

Earth Syst. Sci. Data Discuss., author comment AC1
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Reply on RC1

Xinxin Wang et al.

Author comment on "Improved maps of surface water bodies, large dams, reservoirs, and lakes in China" by Xinxin Wang et al., Earth Syst. Sci. Data Discuss.,
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Response Letter to the Referees

Referee #1:

In this study, the authors generated a valuable dataset of Large Dams, Reservoirs, and Lakes across China by analyzing all available Landsat imagery in 2019 via GEE platform.

Overall, this manuscript is written well and suitable to publish in ESSD. I recommend a minor revision based on the comments below to improve the quality of this manuscript /data set before publication.

Reply: We were encouraged by your positive statement, and we appreciate your time and effort during the review process of our manuscript.

Specific comments:

1) Line 78: Please confirm the expression of "GLObal geOreferenced Database of Dams (GOODD) V1", which is different from the handwriting in line 165.

Reply: We double-checked the name of dataset, and its full name is "GLObal GeOreferenced Database of Dams". We have updated it throughout the main text.

2) Line 118: Why did the authors choose to analyze the large SWB with area $> 1\text{km}^2$? What about the area $\leq 1\text{km}^2$? Please add one or two sentences to explain it.

Reply: Large water bodies (e.g. lakes and reservoirs) have been the subject of great interest not only because of their water resources roles but also as indicators of anthropogenic impact on water scape change (Yang and Lu, 2014). A number of studies have reported and analyzed the dynamics of large water bodies, for example, Feng et al. (2019) explored the overall characteristics and changes of large SWB during 1984-2015 in China; Zhang et al. (2019) explored the evolution of large lake across China during 1960s-2015. Furthermore, Yang and Lu (2014) analyzed the drastic change in China's large lakes and reservoirs over the past decades.

Thus, in our study, we analyzed the large SWB with area $> 1\text{km}^2$ and those SWB with area $\leq 1\text{km}^2$ were excluded. In the main text, we introduced the importance of large SWB,

including large lakes and reservoirs, in the control and management of water resources: "Surface water bodies (SWB), including large lakes and reservoirs (surface water areas > 1 km²), play an important role in the control and management of water resources (Yang and Lu, 2014, 2013; Feng et al., 2013, 2019)" and "Nearly 50% of the global large dams were built primarily for agricultural irrigation through storing, regulating, and diverting water (Mulligan et al., 2020). Additionally, they are also used for hydropower generation, human and industrial uses, and flood peak attenuation (Lehner et al., 2011; Lehner and Döll, 2004; Wang et al., 2021a). Large lakes have been the subject of great interest not only because of their water resources but also as indicators of local climate change and anthropogenic activities (Zhang et al., 2019; Ma et al., 2011; Birkett and Mason, 1995), and they could provide vital ecosystem services for human being, such as alteration of river flow, supplies of irrigation water, fisheries, and abundant valuable mineral deposits, and have disproportionate effects on the global carbon cycle (Ran et al., 2021; Armstrong, 2010; Ma et al., 2011)." (Line 37-51). In addition, we explained the exclusion of small SWB in the Objective of this study: "The objective of this study was to produce detailed and accurate maps of open SWB, large dams, reservoirs, and lakes (surface water area > 1 km²) in China in 2019, the latest year when this study started in late 2020, and those SWB with area 1km² were excluded." (Line 114-116).

References:

Feng, S., Liu, S., Huang, Z., Jing, L., Zhao, M., Peng, X., Yan, W., Wu, Y., Lv, Y., Smith, A. R., McDonald, M. A., Patil, S. D., Sarkissian, A. J., Shi, Z., Xia, J., and Ogbodo, U. S.: Inland water bodies in China: Features discovered in the long-term satellite data, Proc. Natl. Acad. Sci., 116, 25491-25496, <https://doi.org/10.1073/pnas.1910872116>, 2019.

Yang, X. and Lu, X.: Drastic change in China's lakes and reservoirs over the past decades, Sci. Rep., 4, 6041, <https://doi.org/10.1038/srep06041>, 2014.

Zhang, G., Yao, T., Chen, W., Zheng, G., Shum, C. K., Yang, K., Piao, S., Sheng, Y., Yi, S., Li, J., Oreilly, C., Qi, S., Shen, S., Zhang, H., and Jia, Y.: Regional differences of lake evolution across China during 1960s-2015 and its natural and anthropogenic causes, Remote Sens. Environ., 221, 386-404, <https://doi.org/10.1016/j.rse.2018.11.038>, 2019.

3) Line 127: In the Fig.2a, the DEM or other data could be added as the base map to make this figure look more abundant.

Reply: Good suggestion. We added the DEM data of China in Fig. 2a, and reorganized the Fig. 2b to avoid the coverage by the histogram.

(Please see attached PDF for the detail of Fig. 2)

4) Lines 127-132: The content of section 2.1 is a little simple, some information could be added in this part, like geographic or climatic characteristics.

Reply: Done. We added some brief introduction about the geographic or climatic characteristics of China in section 2.1: "China has great altitude diversity as the eastern plains and southern coasts consist of lowlands and foothills, the southern areas of China consist of hilly and mountainous terrains, the west and north of the country are dominated by basins, plateaus, and massifs, and the southwestern China contains part of the highest tablelands on earth, the Tibetan Plateau (Fig. 1a). Due to substantial differences in latitude, longitude, and altitude, the climate of China is extremely diverse, ranging from tropical in the far south to subarctic in the far north and alpine in the higher elevations of the Tibetan Plateau, contributing to the much more surface water areas in Southwest and Southeast of China than other regions, especially North China (Wang et al., 2020a)." (Line 136-143).

5) Line 146: In the Fig.2b, part of the background map was covered by the histogram, which could be improved to be more normative and beautiful.

Reply: Done. We updated this figure and is shown in Fig. 2. **(Please see attached PDF for the detail of Fig. 2)**

6) Line 170: In the Fig.3, if it's possible, the shapefile of dam and reservoir could be symbolized separately.

Reply: In the Fig.3, we showed the spatial distribution of dams and reservoirs from the GOODD, GRanD, and GeoDAR datasets using different symbolizations. Fig.3a-c were the three dam maps using point symbol, and Fig. 3d showed the catchment of each dam of GOODD as it only reported the catchment of each dam rather than the reservoirs. Fig. 3e-f showed the spatial distribution of reservoir from GRanD and GeoDAR.

(Please see attached PDF for the detail of Fig. 3)

7) Lines 209-210: As we know, the Landsat 7 ETM+ has problem of stripe, would it effect the generation of SWB? How did the authors deal with this issue? Please give detailed explanation.

Reply: You raised a good question about the stripe of Landsat-7 imagery. In this study, we used the Landsat surface reflectance (SR) images in the GEE platform, and all these images had undergone necessary pre-processing, including radiometric calibration and atmospheric correction. In addition, all the pixels of the stripes in the Landsat-7 have been removed by GEE team (**Fig. R1**), thus, they were not included in our study when we generated the annual water frequency map of China.

(Please see attached PDF for the detail of Fig. R1)

8) Line 221: In the section 2.3.2, when the authors generated the polygons of lakes or reservoirs, how did the authors determine the borderlines between water bodies and adjacent land, especially for mixed land-water pixels? Please give detailed explanation.

Reply: In our study, we first identified SWB through the algorithm of ((mNDWI > EVI or mNDWI > NDVI) and EVI < 0.1), which reduces the effects of mixed land-water pixels on identification of SWB, especially those vegetation pixels, and was widely used to identify and map SWB at the regional and national scales. Second, we generated the surface water frequency map in 2019 using all the available Landsat imagery and the algorithms in Section 2.3.1. Third, the yearlong surface water imagery was generated using water frequency ≥ 0.75 . After that, the vector map of yearlong surface water for 2019 was generated based on the yearlong surface water imagery, and was reprojected the Krasovsky_1940_Albers equal-area conic projection and calculated the area of each yearlong surface water polygon within China. Finally, we removed those polygons with area 1km^2 and only reported large reservoirs and lakes with area $> 1\text{km}^2$ in this study (**Fig. R2**). Therefore, the boundaries of resultant lakes and reservoirs were detected automatically. In order to introduced the work flow for generating lake and reservoir polygons clearly, we added the **Fig. R2** in the supplementary file and improved the introduction of Section 2.3.2.

(Please see attached PDF for the detail of Fig. R2)

9) Lines 240-244: In the section 2.4, is there only "area" in the attribute table? If not, please give more description about the attributes, otherwise, this paragraph is too simple.

Reply: Thanks. Here we reported the area and perimeter of lakes and reservoirs, the ID

of corresponding dams and dam/reservoir classes of reservoirs as their attributes (**Fig. R3**). In this revised version, we combined section 2.3.2 and 2.4 into one section and introduced the methods of calculating area and perimeter of each polygon. The introduction of each column of the attributes were shown in the Section of "5. Data availability".

(Please see attached PDF for the detail of Fig. R3)

Please also note the supplement to this comment:

<https://essd.copernicus.org/preprints/essd-2021-400/essd-2021-400-AC1-supplement.pdf>