML-V2 model performed better than other products. The evidence of the high accuracy of the ET and GPP mainly comes from the validation results at 26 EC sites. The 26 EC sites were used to calibrate and validate the model, while other global products did not calibrate and validate based on the same EC sites. If the PML-V2 and other products were used to compare against other new EC sites (not the 26 sites), can it still be the best one? It seems a little bit unfair to claim that this dataset is better than others when other models cannot

access these EC data. I encourage authors to also publish these EC data that are used in validation.

Response:

Here we use the water-balance ET to compare the accuracy of several products and it can be regarded as an independent validation since the PML-V2 (China) is not calibrated against the water-balance ET. The PML-V2 (China) model estimates get the smallest Bias of 6.28% and the highest NSE of 0.82 against water-balance annual ET estimates across 10 major river basins in China among five ET products.

The copyright of the EC data used in this study belongs to principal investigators of the EC stations. Therefore, we have no right to publish them. The EC data are all free to access from platforms on the Internet and their download links are provided in Table 2 and the references part of the manuscript.

4. According to the distribution of 26 EC sites (Fig 2), most of them are located in arid regions where ET may be low. The total estimated ET in China may be controlled by the ET estimated in the south region where few EC sites are located. There may exist large uncertainties in quantifying total ET.

Response:

We used the 26 EC-observed classified according to various plant function types (PETs) to get the 11 calibrated parameters for each PFTs, not based on climate types. Every PFTs have no less than one EC site. Besides, China has one of the largest dryland areas worldwide about 6.6 million km^2 which covers 68.8% of the country (Prăvălie, 2016; Li et al., 2021). This shows the rationality of using more EC sites in arid areas. In addition, we have reselected the color ramps for the aridity index (AI) map based on United Nations Convention to Combat Desertification (as shown in Fig. R1 below), because the original AI colors between 0.6 and 1 were set as different degrees of yellow which may mislead readers that China has too much dryland (Fig 2 in the original manuscript).

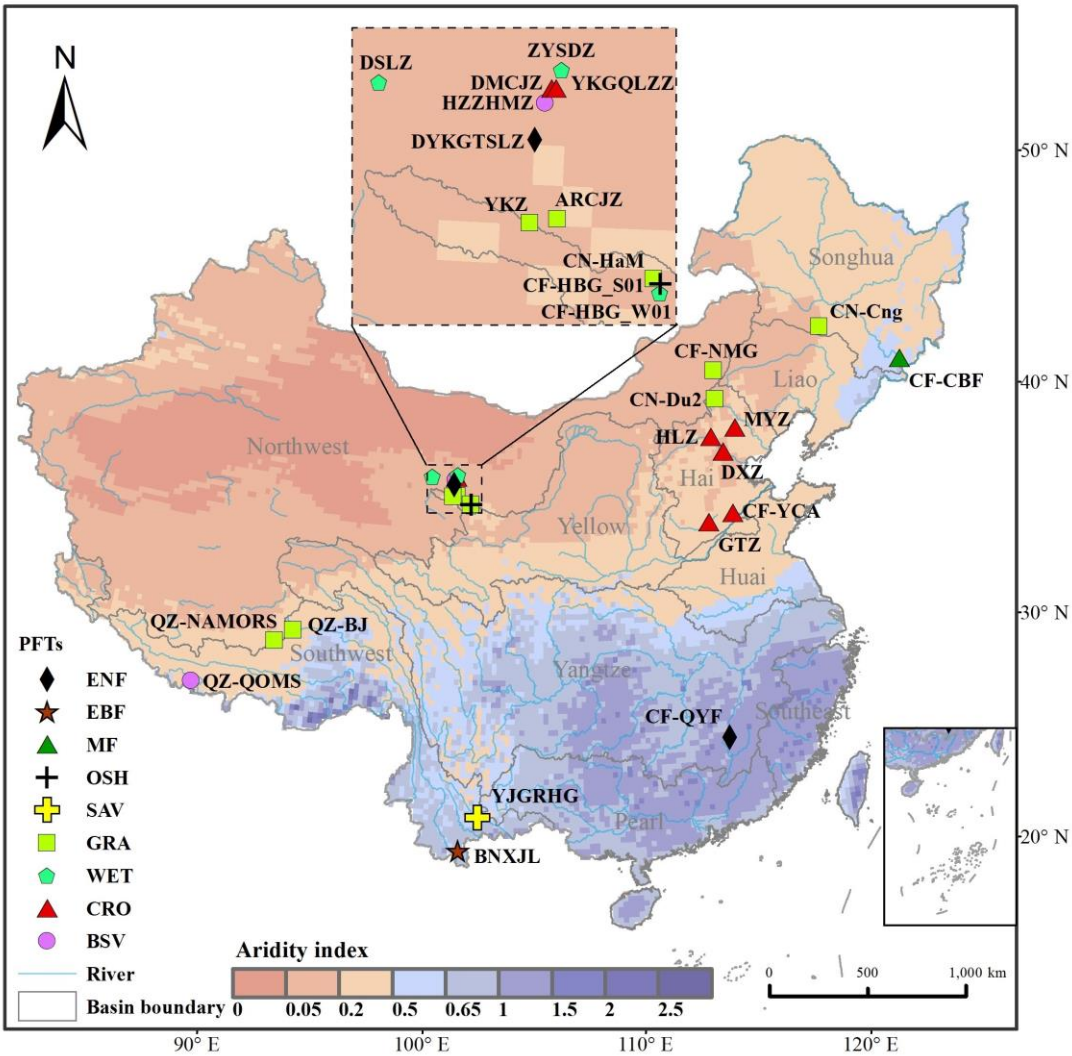

Figure R1: Geographical locations of 26 EC flux towers for nine major IGBP PFTs, the main rivers, and the ten major river basins in China. Overlain are 20-year mean annual aridity index (AI) values during 2001-2020 using GLDAS-2.1, that is, the ratio of annual precipitation to Penman potential evapotranspiration. PFTs shown in legend are ENF (Evergreen Needleleaf Forests), EBF (Evergreen Broadleaf Forests), MF (Mixed Forests), OSH (Open Shrublands), SAV (Savannas), GRA (Grasslands), WET (Permanent Wetlands), CRO (Croplands), and BSV (Barren Sparse Vegetation).

References

Li, C., Fu, B., Wang, S., Stringer, L. C., Wang, Y., Li, Z., Liu, Y., and Zhou, W.: Drivers and impacts of changes in China's drylands, Nat Rev Earth Environ, 2, 858–873, https://doi.org/10.1038/s43017-021-00226-z, 2021.

Prăvălie, R.: Drylands extent and environmental issues. A global approach, Earth-Science Reviews, 161, 259–278, https://doi.org/10.1016/j.earscirev.2016.08.003, 2016.

5. In the discussion section, two advantages of this new dataset are provided, one is the water-carbon coupled process, and the other is more EC data help constrain the parameters. How are water and carbon coupled in the model? And why does the coupled carbon process help advance

the model? There are many land surface models that couple water and carbon processes, but it is not always the case that these models performed better in simulating ET.

Response:

PML-V2 adopted coupling a photosynthesis model (Farquhar et al., 1980) and an improved canopy stomatal conductance model (Yu et al., 2004) with the Penman-Monteith (P-M) equation to estimate GPP and transpiration from the plant canopy (E_c) collectively (Gan et al., 2018). Detailed descriptions of PML-V2 have been provided in the revised supplement. The most important fact is that E_c and GPP processes should be coupled through stomata. Not coupling these two processes can cause the following issues: (i) internal inconsistency between ET and GPP estimates if their forcing data are not the same; (ii) inaccurate causality analysis for mean annual values, trends/variation, and water use efficiency. To better understand the influence of carbon-constrained impacts on evapotranspiration, it is critical to credibly couple ET and GPP products at moderate spatial resolution (Zhang et al., 2019; Ma et al., 2022). PML-V2 is a water-carbon coupled but a parsimonious model with only 11 parameters. For most land surface models, they contain much more parameters that are hard to calibrate, which may cause uncertainties in simulating ET.

References

Ma, N. and Zhang, Y.: Increasing Tibetan Plateau terrestrial evapotranspiration primarily driven by precipitation, Agricultural and Forest Meteorology, 317, https://doi.org/10.1016/j.agrformet.2022.108887, 2022.

Zhang, Y., Kong, D., Gan, R., Chiew, F. H. S., McVicar, T. R., Zhang, Q., and Yang, Y.: Coupled estimation of 500 m and 8-day resolution global evapotranspiration and gross primary production in 2002–2017, Remote Sensing of Environment, 222, 165–182, https://doi.org/10.1016/j.rse.2018.12.031, 2019.

6. The daily data is one important advantage of this dataset. But there are no details of how daily data is better than the data at the 8-day scale.

Response:

Here we emphasized the advantage and implications of daily data against the data at the 8-day scale is an improvement of temporal resolution of PML-V2(China) compared to current mainstream products with higher simulation accuracy. The cross-validated statistical indicators of the daily GPP estimated by PML-V2(China) at 26 EC flux towers have been added in Table 3. It is evident that PML-V2(China) at a daily scale excels its global version at the 8-day scale, rendered by *RMSE* being 0.48 mm d^{-1} lower for ET, and 1.30 g C m^{-2} d^{-1} lower for GPP, *NSE* being 0.04 higher for ET and 0.08 higher for GPP and *R* being 0.04 higher for ET and 0.05 higher for GPP. Then in the 4.3 section, we discussed the implications of the daily products. For instance, daily outputs from PML-V2(China) can be better used by the agricultural and water sectors for operational applications. Timely access to daily data at the regional or national scale helps the Ministry of Agriculture and Water Resources to develop better policies. Indeed, there is a remarkable relationship between soil water content and ET (Graf et al., 2014; Brust et al., 2021), so getting daily ET information accurately is of great significance for soil water depletion assessment, irrigation system design, and water resources management in agricultural areas, such as in the North China Plain.

Table 3: Statistical indicators of PML-V2(China) and other models for simulating ET and GPP at 26 EC flux towers. NSE and R values are unitless. The unit of RMSE for ET is mm d^{-1} while it is g C m^{-2} d^{-1} for GPP. The unit of Bias is %.

Scale	Variable	Models	NSE	R	RMSE	Bias
daily	ET	PML-V2(China)	0.66	0.84	0.33	-7.97
		GLEAM	0.44	0.69	1.04	-14.45
		SEBAL	-7.10	0.16	3.95	5.31
8-day	ET	PML-V2(China)	0.74	0.87	0.66	-11.54
		PML-V2(Global)	0.62	0.80	0.81	-5.05
		MOD16A2	0.37	0.63	1.07	-10.90
daily	GPP	PML-V2(China)	0.76	0.87	0.87	-0.82
8-day	GPP	PML-V2(China)	0.75	0.87	1.93	-6.51
		PML-V2(Global)	0.68	0.82	2.17	-1.74
		MOD17A2H	0.49	0.78	2.74	-38.79
		EC-LUE	-0.04	0.35	3.91	-41.91
		VPM	0.21	0.60	3.41	-8.21

Specific Comments:

1. L60. The 8-day scale data is enough to detect seasonal changes.

Response:

We agree with you. The sentence has been modified and an appropriate reference has also been added below.

For instance, products with low temporal resolutions are erratic to detect subtle seasonal changes in areas seriously affected by human activities and in arid regions, such as irrigated farmland with a dry climate (Bodner et al., 2015) and an evergreen broad-leaf Mediterranean forest during severe summer drought (Liu et al., 2015).

References

Bodner, G., Nakhforoosh, A., and Kaul, H.-P.: Management of crop water under drought: a review, Agron. Sustain. Dev., 35, 401–442, https://doi.org/10.1007/s13593-015-0283-4, 2015.

Liu, J., Rambal, S., and Mouillot, F.: Soil Drought Anomalies in MODIS GPP of a Mediterranean Broadleaved Evergreen Forest, Remote Sensing, 7, 1154–1180, https://doi.org/10.3390/rs70101154, 2015.

2. L68-70. Whether this dataset has a better performance in simulating WUE. Different data sources of GPP and ET do not necessarily mean high uncertainties. If a water-carbon model is used to estimate GPP and ET, other information such as nutrient limitation may be lost, therefore, the estimated GPP may not be more accurate than directly observed data.

Response:

Figure R2 summarizes PML-V2 performance when estimating annual WUE for whole ecosystems at the 95 global flux sites, in comparison to other model performance, i.e., FluxCom GPP/GLEAM ET, VPM GPP/GLEAM ET, and MOD17 GPP/MOD16 ET (Zhang et al., 2019). PML-V2 performs reasonably well in estimating annual total WUE, indicated by the statistical metrics: NSE = 0.48, R^2 = 0.49, RMSE = 0.86 g C mm^{-1} H_2O, Bias = 3.3%. Furthermore, PML-V2 is much better than the combinations of other products for estimating ecosystem WUE. This result indicates the benefit of using the coupled PML-V2 model for estimating ecosystem WUE as the use of the coupled GPP/ET models avoids internal inconsistencies between independent ET and GPP models which provides strong motivation for this research.

We agree that the estimated GPP may not be more accurate than directly observed data. But there are sparse and short-period ground observations in China, continuous gridded GPP products are needed to understand the spatial and temporal pattern of GPP. The paragraph from lines 68 to 70 has a chief sentence at first: *secondly, the phenomenon of ignoring the water-carbon coupling process frequently appearing in the existing products has brought systematic errors.* So, in this paragraph, we just introduced a problem in the existing ET and GPP gridded models. Moreover, the nutrient limitation for estimating GPP and ET deserves further study in the future.

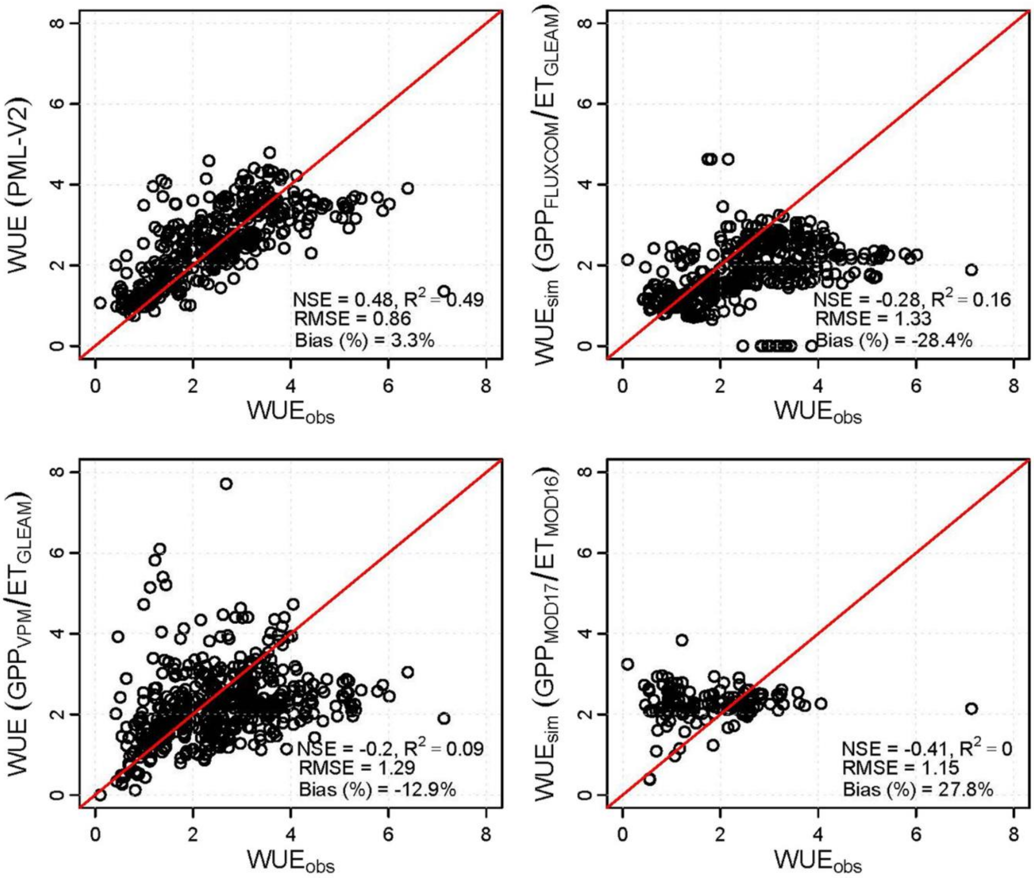

Figure R2: Scatterplots between the observed annual WUE (GPP/ET, g C mm^{-1} H_2O) and simulated by PML-V2 model at the 95 global flux sites.

References

Zhang, Y., Kong, D., Gan, R., Chiew, F. H. S., McVicar, T. R., Zhang, Q., and Yang, Y.: Coupled estimation of 500 m and 8-day resolution global evapotranspiration and gross primary production in 2002–2017, Remote Sensing of Environment, 222, 165–182, https://doi.org/10.1016/j.rse.2018.12.031, 2019.

3. L86. "While" is not proper here.

Response:
It has now been revised to "On the other hand".

4. L109. Please provide the name of Ec, Es and Ei.

Response:
Added as you suggested: plant transpiration (E_c), evaporation from the soil (E_s), and canopy evaporation from precipitation interception (E_i).

5. Equation 1-6. Reorganize the description of these equations. Separate equations and descriptions rather than list them together.

Response:
We have reorganized the detailed descriptions of PML-V2 and provided them in the revised supplement.

6. L151. Is the climate data publicly available? Maybe provide a data source link.

Response:
Yes, and the CMFD data source link has been provided in the acknowledgements part like other data sources or links, as follows:
We appreciate the China Meteorological Forcing Dataset shared by He et al. at https://doi.org/10.6084/m9.figshare.c.4557599.

7. L188. Provide the time period information of these datasets.

Response:
The time period information has been provided, as follows.
Among them, $Prcp$ and Q are the annual values of ten major river basins in China from 2003 to 2013, including the Hai, Huai, Liao, Northwest, Pearl, Songhua, Southeast, Southwest, Yangtze, and Yellow (Fig. 2), from the National Water Resources Bulletin, which is extensively used in water resources calculation (Miao et al., 2022) and assessment (Yang et al., 2004; Xie et al., 2018).

8. L190. The data source link of the National Water Resources Bulletin.

Response:
The data source link has been provided in the acknowledgements part like other data sources and links, as follows.

Thanks to the Ministry of Water Resources of the People's Republic of China for providing the basin-wide precipitation and runoff data from the National Water Resources Bulletin at http://szy.mwr.gov.cn/gbsj/index.html.

9. Section 3.1. Instead of the detailed description of NSE change between calibration and validation, it may be better to explain the model performance in different PFTs. For example, why PML-V2 doesn't perform well on wetland.

Response:

This part of the manuscript has been revised, as follows:

For daily ET, the declines in NSE values are less than 0.14 in most PFTs except BSV and ENF, whose NSE decreased by 0.36 and 0.33, respectively. As expected, RMSE values all increased to some extent in all PFTs (ranging from 0.002 to 0.305 mm d^{-1}) when compared with those in calibration mode. The Bias values in the cross-validation mode were almost identical to those in the calibration mode for most PFTs except WET and ENF of which the absolute value of Bias increased by 10.59% and 17.42%, respectively (Fig. 4a). From calibration to cross-validation, the degradation of BSV, ENF, and WET is more serious than that for the remaining PFTs, which is mainly caused by the small samples (2, 2, and 3, respectively) for ET estimates.

10. L293. PML-V2 performs well when compared with other mainstream ET or GPP products in China. Please check through the manuscript and make it clear the model only performed better in China.

Response:

We have revised the description of the model's performance, as follows.

In summary, PML-V2(China) performs well when compared with other mainstream ET or GPP products in China.

11. L299-300. Performs better in simulating GPP. Add GPP in this sentence.

Response:

We have revised the description of the model's performance, as follows.

As shown in Fig. 8, PML-V2(China) performs significantly better than other advanced methods in simulating the GPP of CRO, MF, ENF, EBF, SAV, and BSV, producing higher NSE, R, and lower RMSE and Bias.

12. L333. The units of change rates could be yr-2, mm/yr /yr.

Response:

We have revised the units of change rates throughout the manuscript.

13. L338. Use the same decimal digits.

Response:

We have edited the decimal digits to make sure that they are the same.

14. Fig 10. What does the SD represent? SD of spatial data or temporal data within a year.

Response:

The SD represents the standard deviation of the annual simulated values during the study years. We have made the SD description clear and changed the shaded area in each sub-part for representing the 95% confidence interval as follows:

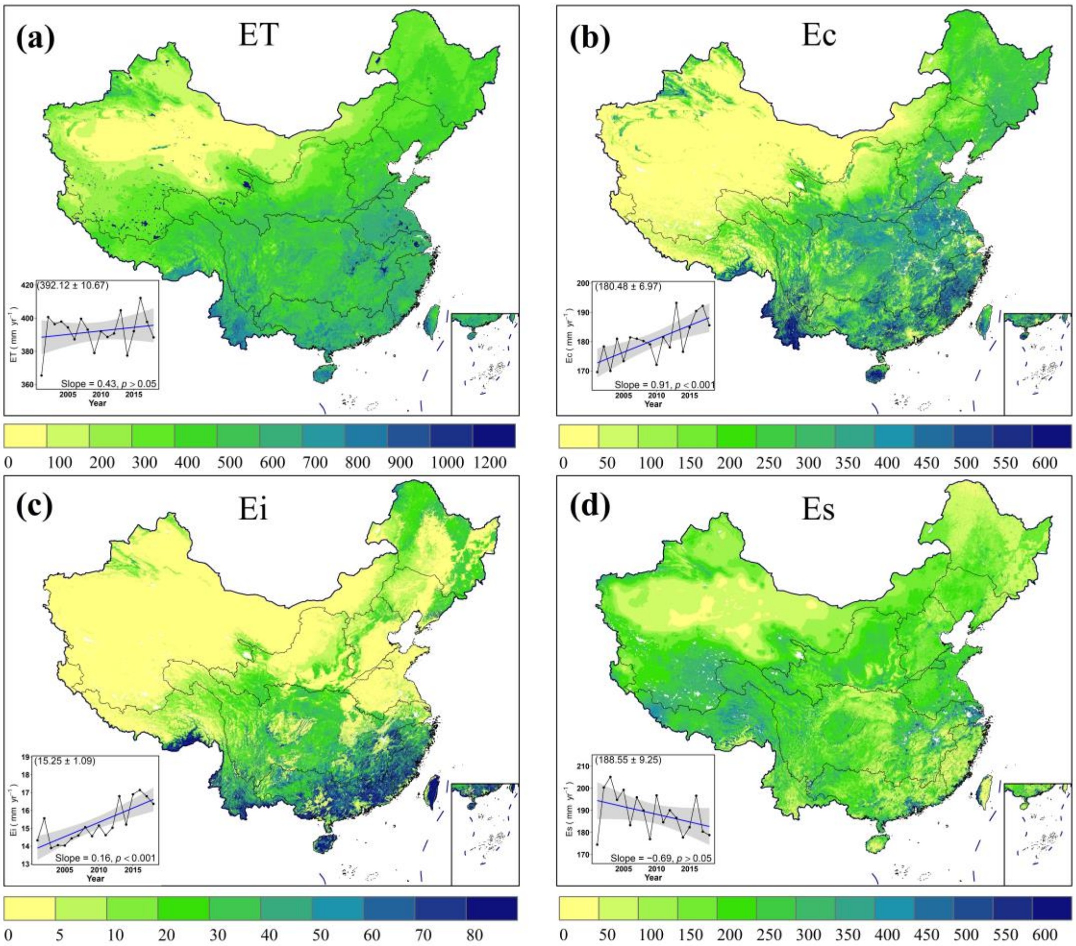

Figure 10: Spatial pattern of mean annual ET, E_c, E_i, E_s and their annual variation during 2001–2018. In all insets, the shaded areas represent the 95% confidence interval based on the linear regression modelling. The number in the parentheses of each inset is mean ± standard deviation of the annual simulated variables during the 18 years.

15. L347. What are the time periods of these previous estimations?

Response:

The sentence has been revised, as follows.

For annual ET over China, the multi-year (2001-2018) mean annual ET from PML-V2(China) is 392.12 ± 10.67 mm yr^{-1} *(Fig. 10a). This result is overall consistent with the country-wide averaged annual ET estimated by the machine learning method (Yin et al., 2021: 397.65 mm yr^{-1} for 2000-2018) and land surface models (Ma et al., 2019a: 395.34 mm yr^{-1} for 2001-2012), and slightly higher than MOD16A2 ET about 359.61 ± 59.52 mm yr^{-1} for 2001-2018 (Cheng et al., 2021). But they are all less than the annual ET of about 482.27 ± 192.31 mm yr^{-1} from SEBAL for 2001-2018 (Cheng et al., 2021).*

References

Cheng, M., Jiao, X., Li, B., Yu, X., Shao, M., and Jin, X.: Long time series of daily evapotranspiration in China based on the SEBAL model and multisource images and validation, Earth System Science Data, 13, 3995–4017, https://doi.org/10.5194/essd-13-3995-2021, 2021.

Ma, N., Szilagyi, J., Zhang, Y., and Liu, W.: Complementary-Relationship-Based Modeling of Terrestrial Evapotranspiration Across China During 1982–2012: Validations and Spatiotemporal Analyses, Journal of Geophysical Research: Atmospheres, 124, 4326–4351, https://doi.org/10.1029/2018jd029850, 2019a.

Yin, L., Tao, F., Chen, Y., Liu, F., and Hu, J.: Improving terrestrial evapotranspiration estimation across China during 2000–2018 with machine learning methods, Journal of Hydrology, 600, https://doi.org/10.1016/j.jhydrol.2021.126538, 2021.

16. L354. Rephrase this sentence.

Response:

The sentence has been rephrased, as follows.

The annual ET displays a statistically insignificant increasing trend from 2001 to 2018, which is consistent with the calculated ET using the Budyko equation (Feng et al., 2018; Su et al., 2022).

References

Feng, T., Su, T., Ji, F., Zhi, R., and Han, Z.: Temporal Characteristics of Actual Evapotranspiration Over China Under Global Warming, Journal of Geophysical Research: Atmospheres, 123, 5845-5858, https://doi.org/10.1029/2017JD028227, 2018.

Su, T., Feng, T., Huang, B., Han, Z., Qian, Z., Feng, G., Hou, W., and Dong, W.: Long-term mean changes in actual evapotranspiration over China under climate warming and the attribution analysis within the Budyko framework, International Journal of Climatology, 42, 1136–1147, https://doi.org/10.1002/joc.7293, 2022.

17. L369-370. The global data also have many EC observation data, but not in China. These models were calibrated on a global scale, not only in China, and pursued a global optimal solution.

Response:

The sentence has been rephrased, as follows.

This indicates that more local observations will facilitate the improvement of ET and GPP estimates at regional and national scales.

18. L374. More spatial analysis should be conducted to prove the strong ability of the model in simulating ET on the double-cropping system. Show some regional analysis rather than only using EC sites. Why PML-V2 can have this ability?

Response:

We have supplemented the spatial analysis of the simulated ET of PML-V2(China) on the double-cropping system. We extracted the cropland with peaks and identified the dates of peaks appearing within a year at each pixel by a faster peak detection algorithm (Liu et al., 2020). Here, we quantified the cropping intensity (e.g., double-cropping system) in croplands (Fig. S2a1) and identified the dates of the first peak and the second peak appearing in 2015 (Fig. S2a2, a3). To verify the reliability of the results, we mapped the double-cropping cropland areas of winter wheat and summer maize rotations (Fig. S2b1), the heading dates distribution of winter wheat and summer maize (Fig. S2b2, b3) in 2015 based on the crop phenological dataset (Luo et al., 2020). The croplands with a double-cropping show similar spatial patterns, as indicated by Fig. S2a1 and b1. In particular, we also compared the first ET peak date (Fig. S2a2) with the heading date of winter wheat (Fig. S2b2) in 2015. The first ET peak date (i.e., day of the year (DOY)) is mainly between DOY 120 and 150, occurring after the heading date of winter wheat about DOY 100 to 130. Similarly, the second ET peak also occurs slightly later than the heading of summer maize (Fig. S2 a3 and S2b3). The ET intensity was the highest of the entire growth period from the heading date to the filling date (He et al., 2022), which means the ET peak appears slightly later than the crop heading. Moreover, we have added this figure in the Supplementary material. Compared to the old version of PML-V2, PML-V2(China) utilized the MODIS leaf area index data after the improved Whittaker filter. The filtered LAI carrying more accurate phenology information as model inputs, is not only the reason why the PML-V2(China) product can reveal the characteristics of the water consumption from the croplands but also the reason why it is well estimated in most plant function types.

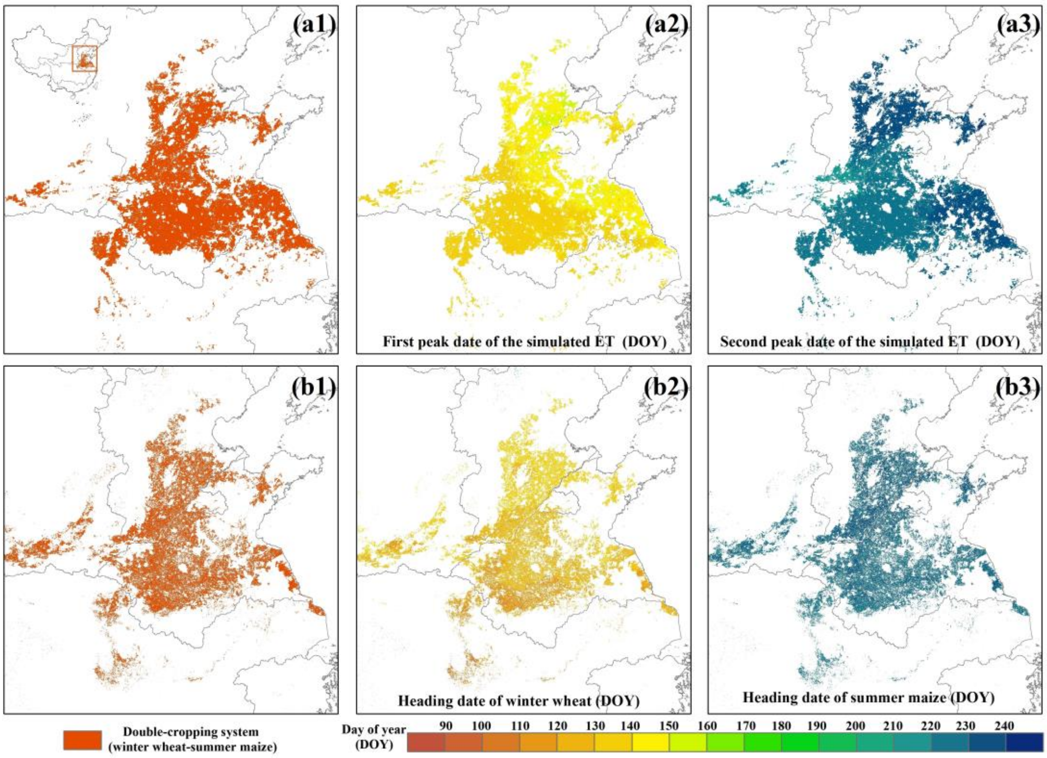

Figure S2: Spatial patterns of the PML-V2(China) ET with double peaks in 2015 (a1) and the double-cropping croplands in 2015 from a crop phenological dataset (ChinaCropPhen1km) (b1); spatial patterns of the first peak dates (a2) and the second peak dates (a3) from the PML-V2(China) ET in 2015; and spatial patterns of the heading dates of winter wheat (b2) and those of summer maize (b3) from the crop phenological dataset in 2015.

References

He, H., Wu, Z., Li, D., Zhang, T., Pan, F., Yuan, H., Jiang, S., Shi, Z., Yang, S., and Wang, F.: Characteristics of Winter Wheat Evapotranspiration in Eastern China and Comparative Evaluation of Applicability of Different Reference Evapotranspiration Models, J Soil Sci Plant Nutr, 22, 2078–2091, https://doi.org/10.1007/s42729-022-00795-y, 2022.

Liu, L., Xiao, X., Qin, Y., Wang, J., Xu, X., Hu, Y., and Qiao, Z.: Mapping cropping intensity in China using time series Landsat and Sentinel-2 images and Google Earth Engine, Remote Sensing of Environment, 239, 111624, https://doi.org/10.1016/j.rse.2019.111624, 2020.

Luo, Y., Zhang, Z., Chen, Y., Li, Z., and Tao, F.: ChinaCropPhen1km: a high-resolution crop phenological dataset for three staple crops in China during 2000–2015 based on leaf area index (LAI) products, Earth System Science Data, 12, 197–214, https://doi.org/10.5194/essd-12-197-2020, 2020.

19. L395. Which results in this study exhibit a huge potential for carbon sequestration of vegetation in China?

Response:

Gross primary productivity (GPP), the gross uptake of carbon dioxide (CO_2) by plant photosynthesis, is the primary driver of the land carbon sink, which presently removes around one-quarter of the anthropogenic CO_2 emissions each year (Spielmann et al., 2019). GPP is usually recognized as an important positive factor to gain carbon sequestration by terrestrial ecosystems (Liu et al., 2014; Chen et al., 2021). Using the PML-V2(China) dataset, we find that the trend of annual GPP has a significant increase of about 8.99 g C m^{-2} yr^{-2} for 2001-2018, which indicates that vegetation in China exhibit a huge potential for carbon sequestration in China. The paragraph in this manuscript has been revised, as follows:

On the other hand, this dataset has better simulations of carbon consequences and water use efficiency, which is important for carbon-neutron policy (Yang et al., 2022). Specifically, for 2001-2018, the annual GPP and water use efficiency experienced a significant increase (8.99 g C m^{-2} yr^{-2} and 0.02 g C mm^{-1} H_2O yr^{-1}, respectively), but annual ET showed a non-significant increase (0.43 mm yr^{-2}). This indicates that vegetation in China exhibits a huge potential for carbon sequestration with little cost in water resources, which plays an important role in the global carbon cycle.

References

Chen, Y., Feng, X., Tian, H., Wu, X., Gao, Z., Feng, Y., Piao, S., Lv, N., Pan, N., and Fu, B.: Accelerated increase in vegetation carbon sequestration in China after 2010: A turning point resulting from climate and human interaction, Global Change Biology, 27, 5848–5864, https://doi.org/10.1111/gcb.15854, 2021.

Liu, Y., Zhou, Y., Ju, W., Wang, S., Wu, X., He, M., and Zhu, G.: Impacts of droughts on carbon sequestration by China's terrestrial ecosystems from 2000 to 2011, Biogeosciences, 11, 2583–2599, https://doi.org/10.5194/bg-11-2583-2014, 2014.

Spielmann, F. M., Wohlfahrt, G., Hammerle, A., Kitz, F., Migliavacca, M., Alberti, G., Ibrom, A., El-Madany, T. S., Gerdel, K., Moreno, G., Kolle, O., Karl, T., Peressotti, A., and

Delle Vedove, G.: Gross Primary Productivity of Four European Ecosystems Constrained by Joint CO2 and COS Flux Measurements, Geophysical Research Letters, 46, 5284–5293, https://doi.org/10.1029/2019GL082006, 2019.

Yang, Y., Shi, Y., Sun, W., Chang, J., Zhu, J., Chen, L., Wang, X., Guo, Y., Zhang, H., Yu, L., Zhao, S., Xu, K., Zhu, J., Shen, H., Wang, Y., Peng, Y., Zhao, X., Wang, X., Hu, H., Chen, S., Huang, M., Wen, X., Wang, S., Zhu, B., Niu, S., Tang, Z., Liu, L., and Fang, J.: Terrestrial carbon sinks in China and around the world and their contribution to carbon neutrality, Sci. China Life Sci., 65, 861–895, https://doi.org/10.1007/s11427-021-2045-5, 2022.

20. L454. How this misclassification issue was dealt with in this study.

Response:

Thank you for your great comments. To extend the estimated ET and GPP from the observed sites to gridded country-wide maps, we used the Annual International Geosphere-Biosphere Programme (IGBP) classification of MCD12Q1.006 dataset as land covers or plant function types. Among the MCD12Q1.006 IGBP land cover types, the Cropland/Natural Vegetation Mosaics (CNVM) type is usually recognized as a part of cropland (Estel et al., 2016; Odongo et al., 2019; Zhang et al., 2019). Hence, we used the same 11 parameters as cropland in CNVM. Besides, we used the published MCD12Q1.006 IGBP land cover types without handling some misclassification coming from spectral confusion.

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