Comments from Reviewer #1:

Terracing is one of the most important soil and water conservation (SWC) measures in China, playing a critical role in mitigating soil erosion. This study proposes a two-stage mapping framework to classify different types of terrace measures and develops a new dataset—the Soil and Water Conservation Terrace Measures Dataset (SWCTMD)—based on time-series Landsat imagery and digital elevation model (DEM) data from 2000 to 2020. The framework incorporates a refined classification system that provides detailed information on both terrace distribution and associated SWC measure factors, offering significant value for understanding and managing soil erosion dynamics.

Response: We greatly appreciate your positive comments concerning our manuscript. Those comments are valuable and helpful for improving our manuscript. We followed all comments and made revision and responses carefully. A point-by-point reply to the comments are listed below.

1. It is recommended to revise the title to: A 30 m resolution dataset of soil and water conservation terraces across China (2000–2020).

Response: Thank you very much for your valuable suggestion regarding the title. Based on all reviewers' comments on the title, we have revised the title to "A 30 m resolution dataset of soil and water conservation terraces across China for 2000, 2010, and 2020" (Lines 1-2).

2. What specific subcategories of cropland are included in the study?

Response: The cropland data from GlobeLand30 used in this study does not have a secondary classification. The cropland is defined as land used for cultivating crops, including irrigated farmlands, paddy fields, green houses cultivated land, artificial tame pastures, economic cultivated land (e.g., grape, coffee, and palm), and abandoned arable lands.

3. What information is contained in the 30 m grid dataset? Does it include whether the area is terraced or not, the type of terrace, and the associated conservation measure factor?

Response: The 30-meter resolution Soil and Water Conservation Terrace Measures Dataset (SWCTMD) includes maps of different terrace types, along with corresponding values of soil and water conservation measure factors for each type.

4. It is recommended to retain numerical values to one decimal place for better clarity and consistency.

Response: Thank you for the valuable suggestion. We revised the entire manuscript, retaining numerical values to one decimal place.

5. In Table 2, the four types of terrace measures are shown with remote sensing images. To enhance clarity and visual recognition, it is recommended to replace these with high-resolution photographs.

Response: Thank you for your insightful comment. I have replaced the remote sensing images with high-resolution field photographs.

Table 2. Image characteristics of different terrace types.

Terrace types	Image characteristics	Remote sensing image
Level terrace	Steep slope land transformed into a series of successively receding flat surfaces, with bunds constructed from soil or stones, ranging in width from 5 to 40 m, looking like the steps of a staircase in remote sensing images. In contrast to slope terraces, level terraces are predominantly found in low and flat areas.	
Slope terrace	Similar to level terraces, but with wider and more uneven surfaces, these terraces exhibit irregular shapes in remote sensing images. They are primarily used for dryland agriculture and are largely distributed the areas with slopes greater than 5°.	
Zig terrace	Steep slope land has been transformed into step-like terraces that are narrower than level terraces. The surfaces of these terraces exhibit regular strip shapes in remote sensing images. These terraces are primarily found in sloping regions and are used for planting permanent crops such as tea.	
Slope-separated terrace	Each flat surface constructed on steep slope land retains a segment of the original slope above, forming a composite structure that features a slope between flat surfaces. These terraces are primarily used for rubber plantations.	

6. In the accuracy assessment section, the evaluation metrics should be further explained, such as the possible value ranges of each indicator and whether higher or lower values indicate better accuracy.

Response: Thank you for the constructive suggestion. We have added the relevant explanations in Section 2.8. The revised sentence in is provided in Lines 179-184:

"... This method offers quantitative assessment metrics, including the kappa coefficient (KA), overall accuracy (OA), the producer's accuracy (PA), and the user's accuracy (UA), which collectively assess the performance of the products. OA and KA measure the total map accuracy. PA and UA measure the omission and commission errors for each class. In addition, we calculated the F1 score, which reflects the balance between UA and PA. The KA, OA, PA, UA, and F1 metrics range from 0 to 1, where 1 indicates optimal performance and 0 represents the poorest performance.…"

7. The methodology section lacks details about the estimation of soil erosion and the other influencing factors used in the analysis related to terrace responses in China. Please specify the estimation methods and data sources for these additional factors.

Response: Thank you very much for pointing out this issue. In the supplementary materials, we have added the evaluation method for soil erosion in China (Supplementary Note S1), the calculation approach for erosion area (Supplementary Note S2), and the analytical method for assessing the impact of terracing on soil erosion (Supplementary Note S3). Additionally, we have clearly specified the data sources and the relevant preprocessing steps.

8. In Figure 3, should the legend indicate "cropland with terraces" and "cropland without terraces," rather than "cropland" and "terraces"? Additionally, does the map on the left represent the distribution of cropland? Please clarify it.

Response: Thanks for pointing out this omission. Here, the legends for the two subgraphs are placed together. The map on the left side of figure 4 represents the distribution of cropland in China in 2020 (Figure 4a). The map on the right side of Figure 4 shows the spatial distribution of the three terraces datasets (Figure 4b). We have created legends for Figure 4a and Figure 4b respectively. Figure 4 has been updated and the legend meanings have been clarified:

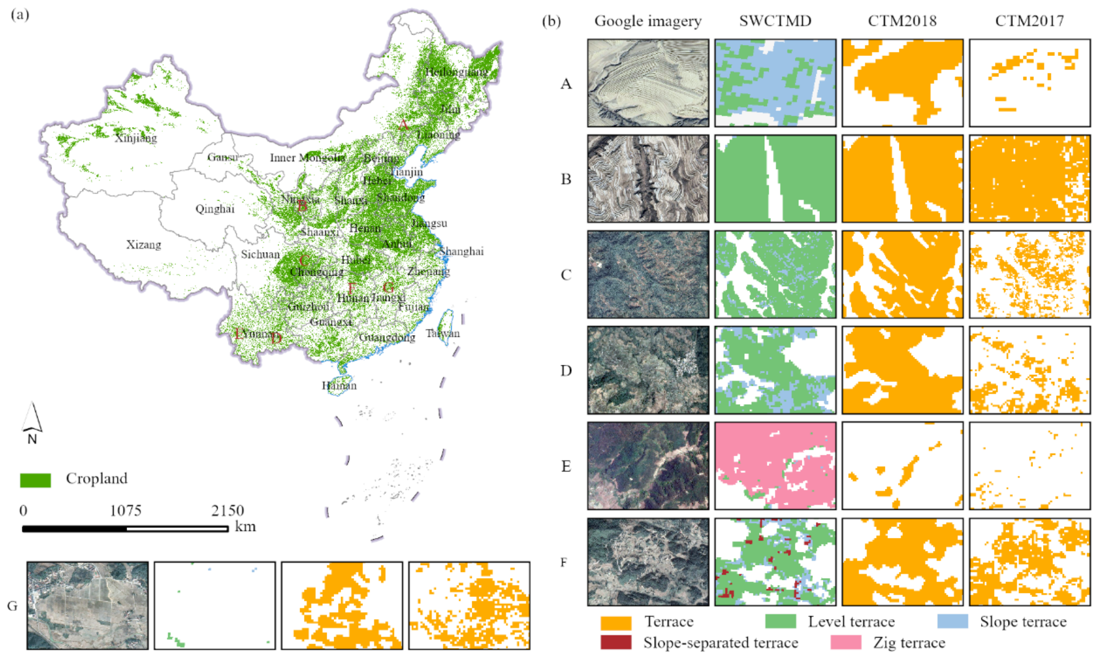

Figure 5. The spatial patterns of different terrace types at the pixel and provincial. (a) The spatial distribution of different terraces in China in 2020. (b) The different terrace areas in provinces in 2020.

9. To highlight the novelty of this dataset, it is recommended to include a comparison table in addition to Figure 3. This table should provide quantitative details of the differences between this new dataset and existing ones, such as the extent of area change in specific regions and the types of terraces contributing to those changes.

Response: Thank you for your helpful comment. We have added two tables to the supplementary materials, namely Table S8 and Table S9. Table S8 presents the differences in provincial terrace areas between SWCTMD and CTM2018, along with the types of terraces contributing to those changes. In the

Section 3.1, we revised the sentences (Lines 203-212). Furthermore, to analyze the differences among the three datasets, In the Section 4.1, we compared terrace areas at the provincial scale and analyzed the causes of these discrepancies. The revised text now stands as follows (Lines 278-288):

"*Figure 4 illustrates the spatial consistency between the SWCTMD and two existing datasets: the 2018 China Terrace Map (CTM2018) (Cao et al., 2021) and the 2017 China Terrace Map (CTM 2017) (Li et al., 2024). SWCTMD exhibited the highest accuracy. Compared to SWCTMD and CTM2018, CTM2017 exhibited relatively lower accuracy for both typical terrace and non-terraces areas (regions A, B, C, D F and G in Fig. 4b). For typical terraces, SWCTMD and CTM2018 show similar identification performance (regions A, B, C and F in Fig. 4b). However, for atypical terraces, such as zig terraces located in Yunnan Province, SWCTM successfully identified these as terraces, whereas CTM2018 failed to identify them as terraces (regions E in Fig. 4b). Conversely, for non-terrace areas situated in the Middle-Lower Yangtze River, SWCTMD accurately classified these as non-terraces, while CTM2018 erroneously classified them as terrace areas (regions G in Fig. 4b). At the provincial scale, the majority of provinces exhibit larger terrace areas in SWCTMD compared to both CTM2018 and CTM2017 (Tables S8 and S9).*"

"We compared the 2020 terrace area estimated by SWCTMD with those from CTM2018 and CTM2017. SWCTMD exhibited the largest terrace area compared to CTM2018 and CTM2017. The areal discrepancies can be attributed to the following reasons. First, CTM2017 and CTM2018 predominantly focused on the most typical level terraces, whereas our research encompasses a broader range of terrace types, including non-typical terraces such as slope terraces, zig terraces, and slope-separated terrace. Second, each dataset employed distinct cropland for terrace classification. SWCTMD utilized the union of cropland with slopes exceeding 2° from the 2000, 2010, and 2020 GlobeLand30 cropland data, whereas CTM2018 employed only the 2010 GlobeLand30 cropland data, and CTM2017 adopted FROM-GLC cropland data. Third, CTM2018 excluded isolated patches smaller than 9,000 m² from its classification scheme. However, since SWCTMD constrains its classification to cropland with slopes exceeding 2°, the identified terrace areas in Anhui, Fujian, Jiangxi, and Zhejiang provinces were smaller than those from CTM2018. In these provinces, CTM2018 included terraces with slopes below 2°, which is classified as non-terraces according to the technical regulations of the third nationwide land survey. Overall, our dataset provides more comprehensive coverage for terraces and exhibits higher accuracy and robustness."

Table S8. Comparison of terrace Areas between SWCTMD in 2020 and CTM2018 Datasets. "Gain" denotes areas identified as terraces only in the SWCTMD dataset, whereas "Loss" refers to areas identified as terraces only in the CTM2018 dataset.

province	CTM2018 (km²)	SWCTMD in 2020 (km²)	Difference (SWCTMD – CTM2018) (km²)	Gain (km²)				Loss (km²)
				Level terrace	Slope terrace	Zig terrace	Slope-separated terrace	Terrace
Anhui	7255.19	5092.39	-2162.80	2414.14	325.61	60.99	/	4963.55
Fujian	9097.75	6637.96	-2459.79	1002.26	510.44	479.38	/	4451.87
Gansu	52248.06	57356.15	5108.09	8007.46	1091.93	339.48	/	4330.79

Guangdong	4982.90	6597.43	1614.52	2051.30	996.20	/	/	1432.97
Guangxi	13133.09	20975.42	7842.33	8423.77	4339.73	/	/	4921.16
Guizhou	46315.57	59035.48	12719.91	9192.84	4410.92	1226.73	6.24	2116.83
Hebei	13751.55	15209.87	1458.32	2853.21	2320.73	/	0.00	3715.62
Henan	14027.56	23705.55	9678.00	7959.63	3491.49	/	17.69	1790.81
Hubei	23267.58	26391.32	3123.74	7600.61	3458.52	/	27.13	7962.52
Hunan	30868.80	40813.88	9945.08	10964.49	5169.61	/	9.15	6198.18
Jiangxi	15564.45	7512.25	-8052.20	2181.49	391.19	296.52	/	10921.41
Ningxia	8035.61	10194.15	2158.53	2247.29	79.69	141.31	/	309.76
Shandong	18302.50	23123.89	4821.39	5771.31	1584.79	46.37	/	2581.08
Shanxi	37062.87	41679.43	4616.57	6286.92	2595.84	0.00	/	4266.19
Shaanxi	30977.01	39467.78	8490.77	7044.01	4313.44	75.73	/	2942.41
Sichuan	83417.53	99285.71	15868.18	13574.22	7424.91	475.86	4.31	5611.11
Yunnan	75073.95	97955.88	22881.93	6853.27	12469.88	7584.56	324.43	4350.22
Zhejiang	6334.11	3807.41	-2526.70	743.45	305.45	94.45	/	3670.05
Chongqing	29746.65	38039.26	8292.62	5864.75	3569.64	479.07	2.59	1623.43
Qinghai	6038.90	6316.37	277.47	792.53	88.16	47.56	0.00	650.78

Table S9. Comparison of terrace Areas between SWCTMD in 2020 and CTM2017 Datasets. "Gain" denotes areas identified as terraces only in the SWCTMD dataset, whereas "Loss" refers to areas identified as terraces only in the CTM2017 dataset.

province	CTM2017	SWCTMD in 2020 (km^2)	Difference (SWCTMD - CTM) (km^2)	Gain (km^2)				Loss (km^2)
				Level terrace	Slope terrace	Zig terrace	Slope-separated terrace	Terrace
Anhui	2320.54	5093.47	2772.93	3935.96	448.74	74.63	/	1686.40
Fujian	6698.71	6636.65	-62.06	2749.31	867.76	686.97	/	4366.09
Gansu	32161.56	57353.72	25192.16	26441.27	4092.22	2106.95	/	7448.28
Guangdong	4208.52	6594.76	2386.24	3697.91	1261.08	/	/	2572.75
Guangxi	7308.95	20976.30	13667.35	12190.39	5446.80	0.00	/	3969.85

province	CTM2017	SWCTMD in 2020 (km^2)	Difference (SWCTMD - CTM) (km^2)	Gain (km^2)				Loss (km^2)
				Level terrace	Slope terrace	Zig terrace	Slope-separated terrace	Terrace
Guizhou	25456.48	59035.79	33579.31	27157.62	10924.35	2351.29	11.84	6865.79
Hebei	13537.45	15210.61	1673.16	4921.16	3876.86	/	/	7124.85
Henan	13963.48	23708.82	9745.34	9837.58	4299.97	/	49.04	4441.25
Hubei	14110.44	26391.38	12280.93	13296.29	5157.65	/	41.99	6215.00
Hunan	27467.65	40811.43	13343.79	18362.07	6781.28	/	23.45	11823.01
Jiangxi	9068.41	7510.90	-1557.51	4355.89	581.50	409.47	/	6904.37
Ningxia	3994.61	10195.18	6200.57	6455.23	158.86	755.13	/	1168.64
Shandong	18097.66	23123.08	5025.42	6757.42	2390.43	420.78	/	4543.20
Shanxi	29853.48	41677.98	11824.50	15744.13	5903.42	/	/	9823.05
Shaanxi	28370.55	39467.41	11096.85	14514.39	7367.91	391.46	/	11176.91
Sichuan	59470.14	99284.94	39814.80	36890.96	14167.60	781.83	7.66	12033.25
Yunnan	38251.80	97945.82	59694.02	19271.94	38146.24	13171.54	347.91	11243.60
Zhejiang	2780.66	3807.41	1026.75	2102.36	624.01	202.83	/	1902.45
Chongqing	20357.14	38039.24	17682.10	13703.93	6753.94	688.10	4.21	3468.08
Qinghai	5519.58	6315.62	796.03	1999.26	465.99	281.98	/	1951.19

10. In Figure 6, it is suggested to label the numerical values within each grid cell to improve readability and interpretability.

Response: We thank the reviewer for making this helpful suggestion. We have added numerical labels within each grid cell to enhance readability and interpretability. Figure 7 has been updated:

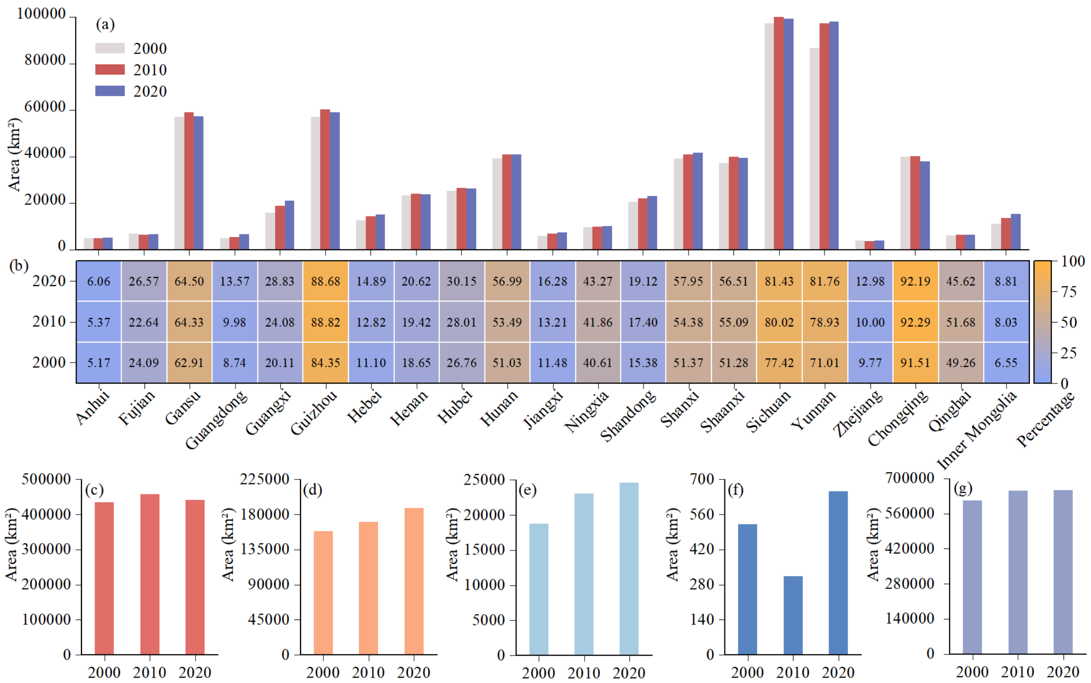

Figure 7. The changes of terrace areas at provincial and types from 2000 to 2020. (a) The changes of terrace area in different provinces. (b) The proportion of terraces to cropland in different provinces. (c-f) The areas of level terrace, slope terrace, zig terrace, and slope-separated terrace. (g) The total terrace areas of China.

11. Many quantitative descriptions in the manuscript only provide absolute values; it is recommended to also include relative percentages to help readers better interpret the significance of the results.

Response: Thank you for the valuable suggestion. We carefully reviewed the manuscript and, in quantitative descriptions, provided both absolute values and relative percentages to help readers better understand the significance of the results.

Accordingly, the sentences (Lines 251-257) have been revised as follows:

"… From 2000 to 2020, Yunnan, Guangxi, Shanxi, and Shaanxi experienced the most significant increases in terrace areas, increasing by 11,372.4 km² (13.1%), 5,192.4 km² (32.9%), 2,395 km² (6.1%), and 2,295.0 km² (6.2%), respectively (Fig. 7a). In terms of terrace types, the areas of level terraces, slope terraces, zig terraces and slope separated terraces increased by 5,701.4 km² (1.3%), 29,876.3 km² (18.9%), 5,886.5 km² (31.4%), and 129.9 km² (24.9%), respectively, with the slope terrace having the largest increase (Figs. 7c, d, e and f). Overall, China's total terrace area expanded from 612,885.4 km² in 2000 to 654,479.5 km² in 2020, an increase of 6.8% (Fig. 7g).

12. In Figure 7, are fixed values assigned to each type of terrace measure? Please clarify the value assignment approach.

Response: Thank you for this important comment. In soil erosion assessment, the soil and water conservation engineering practice factor (E) is generally assigned by a value to each measure. In this study, the E values for different terrace types were assigned according to the China's First National

Census for Water and published literature (Table S12) (Duan et al., 2020; Liu et al., 2020).

Table S12. Values of E factor.

Level terrace	Slope terrace	Zig terrace	Slope-separated terrace
0.01	0.252	0.114	0.343

References

Duan, X., Bai, Z., Rong, L., Li, Y., Ding, J., Tao, Y., Li, J., Li, J., and Wang, W.: Investigation method for regional soil erosion based on the Chinese Soil Loss Equation and high-resolution spatial data: Case study on the mountainous Yunnan Province, China, Catena, 184, 104237, https://doi.org/10.1016/j.catena.2019.104237, 2020.

Liu, B., Xie, Y., Li, Z., Liang, Y., Zhang, W., Fu, S., Yin, S., Wei, X., Zhang, K., Wang, Z., Liu, Y., Zhao, Y., and Guo, Q.: The assessment of soil loss by water erosion in China, Int. Soil Water Conserv. Res., 8, 430–439, https://doi.org/10.1016/j.iswcr.2020.07.002, 2020.

13. The sentence: "According to our estimation, the soil erosion of the Loess Plateau accounts for only 10.95% of the total cropland erosion in China, indicating that the SWC measures previously implemented have achieved good governance…" is better rephrased with the emphasis placed on the comparative effects of having terraces vs. not having terraces, or the differences among this dataset and previpus datasets, in order to reflect the value of this dataset in soil erosion estimation. The relatively low share of cropland erosion in the Loess Plateau does not necessarily indicate the effectiveness of conservation measures alone—it may also be influenced by factors such as total cropland area, topography, vegetation cover, climate and so on.

Response: Thank you for your insightful comment. Sorry for the unclear expression. We have revised this sentence (Lines 323-325). We shifted the focus of the description to the amount of soil erosion reduced by terraces, emphasizing the impact of terraces on soil erosion. The updated version reads:

"According to our estimate, soil erosion of the Loess Plateau accounted for only 12.6% of the total cropland erosion. Terraces in this region contributed to 17.4% of the total reduction of cropland soil erosion, demonstrating the benefits of terraces to SWC. … "