

Reply to reviewer #1

This study, by integrating multiple existing high-resolution remote sensing products, achieved a high spatiotemporal accuracy accounting of the water footprint for major crops such as wheat, maize, rice, soybeans, and potatoes from 2001 to 2020. The overall writing logic of the paper is clear, and the scientific question is well-articulated. The research results hold certain value for data application in fields like agricultural water resource management. However, there are still deficiencies in the study's innovation, methodological explanation, and result description, which require further revision and improvement.

Response: We are grateful to the reviewer for the positive assessment of our manuscript and for the constructive comments on the research's innovation, methods, and manuscript writing. We have carefully addressed all comments and revised the manuscript accordingly. Detailed point-by-point responses are provided below, with our replies shown in blue and all revisions highlighted in red.

Specific comments:

Comment 1: Introduction: Are the daily-scale accounting results based entirely on daily-scale remote sensing products? And given that there are many studies on crop water footprint accounting, what are the other novel aspects of ChinaCropWF besides its daily resolution?

Response 1: Thank you for your comments. The remote sensing data used for ChinaCropWF are all daily-scale products, among which daily-scale crop phenology information is the most critical. This enables our method to quantify blue and green water consumption during crop growth with high precision, achieving a level of accuracy previously unattainable. Furthermore, based on the soil water balance method, this study also quantifies the water footprint required to address seasonal soil water shortages, thereby significantly improving the completeness and accuracy of crop water footprint accounting. In response to your comments, we have revised the manuscript accordingly. These advantages of ChinaCropWF are highlighted in Section 4.2 ("4.2.1 Phenology impacts on water footprint" and "4.2.2 Seasonal water shortages effects").

Comment 2: Methods: please check the equations in Figure 1, which should be consistent with those in 2.2.1

Response 2: Thank you for your comments. We noticed that the crop water footprint calculation formula in Section 2.2.1 was inconsistent with Figure 1, and we have now corrected this in the manuscript. The specific revisions can be found in lines 163-167 of the manuscript.

Comment 3: Methods: for wheat, if both spring and winter wheat were considered at the same

time?

Response 3: Thank you for your comments. The daily-scale phenological data employed by ChinaCropWF explicitly differentiates spring wheat from winter wheat based on their growing periods. Accordingly, the subsequent water footprint accounting directly leverages this classification to dynamically characterize water use by crop type, eliminating the need for additional classification procedures.

Comment 4: Methods: How were evaporation and transpiration amounts calculated? They are not presented in the uploaded dataset.

Response4: Thank you for your comments. The PML-V2 remote sensing product used in this research contains both evaporation and transpiration data. By integrating it with crop growing periods, daily-scale evaporation and transpiration can be effectively distinguished. The methods section already describes the accounting of crop evaporation and transpiration. The specific revisions can be found in lines 129-131 of the manuscript.

Lines 129-131: "Furthermore, to accurately distinguish between evaporation and transpiration during crop growing seasons, this study separates the evaporation components (E_s and E_i) and the transpiration component (E_c) in the PML-V2 dataset."

Comment 5: Results: "3.1 Spatiotemporal evolution patterns of crop water footprint", why does potato show large interannual variations, with consecutive years being relatively similar?

Response 5: Thank you for your comments. We have conducted a comprehensive review of all potato-related basic data and identified and corrected the issues in the calculation process. The potato planting area in this research was derived from the SPAM dataset, which is updated every five or ten years. This inherent temporal resolution limitation may introduce uncertainties in the planting area estimation, thereby affecting the results. An explanation regarding this issue has already been provided in the methods section. The specific revisions can be found in lines 139-140 of the manuscript.

Lines 139-140: "Potato planting areas were sourced from the SPAM dataset (available at <https://mapspam.info/>), which is updated every five or ten years."

Comment 6: Results: Can the production water footprint go beyond the county scale to obtain higher-precision spatial data?

Response 6: Thank you for your comments. This study considers the city scale to be the most appropriate accounting scheme, based primarily on the following considerations. First, at the city level, a relatively well-developed statistical system comprehensively covers economic, social, and

resource-environmental dimensions, facilitating the effective integration of research findings into local development planning and policy-making frameworks. Second, high-resolution data face practical limitations in terms of spatial coverage, temporal consistency, and data availability, which constrain the feasibility of more refined-scale analyses. Based on the above understanding, we have explained the relevant limitations in the discussion section and indicated that future research can be further conducted under conditions of improved data availability. See lines 423-425 of the manuscript for specific revisions.

Lines 423-425: "Finally, various remote sensing data products and statistical data exhibit inconsistencies in spatial and temporal resolutions, along with limitations in data accuracy, highlighting the need for further integration and refinement to support more detailed research."

Comment 7: Discussion: "4.2.1 Phenology impacts on water footprint" compares different phenological period product datasets. However, this section merely provides a simple comparison of accounting results and does not demonstrate the advantages of daily-scale accounting. Further analysis is recommended.

Response 7: Thank you for your comments. The data comparison in the table primarily reflects differences among various methods in terms of phenological temporal resolution. In contrast, the daily-scale data adopted in this research offer higher temporal resolution, enabling a more accurate depiction of crop growth processes. However, due to differences in underlying data sources and inconsistencies in yield results, the results presented in the table are for illustrative purposes only and are not suitable for in-depth analysis or comparison. Notably, we have already validated our results in Section 4.1 using other products, which further confirms the advantage of daily-scale data in terms of water footprint accounting. We have also revised this section to improve readability.

Technical corrections:

Comment 1: "2.1.4 Crop planting area" should refer to the crop phenology period.

Response 1: Thank you for your comments. We have revised the title to "2.1.4 Crop phenology data".

Comment 2: "Author contributions: XW and EH the research" means "EH and XW wrote the original draft"?

Response 2: Thank you for your comments. Sure, XW and EH jointly conducted the research; simultaneously, EH and XW drafted the original manuscript.

We sincerely thank the reviewer for the thoughtful comments and suggestions, which have helped us improve both the manuscript and the dataset.