

Responses to the comments of Referee #1

Article ID: essd-2024-2

Title: CIrrMap250: Annual maps of China's irrigated cropland from 2000 to 2020 developed through multisource data integration

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Dear Editor,

Thank you very much for the great efforts on our manuscript. Below, you will find the original comments from the reviewer along with our point-to-point responses.

Texts in red are the reviewer's comments; **those in black** are our responses to the reviewer's comments; and *those in blue and italics* are the revised texts appeared in the revised manuscript.

The authors have greatly improved the manuscript. I am generally satisfied with their responses + the corrections made in the revised manuscript/supplement. As such, I only have a few minor comments.

Thank you for the positive comment.

- While they have somewhat explained why they use the total FVC and not the binary [1 0] in their irrigation maps, I still believe that could lead to misinterpretation by users, e.g. a pixel could have 50% vegetation coverage but only 50% of that is irrigated (thus only 25% of the pixel is under irrigation).

Response: Thank you for the valuable comment. As mentioned in our earlier response, binary irrigation maps can lead to misinterpretations, where users may assume pixels with a value of 1 are fully covered by irrigated areas. This can result in inaccurate estimates of irrigated area, especially in regions with small and fragmented farms. In future work, we plan to use higher resolution satellite data (e.g., Landsat and Sentinel images) to better address this issue more effectively.

To further clarify and avoid potential misinterpretations, we have provided a clear detailed explanation of our product in the data availability section (Page 25 Lines 532-536).

Our maps show the percentage of each 250 m pixel covered by irrigated cropland (i.e., pixel value = irrigated area / pixel area × 100). Note that our product accounts for

the fractional coverage of croplands within coarse-resolution MODIS pixels but does not differentiate between irrigated and rainfed croplands at subpixel scales. For example, if a pixel has 50% cropland coverage, all cropland within that pixel would be classified as either “irrigated” or “non-irrigated”.

- “(CIrrMap250) feature a spatial resolution of 250 meters and an annual temporal resolution”: should that be interpreted to mean that you assume no short or mixed periods with/without irrigation during the year? Maybe add a comment why you did not consider a product based on growth seasons?

Response: Yes, our product was created at an annual frequency from 2000 to 2020, and thus does not provide irrigation information at monthly or seasonal scales. As you noted, there may be short or mixed periods of irrigation throughout the year. In this study, we define cropland in a pixel as “irrigated” if it has been irrigated at any point within the year, regardless of the specific month or season. This assumption aligns with several previous studies (Zhu et al., 2014; Meier et al., 2018; Xie and Lark, 2021; Zhang et al., 2022; Wu et al., 2023).

Using satellite observations to identify seasonal irrigation practices is possible. However, there are several challenges, particularly for nationwide mapping. First, developing such a product requires a high-resolution cropland dataset that can accurately map cropland areas, distinguish among various crop types (e.g., rice, wheat, maize), and account for mixed and sequential cropping practices. To our knowledge, no existing cropland data in China meets these criteria. Second, creating a growth-season-based product requires high-quality training samples with high temporal resolution and detailed information on crop types. Meeting these requirements poses significant challenges.

In the revised manuscript, we have pointed out the above-mentioned limitation of our product in the discussion section (Page 25 Lines 512-516).

Additionally, CIrrMap250 was created at an annual frequency and therefore does not provide monthly and seasonal irrigation information. A pixel is classified as “irrigated” if it has been irrigated at any point during the year, regardless of the specific month or season. While a growth-season-based irrigation product could be more desirable, it faces significant challenges, such as the lack of high-resolution crop type information (e.g., rice, wheat, maize) and high-quality training samples with sufficient temporal resolution.

- As it is a separate document, ensure the corrected supplementary document is the one available online (at the moment, only the old uncorrected version is accessible online).

Response: Thank you for the reminder. We have double-checked our submitted files in the last round of revisions and confirmed that the revised supplementary document had been correctly uploaded. However, only the previous, uncorrected supplementary document is accessible online (we are unsure why). We anticipate that the revised manuscript and its supplementary materials will be updated after formal publication.

References

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