

Topic editor

Please address the comments from Reviewer #3 and also include a discussion comparing your land use/cover data with those from other studies. For example: Liu, M., and H. Tian (2010), China's land cover and land use change from 1700 to 2005: Estimations from high-resolution satellite data and historical archives, *Global Biogeochem. Cycles*, 24, GB3003, doi:10.1029/2009GB003687.

Response: Thank you for this comment.

Thank you for your and the reviewer's valuable comments. We have comprehensively revised the manuscript in response to the comments from Reviewer #3. Specifically, we have optimized the tense and logical structure of the Abstract and Introduction, and streamlined the map of the study area (Figure 1) to avoid potential confusion.

Furthermore, in response to your specific suggestion regarding the comparison of land-use data: We have added a new section, “4.1 Comparison with other land-use reconstructions,” in the Discussion, which comprehensively reviews the significant biases of global long-term land-use datasets regarding China and systematically compares the land-use data used in this study with existing representative datasets (including Liu and Tian, 2010; Cao et al., 2014; Yang et al., 2018; Yu et al., 2021). Our analysis reveals a high degree of consistency in the data sources of these studies: the historical cropland and forest data reconstructed by Ge et al. (2004) and He et al. (2008) serve as the common foundation for multiple studies, including Liu and Tian (2010). This study is grounded in the same data system but utilizes the updated millennial-scale versions based on the latest historical documents. Although these studies differ in multi-type integration or gridding reconstruction methods, the data used in this study exhibit highly consistent trends with the aforementioned representative datasets during the overlapping period (the past 300 years) and at the provincial scale. Compared to most existing studies that focus on the past 300 or 100 years, the dataset used in this study provides a continuous perspective on a millennial scale (1000–2019), thereby enabling the capture of carbon emissions over a longer

historical period. For detailed discussion, please refer to Lines 513–535 in the main text.

Response to Reviewer 3 Comments

My previous comments and suggestions were well addressed. The paper’s structure and readability have significantly improved. I have a few minor additional suggestions for the authors’ reference.

Point 1. First, regarding the Abstract. Lines 19–21 (this part summarizes content from Lines 92–96 in the Introduction)—is it necessary to retain this in the Abstract? The statement that “uncertainty in land use carbon emission estimates for recent decades is greater than that for the past 300 years” may confuse readers, as land use data for the past 300 years are likely to have greater inherent uncertainty. This discrepancy might arise because more studies focus on recent decades, leading to larger variances in results, whereas the actual uncertainty in estimates for the past 300 years could be even higher. I wonder if this paper includes results for China similar to those reported in: Kaplan, J. O., Ruddiman, W. F., Crucifix, M. C., Oldfield, F. A., Krumhardt, K. M., Ellis, E. C., Ruddiman, W. F., Lemmen, C., and Klein Goldewijk, K.: Holocene carbon emissions as a result of anthropogenic land cover change, *The Holocene*, 21, 775–791, <https://doi.org/10.1177/0959683610386983>, 2011.

Response: Thank you for this comment. Revised.

We fully agree with the reviewer’s assessment. The statement regarding uncertainty in the Abstract was indeed potentially misleading and has been removed. To clarify the data scope, the 150% discrepancy covers results from both global models (e.g., BLUE, H&N) and studies by Chinese scholars for the period 1950–2021, where substantial divergences in parameter settings, driver data, and accounting boundaries lead to a high degree of dispersion. In contrast, the 102% discrepancy pertains exclusively to research by Chinese scholars regarding the past 300 years (1700–2000) based on domestic historical documents, and this statistic does not include the study

by Kaplan et al. (2011).

Please refer to line 19 of the Abstract and lines 92–95 of the Introduction for the revisions.

Point 2. Second, Lines 76–78: Are the land use changes described in the Introduction reflected in the carbon emission results presented in this paper? Please ask the authors to verify this.

Response: Thank you for this comment. Revised.

We confirm that the land use changes and associated degradation processes described in the Introduction (Lines 76–78) are reflected in our carbon emission results. First, these environmental degradation phenomena (e.g., erosion on the Loess Plateau, vegetation destruction in southern hill regions) are essentially the ecological consequences of high-intensity anthropogenic land-use disturbances, processes that are fully captured by the historical land use reconstruction data used in this study. Second, we classified forest loss that was not converted into permanent cropland as “Forest conversion to Other Land,” which primarily corresponds to historical shifting cultivation and degradation caused by over-exploitation. Our results show that this conversion type contributed 68.45% of the total historical emissions (see Fig. 6d in the main text). This indicates that our estimates robustly quantify the high-intensity land-use activities described in the Introduction and their resulting carbon emissions.

We have made the necessary clarifications in Section 4.1 of the Discussion (please refer to lines 555–557).

Point 3. Third, Lines 100–108: It is suggested to either rephrase this section using the simple future tense or simplify it in the Introduction. The focus should instead be on content to be described after completing this study, which could be better placed in the Discussion section.

Response: Thank you for this comment. Revised.

Following the reviewer's suggestion, we have revised the phrasing of this paragraph in the main text; please refer to lines 97–103 of the Introduction.

Point 4. Fourth, Figure 1 (map of the study area): It is recommended to retain only subfigure (f). Subfigures (a)–(e) do not appear to be referenced later in the text; including them here may confuse readers about the actual study area of this paper. I have a few minor additional suggestions for the authors' reference.

Response: Thank you for this comment. Revised.

We accept the reviewer's suggestion. To avoid confusion regarding the actual study area and to improve clarity, we have modified Figure 1 by retaining only subfigure (f) (the current boundary of China) and removing subfigures (a)–(e), as they were not referenced in the subsequent text. The figure caption has been updated accordingly. Please refer to lines 113–120.

We sincerely thank you for your two rounds of careful and professional reviews, which have substantially improved the quality and scientific rigor of our manuscript.