**Reviewer #2 Comment on essd-2022-422 (Anonymous Referee #2)**

Dear Anonymous Referee #2,

Thank you for your time and efforts in reviewing our manuscript. Please find attached point-to-point responses regarding your comments (marked in purple) and made corresponding changes in the main manuscript (in red). We hope that the improved manuscript can help the readers to better understand our study.

Kind regards.

**Summary:**

This study presents time series data on hydrometeorological, topographic, and catchment attributes for over 3000 Chinese reservoirs. The authors have brought together datasets from many disparate sources, including in-situ data/information and satellite products, which is a commendable effort. The methods used are technically sound and the final product derived could be of great value for many purposes including hydrological modeling, water resource management, and ecosystem studies. The results presented provide many insights on reservoir attributes with a large spatial and temporal coverage. Therefore, this study is worthy of publication; however, there are certain issues that require further attention. In terms of presentation quality, the paper is generally well written but is not devoid of certain typos, grammatical errors, unclear statements. The authors should very carefully proofread the entire manuscript before submitting it again. My overall assessment is that the paper can be published after major revisions. I provided my detailed comments below.

R2C0: Thank you for your recognition of the strengths of our study. We appreciate your constructive feedback and have carefully considered all of your suggestions and comments. We agree that the paper required attention to certain issues, such as typographical errors, grammatical mistakes, and unclear statements. We have thoroughly proofread the manuscript and made the necessary revisions to address all of your concerns.

We hope that these revisions have improved the overall quality of the manuscript. We are grateful for your time and expertise in reviewing our work, and we believe that your feedback has made a valuable contribution to the study's scientific value. Thank you again for your comments, and we hope that the revised manuscript will meet your expectations.

**Major comments:**

L66: I suggest rephrasing the statement, especially for “failed”. The many studies noted by the authors have substantially advanced our ability to better monitor and model reservoirs globally. Perhaps, the datasets could be incomplete and there are more opportunities to develop relatively more comprehensive datasets, but I suggest giving a bit more positive bend to this statement; “failed” seems a bit unfair!

R2C1: We agree that the previous efforts mentioned in our manuscript have substantially advanced our understanding of global reservoir monitoring and modeling. Our aim was to highlight the potential for relatively more comprehensive datasets. Upon reflection, we acknowledge that the term "failed" may be overly negative and unfair. We have rephrased this statement in the revised manuscript to reflect our intent more accurately and to give a more positive bend. We have now emphasized the opportunities for further improvements in data collection and highlighted the potential for even more extensive datasets in the future. Thank you for your feedback, and we appreciate the opportunity to improve the clarity and accuracy of our manuscript. Upon further consideration of the context, we have decided to delete the statement as it was deemed inappropriate.

L89-90: some modeling studies that have dealt with such challenges could be cited here including (Dang et al., 2022; Dang et al., 2020; Galelli et al., 2022; Shin et al., 2020)

R2C2: Yes, thanks for your kind reminder and we carefully checked that all studies mentioned are highly related to our reservoir datasets. We cited all these studies in the section of Introduction, Summary and application.

See main text below:

Results of this study facilitated managements of reservoirs and relevant studies such as hydrological modeling, environmental studies, and climate research in the spatially explicit context of reservoir catchment-level (Dang et al., 2020; Galelli et al., 2022).

This is particularly true if the reservoir inflow is also utilized. Recently, the gridded natural runoff provided by Gou et al. (2021) provides exciting opportunities for quantifying the human water regulation in combination with Res-CN (Dang et al., 2022; Shin et al., 2020).

## References

Dang, H., Pokhrel, Y., Shin, S., Stelly, J., Ahlquist, D., Du Bui, D., 2022. Hydrologic balance and inundation dynamics of Southeast Asia's largest inland lake altered by hydropower dams in the Mekong River basin. Science of The Total Environment, 831: 154833.

Dang, T.D., Vu, D.T., Chowdhury, A.K., Galelli, S., 2020. A software package for the representation and optimization of water reservoir operations in the VIC hydrologic model. Environmental Modelling & Software, 126: 104673.

Galelli, S., Dang, T.D., Ng, J.Y., Chowdhury, A., Arias, M.E., 2022. Opportunities to curb hydrological alterations via dam re-operation in the Mekong. Nature Sustainability: 1-12.

Shin, S., Pokhrel, Y., Yamazaki, D., Huang, X., Torbick, N., Qi, J., Pattanakiat, S., Ngo-Duc, T., Nguyen, T.D., 2020. High Resolution Modeling of River-Floodplain-Reservoir Inundation Dynamics in the Mekong River Basin. Water Resources Research, 56(5): e2019WR026449.

L84: what does “states” mean here?

R2C3: we have reprahsed as: In addition to the time series of reservoir datasets described above,

L85 and elsewhere: I don’t think a “catchment shapefile” is a “catchment attribute”; file is a file. There are many other such instances where certain terminologies are not properly used. Also, what the “anthropogenic activity” – used in a singular form implies there is one such activity that is being considered.

R2C4: Thank you for your comments regarding the terminology used in our manuscript. We appreciate your keen attention to detail and agree that the terminology used should be precise and accurate. Upon review, we agree that the term "catchment attribute" was not an appropriate descriptor for the catchment shapefile used in our study, and we have removed “catchment shapefile” here and revised the main text accordingly.Regarding the use of the term "anthropogenic activity", we apologize for any confusion this may have caused. We have revised as “anthropogenic activity characteristics” in the manuscript to better reflect the multiple anthropogenic activities that were considered in our analysis.

We appreciate your feedback and attention to detail, and we believe that the revisions we have made will improve the clarity and accuracy of our manuscript.

Section 2.1: Why was 10% threshold used for the GSW data? The same question applies for 20 and 40 meters. Please provide justification. Further, I could imagine all of the many products used in these methods contain substantial uncertainties (being primarily remote sensing based). How would those uncertainties affect the outcomes derived here and how did the authors deal with these issues?

R2C5: A low threshold of 10% is chosen for two reasons: (1) Water occurrences are expected to be low for the newly built reservoirs and (2) a lower threshold ensures that a higher number of potential measurements are preselected. We provided a reference here for justification (Zhang et al., 2020).
The threshold of 20 and 40 meters was set in previous studies (Jiang et al. 2017 RSE). In fact, we set a series of thresholds, such as 20, 30, 40, and 50 m, for each reservoir. Interestingly, we found that this parameter was not sensitive because the method of tsHydro ([https://github.com/cavios/tshydro](https://github.com/cavios/tshydro)) used in the next step estimates along-

track water level in the presence of outlying measurements (Nielsen et al. 2015), and also provides the uncertainties for each value in the time series. You can be found in the corresponding data product file. For example, in the "D reservoir states"/"water level"/Standard Rate/OBS/S3A/, the csv files contains, "year", "month", "demical_year","s3a_wl", and "s3a_wlsd".
We have discussed the sources of uncertainties, and their impacts in each section (considered your comments below).
Main text:

- Section 3.3.1: We provided the uncertainty information for each value of the time series in the data product file. The SD (standard deviation) estimates can quantify the accuracy of the water level along the track at the level of individual data points (Fig. S8). Water level time series for each reservoir are available in Rec-CN as EXCELs, PDFs and detailed evaluation reports based on in situ data when available (see Section of data availability).

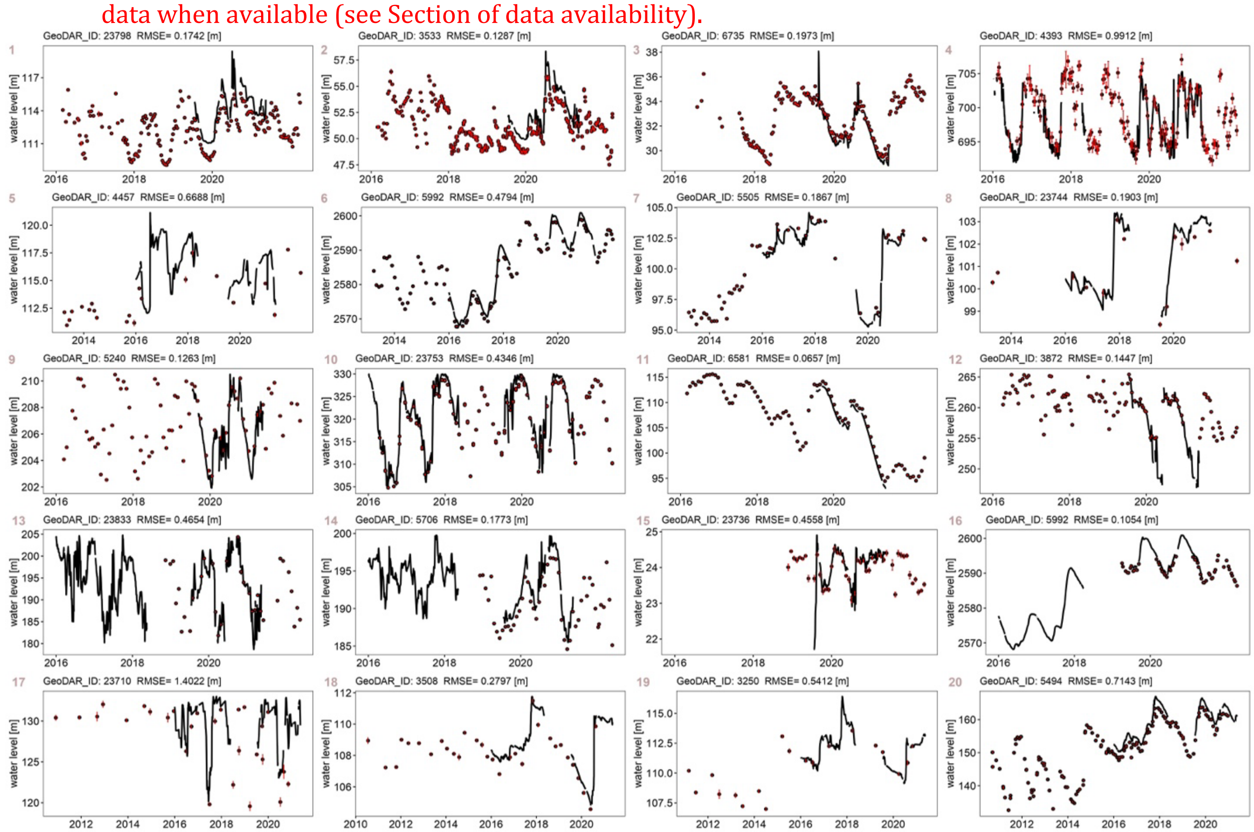


**Fig. S8.** Uncertainties for each value in the time series of reservoir water level. In the figure, black line refers to the observed water level, black dot refers to altimetric water level, error bar quantifies the uncertainty of each value. Taking 20 reservoirs in the Standard rate product as an example, 1-4 are taken from Jason-3 mission, 5-8 are from SARAL/AltiKa mission, 9-12 are from Sentinel-3A mission, 13-16 are from Sentinel-3B mission, 17-20 are from CryoSat-2 mission. All uncertainties values are available in our product.

- Section 3.3.2: Uncertainties in surface water area estimates are generally attributed to satellite images and algorithms. As reported by Zhao et al. (2022), the uncertainty of Landsat-based GRSAD areal dataset is 6.1%. In this study, we generated a more reliable reservoir water area product by fusing both Landsat and Sentinel-2 images (Fig. S9), using an algorithm that can largely reducing the impacts of cloud contaminations (Donchyts et al., 2022). There is strong evidence to suggest that this algorithm performs well in this regard, as it has been widely validated in 768 reservoirs of different sizes and climate zones located in Spain, India, South Africa, and the USA (Donchyts et al., 2022). Nevertheless, some limitations and future developments should be considered. Our first option is to use Sentinel-1 data to provide more information in cloudy regions. Furthermore, the algorithm may be improved by either multiclass Otsu or using advanced machine learning methods.

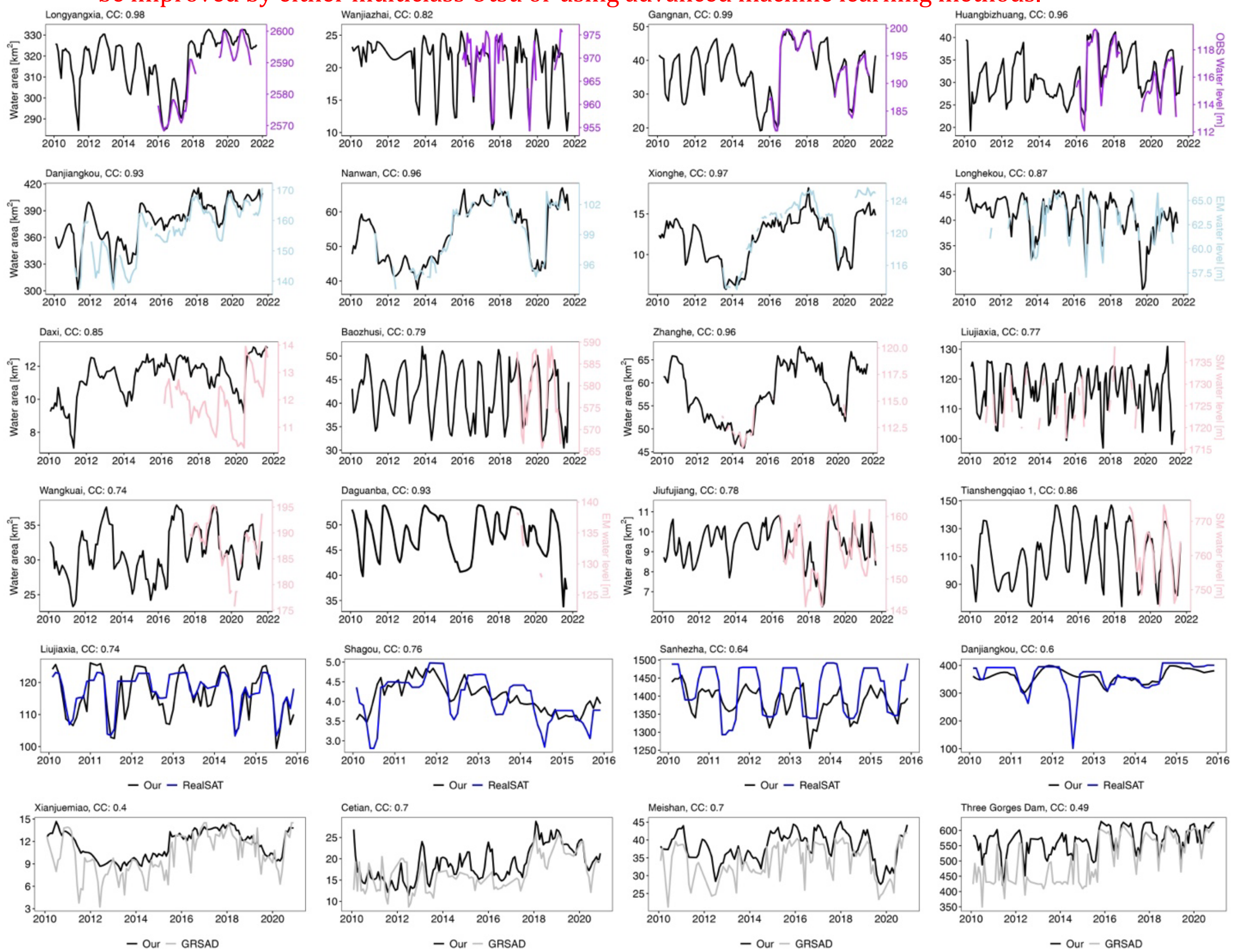


**Figure S9.** Graphs showing reservoir water area time series against in situ water levels, altimetric water levels from high and standard rates, and GRSAD and ReaLSAT area time series for a sample of reservoirs of varying areas (Shen et al., 2022b).

- Section 3.3.3: The uncertainties in storage anomalies are primarily attributed to three sources, i.e., the altimetric water level, water surface area estimations from Landsat and Sentinel-2 images, and the error resulting from their combination (the hypsometric curve). Fig. S10 provides an example that illustrates how the uncertainties in satellite datasets propagate to storage anomalies. According to Shen et al. (2022), the primary source of error in storage anomaly is water surface area and the hypsometric curve. Regarding the water surface area, after applying the algorithm developed by Donchyts et al. (2022), these errors and impacts can be reduced to a large extent. Meanwhile, we employed five hypsometric relationships, and the one with the highest $R^2$ value for further use. For more than 80 % reservoirs, the $R^2$ values are greater than 0.5, providing a strong foundation for storage anomaly estimates. Nonetheless, the current satellite sensors have limitations, as evidenced by the significant discrepancies observed in peak values (Figure 7). The increasing temporal resolution and data accuracy of satellite datasets, such as the SWOT mission, will likely improve the accuracy of storage anomaly estimates in the future.

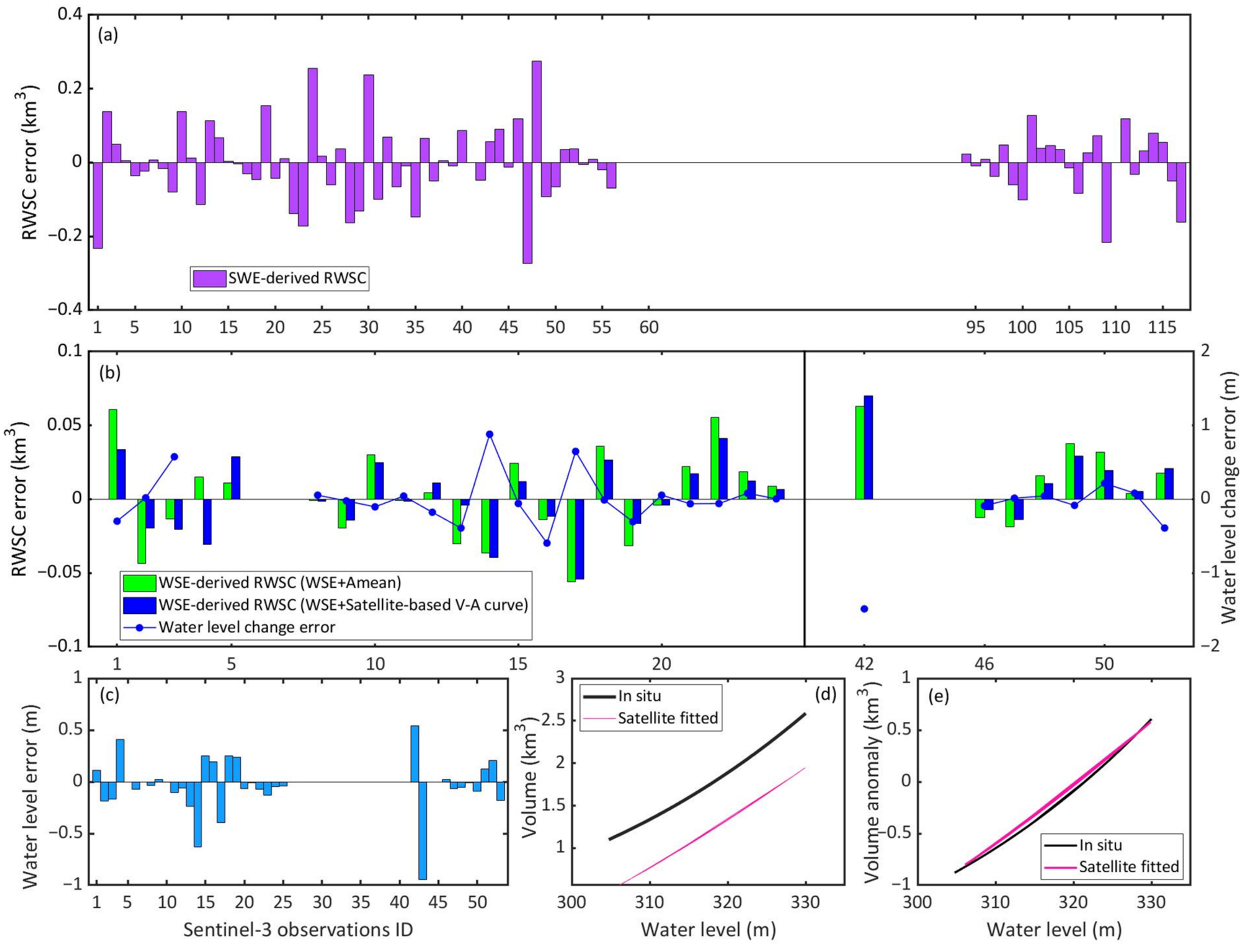


**Figure S10.** Graphs showing an example that illustrates how the uncertainties in satellite datasets propagate to storage anomalies. Error series and relationships of reservoir elevation-storage. Error series of (a) SWE-derived RWSC (i.e., storage anomaly), (b) WSE-derived RWSC and water level change, (c) WSE (i.e., water level). (d) and (e) Relationships of elevation-storage. The numbers on the x-axis (a, b, c) refer to the IDs of SWE, WSE, and WSE change observations, respectively. For more details about the propagation process, please find the reference Shen et al., (2020): https://doi.org/10.3390/rs14040815.

- ## References:

Liguang Jiang, Karina Nielsen, Ole Baltazar Andersen, Peter Bauer-Gottwein, CryoSat-2 radar altimetry for monitoring freshwater resources of China, Remote Sensing of Environment, 200, 2017, 125-139, https://doi.org/10.1016/j.rse.2017.08.015.

Nielsen, K., Stenseng, L., Andersen, O. B., Villadsen, H., and Knudsen, P.: Validation of CryoSat-2 SAR mode based lake levels, Remote Sens. Environ., 171, 162–170, https://doi.org/10.1016/j.rse.2015.10.023, 2015.

Shen, Y., Liu, D., Jiang, L., Tøttrup, C., Druce, D., Yin, J., Nielsen, K., Bauer-Gottwein, P., Wang, J., and Zhao X.: Estimating reservoir release using multi-source satellite datasets and hydrological modeling techniques, Remote Sens., 14, 815, https://doi.org/10.3390/rs14040815, 2022.

Zhao, G., Li, Y., Zhou, L., and Gao, H.: Evaporative water loss of 1.42 million global lakes. Nat. Commun., 13, 3686, https://doi.org/10.1038/s41467-022-31125-6, 2022.

Donchyts, G., Winsemius, H., Baart, F., Dahm, R., Schellekens, J., Gorelick, N., Iceland, C., and Schmeier, S.: High-resolution surface water dynamics in Earth's small and medium-sized reservoirs, Sci. Rep., 12, 13776, https://doi.org/10.1038/s41598-022-17074-6, 2022.

The comment above regarding uncertainty applies to Sections 2.2 and 2.3 as well. I suggest that the authors discuss various uncertainty sources and their impacts.

R2C6: We appreciate the reviewers' insightful and helpful comments on our manuscript. We have revised the manuscript according to the reviewer's suggestion. We have discussed the uncertainties of the dataset in the revised manuscript (section 3.3.1-3.3.3) to facilitate the usage of this dataset. We did our best to collect the most reliable datasets to date and will regularly update the related datasets in the future to ensure their timeliness. Hope R2C5 response addressed your concern.

Figure 3 caption: please add unit to the x-axis of the histograms or provide a note in the caption. I wondered why the panels are organized in this specific order – why not swap (e) and (f) so that the same categories sit adjacent to each other.

R2C7: We have changed the figure 3 as suggested.

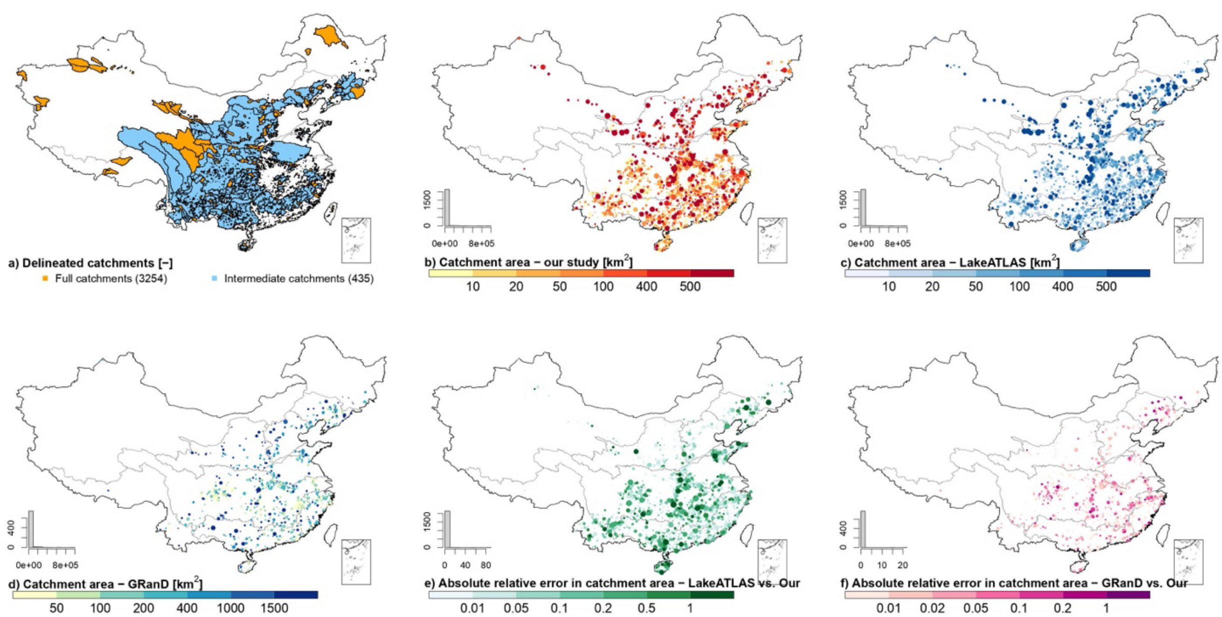


Fig. 3. Distribution of the delineated catchments (intermediate catchments and full catchments). Each category's histogram indicates the number of basins (out of 3254). In a histogram, the X-axis represents the number of basins, while the Y-axis represents each subplot's title. Circle sizes are proportional to catchment areas.

Figure 4 and others: The Zenodo link was not active, so I couldn't make sure if all the datasets were shared. Are all in-situ datasets included in the publicly shared database?

R2C8: From my location in Japan, I have verified the accessibility of the Zenodo link (https://doi.org/10.5281/zenodo.7664489). I apologize for any inconvenience caused. All data presented in the figures and tables has been shared on Zenodo, with the exception of certain in situ reservoir water level and storage data.
We obtained daily water level and storage data spanning 2015–May 2021 for 93 reservoirs from the local watershed agency (http://113.57.190.228:8001/web/Report/BigMSKReport, last access: 15 October 2022) and National Hydrological Information Centre for validation (http://xxfb.mwr.cn/index.html, last access: 15 October 2022).
However, the in-situ datasets are updated day-by-day, thus, not possible to download the historical time series. I apologize for not making our collected in-situ datasets publicly available on Zenodo as we have a federal grant that limits the sharing of in-situ dataset. Moreover, we have no right to make all of them publicly available, now. Anyway, we are happy to share most of these data for users to do some case studies, please feel free to contact the corresponding author (yjshen2020@gmail.com).

Figure 7: Why does Res-CN under or overshoot storage for many reservoirs (e.g., panels 7,8 etc.)?

R2C9: Yes, we add more explanations and discussed the uncertainties as well as limitations in this section. Please also note that for Fig. 7 panels 9-12, our data indeed captured the large peak values for most reservoirs (2, 0.5, 0.2 $km^3$).

Main text: The Res-CN database provides monthly reservoir water storage anomaly for 3254 Chinese reservoirs during 1984-2020 using DEM's area-storage model, along with their detailed evaluation reports (see Section of data availability).

The remotely sensed storage anomalies generally agree with the observations represented by the statistical metrics, although some large discrepancies occur in peak values.

The uncertainties in storage anomalies are primarily attributed to three sources, i.e., the altimetric water level, water surface area estimations from Landsat and Sentinel-2 images, and the error resulting from their combination (the hypsometric curve). Fig. S10 provides an example that illustrates how the uncertainties in satellite datasets propagate to storage anomalies. According to Shen et al. (2022), the primary source of error in storage anomaly is water surface area and the hypsometric curve. Regarding the water surface area, after applying the algorithm developed by Donchyts et al. (2022), these errors and impacts can be reduced to a large extent. Meanwhile, we employed five hypsometric relationships, and the one with the highest $R^2$ value for further use. For more than 80 % reservoirs, the $R^2$ values are greater than 0.5, providing a strong foundation for storage anomaly estimates. Nonetheless, the current satellite sensors have limitations, as evidenced by the significant discrepancies observed in peak values (Figure 7). The increasing temporal resolution and data accuracy of satellite datasets, such as the SWOT mission, will likely improve the accuracy of storage anomaly estimates in the future.

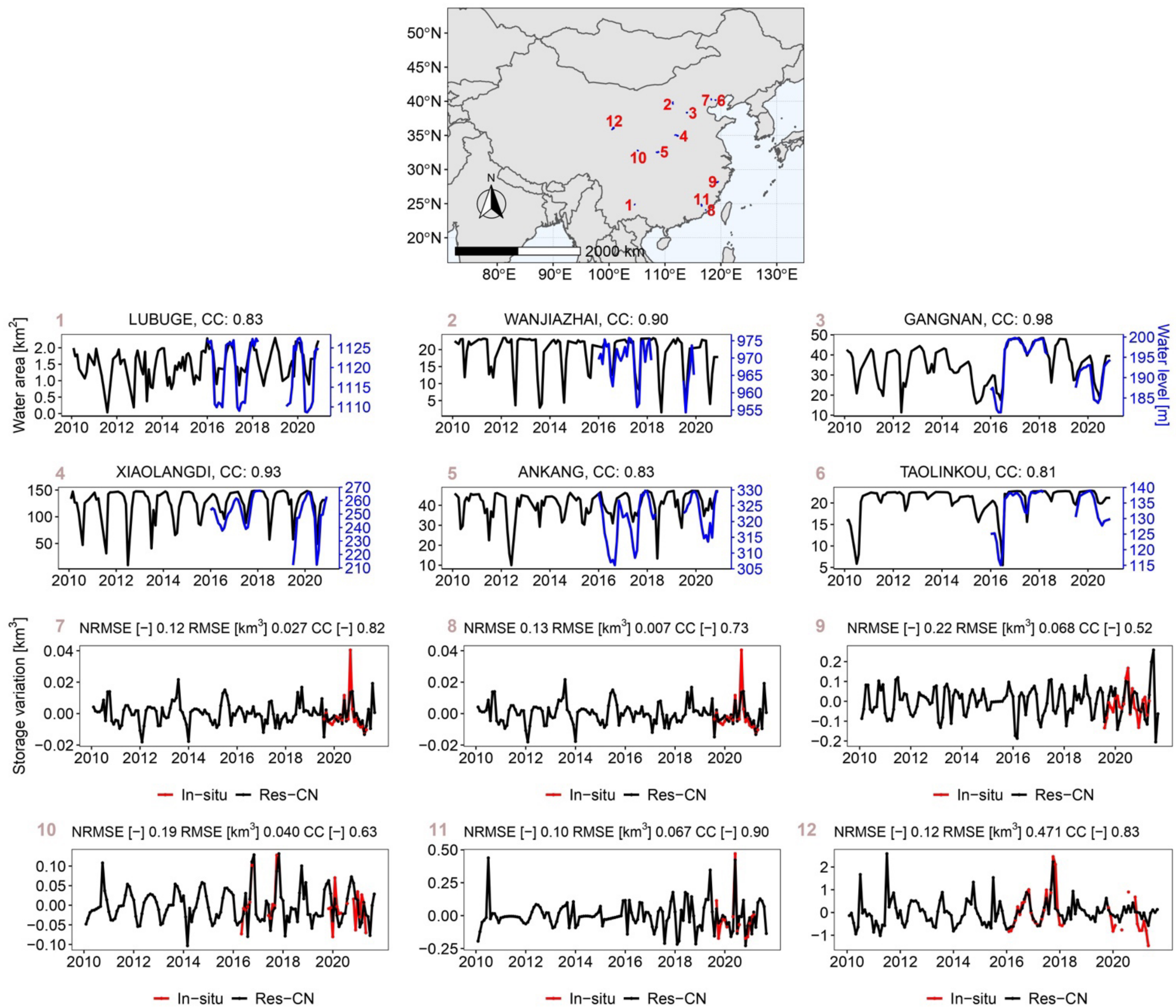


**Figure 7.** Time series of water surface area and storage anomaly in selected reservoirs. RMSE (km3), NRMSE, and CC values are given at the top of each subplot when in situ observations available. Note that: time series of water surface area and storage anomaly of the remaining reservoirs are available in our datasets.

Figure 8: I can't really tell whether this is a good/bad match between the three? I suggest adding some statistical measures such as RMSE and also a seasonal climatology panel on the right (could be just for the period with observed data).

R2C10: We adopted the validation from Tian et al., (2021) for evaluation of reservoir evaporation product considering we found that our pan evaporation is not the observed evaporation, and we cannot provide the source of this dataset. Thus, revised the figure 8 and re-create figure s11 for validation. Please find our revised text below:

Res-CN provides monthly reservoir evaporation values for 3254 Chinese reservoirs during 1984-2021. Detailed validations of the algorithm can be found in Zhao et al. (2019; 2022) and Tian et al., (2021). The validation of simulated evaporation at an annual scale from Tian et al. (2022) at 47 reservoirs was summarized in Fig. S11 through a literature review. The results in Fig. S11 indicate that the modeled average annual evaporation rates match well with the observed rates. Specifically, the percent bias (PBIAS), Nash-Sutcliffe efficiency (NSE), and root-mean-square error (RMSE) were found to be 0.02%, 0.82, and 11.2 mm, respectively. This high level of agreement suggests that the Penman method is a reliable approach for calculating reservoir evaporation rates in China. Fig. S12 shows the long-term mean meteorological variables that were used to calculate the evaporation rates.

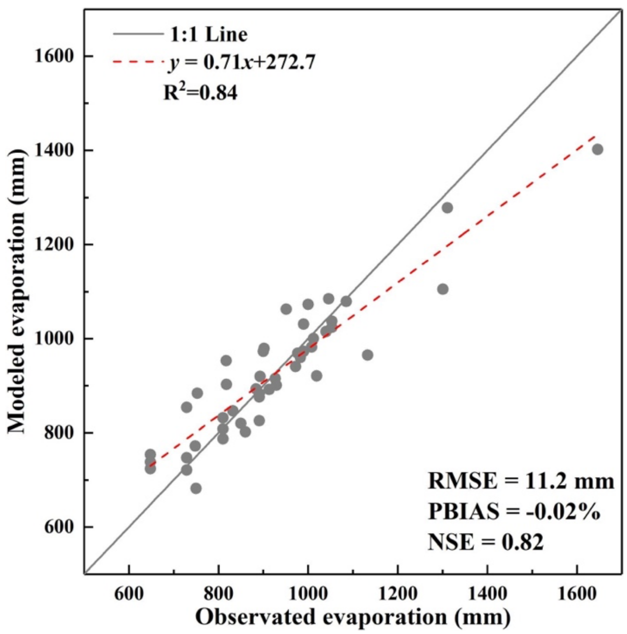


Figure S11. Observed and modeled average annual evaporation for 47 reservoirs (Tian et al., 2021).

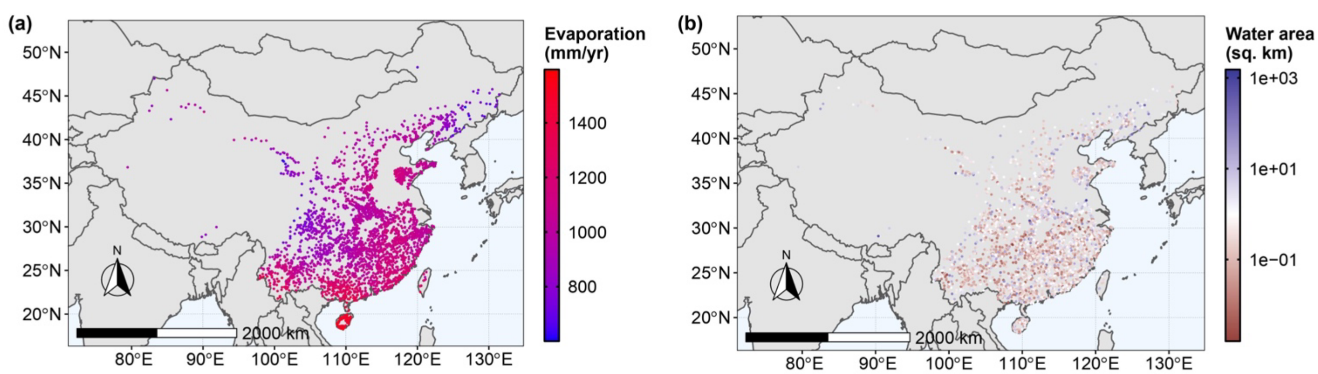


**Figure 8.** Validation of reconstructed monthly reservoir evaporation values. (a) Long-term mean evaporation rates and (b) water surface areas during 1984-2020.

## References:

Tian, W., Liu, X., Wang, K., Bai, P., & Liu, C. (2021). Estimation of reservoir evaporation losses for China. Journal of Hydrology, 596, 126142. https://doi.org/10.1016/j.jhydrol.2021.126142

Zhao, G., and Gao, H.: Estimating reservoir evaporation losses for the United States: Fusing remote sensing and modeling approaches, Remote Sens. Environ., 226, 109-124, https://doi.org/10.1016/j.rse.2019.03.015, 2019.

Zhao, G., Li, Y., Zhou, L., and Gao, H.: Evaporative water loss of 1.42 million global lakes. Nat. Commun., 13, 3686, https://doi.org/10.1038/s41467-022-31125-6, 2022.

Figure 9 caption: are these just “topographic” characteristics or in general “catchment” characteristics?

R2C11: Yes, we checked it. These are topographic characteristics.

Sections 3.4.2 – 3.4.4: The results and graphics here are nice; however, I wonder what the utility of these data/outcomes are. I suggest that the authors shed some light in the intro section and subsequently in the results section regarding why these specific attributes are chosen, and why/how these are useful, for example, for modeling hydrology considering reservoirs.

R2C12: Our study involved the integration of multiple attributes, offering a good dataset to comprehending the features of reservoir-catchments in China systematically. The Res-CN dataset holds considerable potential in advancing the comprehension of the processes involved in Chinese reservoirs. We have further elaborated on this dataset in the introduction, summary, and applications sections.

**Introduction:** In addition to the time series of reservoir datasets described above, reservoir upstream catchment attributes (e.g., climate, geology & soil, topography, land cover, and anthropogenic activity characteristics) are also important as reservoirs collect materials from upstream catchments. Researchers can better understand catchment-level landscape limnology by incorporating these attributes (Soranno et al., 2010). To promote standardized large sample studies and improve the utility of our Res-CN, we have incorporated catchment attributes initially introduced by Addor et al. (2017) in their Catchment Attributes and MEteorology for Large-sample Studies (CAMELS), as well as numerous follow-up studies such as CAMLES-CL, CMALES-BR, CAMLES-GB, (Alvarez-Garreton et al., 2018; Chagas et al., 2020; Coxon et al., 2020), LamaH-CE (Klingler et al., 2021), CCAM (Hao et al., 2021), LakeALTAS (Lehner et al., 2022), and studies by Chen et al. (2022) and Liu et al. (2022), while additionally including several other attributes. These lake datasets and station-based datasets of catchment characteristics proved that catchment-level attribute datasets are very useful.

**Summary and application:** We envision that Re-CN with its comprehensive and extensive attributes can provide strong supports to a wide range of applications and disciplines. Firstly, the included catchment-level attributes and time series with a high temporal resolution as well as the interconnected stream network offer exciting opportunities in a spatially explicit context to simulate the water and sediment transfer if appropriate approaches are used. For example, machine-learning methods make it possible to predict reservoir storage change at 1- to 3-month lead from reservoir upstream attributes and timeseries of reservoir states (Tiwari et al., 2019). This is particularly true if the reservoir inflow is also utilized. Recently, the gridded natural runoff provided by Gou et al. (2021) provides exciting opportunities for quantifying the human water regulation in combination with Res-CN (Dang et al., 2022; Shin et al., 2020).
Thirdly, catchment-level attributes are important and can be used to explore water fluxes and sediment transportation especially in reservoirs that have not been sampled. Studies on cascading patterns in reservoir attributes found that each attribute may display linear function of catchment area, concluding that cascading patterns of each attribute have different implications for dam management (Faucheux et al., 2022). For instance, one study combined knowledge of basin attributes with economic, climate, and landscape data to

inform reservoir removal decisions in California's Central Valley basin (Null et al., 2014). Besides, these catchment-level attribute datasets have also been demonstrated to be highly valuable in other studies (Addor et al., 2017; Coxon et al., 2020).

## References:


Soranno, P. A., Cheruvelil, K. S., Webster, K. E., Bremigan, M. T., Wagner, T., and Stow, C. A.: Using Landscape Limnology to Classify Freshwater Ecosystems for Multi-ecosystem Management and Conservation, Bioscience, 60, 440–454, https://doi.org/10.1525/bio.2010.60.6.8, 2010.

Addor, N., Newman, A. J., Mizukami, N., and Clark, M. P.: The CAMELS data set: catchment attributes and meteorology for large-sample studies, Hydrol. Earth Syst. Sci., 21, 5293–5313, https://doi.org/10.5194/hess-21-5293-2017, 2017.

Alvarez-Garreton, C., Mendoza, P. A., Boisier, J. P., Addor, N., Galleguillos, M., Zambrano-Bigiarini, M., Lara, A., Puelma, C., Cortes, G., Garreaud, R., McPhee, J., and Ayala, A.: The CAMELS-CL dataset: catchment attributes and meteorology for large sample studies – Chile dataset, Hydrol. Earth Syst. Sci., 22, 5817–5846, https://doi.org/10.5194/hess-22-5817-2018, 2018.

Chagas, V. B. P., Chaffe, P. L. B., Addor, N., Fan, F. M., Fleischmann, A. S., Paiva, R. C. D., and Siqueira, V. A.: CAMELS-BR: hydrometeorological time series and landscape attributes for 897 catchments in Brazil, Earth Syst. Sci. Data, 12, 2075–2096, https://doi.org/10.5194/essd-12-2075-2020, 2020.

Coxon, G., Addor, N., Bloomfield, J. P., Freer, J., Fry, M., Hannaford, J., Howden, N. J. K., Lane, R., Lewis, M., Robinson, E. L., Wagener, T., and Woods, R.: CAMELS-GB: hydrometeorological time series and landscape attributes for 671 catchments in Great Britain, Earth Syst. Sci. Data, 12, 2459–2483, https://doi.org/10.5194/essd-12-2459-2020, 2020.

Hao, Z., Jin, J., Xia, R., Tian, S., Yang, W., Liu, Q., Zhu, M., Ma, T., Jing, C., and Zhang, Y.: CCAM: China Catchment Attributes and Meteorology dataset, Earth Syst. Sci. Data, 13, 5591–5616, https://doi.org/10.5194/essd-13-5591-2021, 2021.
Klingler, C., Schulz, K., and Herrnegger, M.: LamaH-CE: LArge-SaMple DAta for Hydrology and Environmental Sciences for Central Europe, Earth Syst. Sci. Data, 13, 4529–4565, https://doi.org/10.5194/essd-13-4529-2021, 2021.

Chen, T., Song, C., Fan, C. Cheng, J., Duan, X., Wang, L., Liu, K., Deng, S., and Che, Y.: A comprehensive data set of physical and human-dimensional attributes for China's lake basins. Sci. Data., 9, 519, https://doi.org/10.1038/s41597-022-01649-z, 2022.

Lehner, B., Messager, M. L., Korver, M. C. and Linke, S.: Global hydro-environmental lake characteristics at high spatial resolution. Sci. Data, 9, 351, https://doi.org/10.1038/s41597-022-01425-z, 2022.

Liu, J., Fang, P., Que, Y., Zhu, L.-J., Duan, Z., Tang, G., Liu, P., Ji, M., and Liu, Y.: A dataset of lake-catchment characteristics for the Tibetan Plateau, Earth Syst. Sci. Data, 14, 3791–3805, https://doi.org/10.5194/essd-14-3791-2022, 2022.

Tiwari, A.D., and Mishra, V.: Prediction of reservoir storage anomalies in India, J. Geophy. Res. Atmos., 124, 3822–3838, doi: 10.1029/2019JD030525, 2019.

Faucheux, N. M., Sample, A. R., Aldridge, C. A., Norris, D. M., Owens, C., Starnes, V. R., VanderBloemen, S., and Miranda, L. E.: Reservoir attributes display cascading spatial patterns along river basins. Water Resources Research, 58, e2021WR029910, https://doi.org/10.1029/2021WR029910, 2022.

Null, S. E., Medellín-Azura, J., Escriva-Bou, A., Lent, M., and Lund, J. R.: Optimizing the dammed: Water supply losses and fish habitat gains from dam removal in California. J. Environ. Manage., 136, 121–131, https://doi.org/10.1016/j.jenvman.2014.01.024, 2014.


## Section 3.4.5: Again, why are these specific human activities selected for analysis and how are those useful?

R2C13: Yes, Hope the above R2C12 response addressed your concern.

References:

Liu, J., Fang, P., Que, Y., Zhu, L.-J., Duan, Z., Tang, G., Liu, P., Ji, M., and Liu, Y.: A dataset of lake-catchment characteristics for the Tibetan Plateau, Earth Syst. Sci. Data, 14, 3791–3805, https://doi.org/10.5194/essd-14-3791-2022, 2022.

Related to the above comments on the utility of various characteristics, I would suggest adding one figure on the ratio of reservoir storage and/or surface area to catchment size.

R2C14: Thanks for your reminder! Actually the ratio of reservoir storage and/or surface area to catchment size is already included in the dataset of "topographic characteristics". We have created the figure S13 as suggested.

Main text: Besides, we also added "resArearatio" to describe the proportion of the reservoir water surface area to the catchment area (Fig. S13).

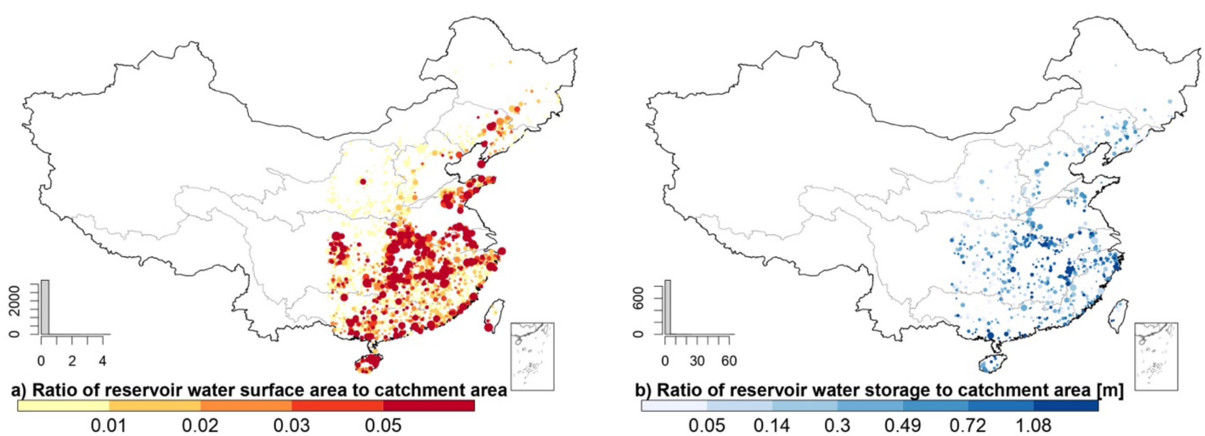


**Figure S13.** Spatial distribution of the ratios of reservoir water surface area and storage to catchment area. Note: not all reservoir water storage data are available from the GeoDAR database (Wang et al., 2022).

Overall/General: the number of reservoirs selected for various purposes is different and validation is provided for a limited subset. Please try to have consistency and expand the validation effort.

R2C15: We apologize for the inadvertent omission of the validation figures for the 138 reservoirs in our Res-CN dataset. We have taken corrective measures by uploading the figures to the same Zenodo link of our Res-CN data product, and we kindly request that you access them from there [https://doi.org/10.5281/zenodo.7664489](https://doi.org/10.5281/zenodo.7664489).

Considering the extensive information contained within the supplementary file, we recognize the potential benefits of incorporating the validation figures - which, due to their size, span multiple pages - in our data product to facilitate user access and convenience. However, we also recognize the importance of maintaining a balance between completeness and conciseness in the main text. Consequently, we have presented only a subset of validations for select reservoirs alongside the overall evaluation accuracy. Nevertheless, we would like to assure users that all validation information is available in the data products. We are confident that this balance between completeness and conciseness is in line with the expectations of our readers, and we encourage them to refer to the data products for more detailed information.

The validation figures for all 138 reservoirs can be found in the **"validation_figures"** folder, which includes the time series of reservoir water level, water area, storage variation, and evaporation. In the "water level" directory, the time series of reservoir water level are available in two modes, i.e., high rate product and standard rate, along with their comprehensive evaluation reports and figures in PDF and TXT files. The "water area" directory provides the monthly area time series of reservoirs, accompanied by their comprehensive evaluation Excel files, including CC values compared with satellite-based water level, in situ water level, and other areal time series from other studies. Finally, the "storage variation" directory includes the time series and comprehensive evaluation figures in PDF files, which include statistical metrics.

Thank you for your feedback, and we hope that the inclusion of these validation figures will facilitate the use of our Res-CN dataset.

Minor/Editorial comments:

L48, "…especially driven by climate warming and …": not clear "what" is driven by climate and population; revisions needed.

We have rephrased as follows:
it is essential to develop a comprehensive publicly available reservoir data set in the context of growing interest of reservoir studies and water managements.

L80: should be "altimetry-based reservoir datasets" and "Chinese reservoirs"

Thanks, we have changed as:

In three popular altimetry-based reservoir datasets (Hydroweb, G-REALM, and DAHITI), there are approximately 30 Chinese reservoirs.

L101: please spell out GEE

Thanks, we have changed as:

GEE (Google Earth Engine)

L108: delete “for”

Thanks, we have deleted it.

Figure 1 caption and elsewhere: I suggest “water SURFACE area” instead of “water area”; this applies to Section 2.2 as well.

Thanks, we have changed as water surface area throughout the paper.

L133: please check grammar.

We have rephrased it:

The Global Surface Water Explorer was used to select altimetric data for which water occurrence is greater than 10% (Zhang et al., 2020).

Figure 3 caption: “dimensionless XX? is indicated ....”

We deleted this sentence, and not show this symbol.

References

Dang, H., Pokhrel, Y., Shin, S., Stelly, J., Ahlquist, D., Du Bui, D., 2022. Hydrologic balance and inundation dynamics of Southeast Asia's largest inland lake altered by hydropower dams in the Mekong River basin. Science of The Total Environment, 831: 154833.

Dang, T.D., Vu, D.T., Chowdhury, A.K., Galelli, S., 2020. A software package for the representation and optimization of water reservoir operations in the VIC hydrologic model. Environmental Modelling & Software, 126: 104673.

Galelli, S., Dang, T.D., Ng, J.Y., Chowdhury, A., Arias, M.E., 2022. Opportunities to curb hydrological alterations via dam re-operation in the Mekong. Nature Sustainability: 1-12.

Shin, S., Pokhrel, Y., Yamazaki, D., Huang, X., Torbick, N., Qi, J., Pattanakiat, S., Ngo-Duc, T., Nguyen, T.D., 2020. High Resolution Modeling of River-Floodplain-Reservoir Inundation Dynamics in the Mekong River Basin. Water Resources Research, 56(5): e2019WR026449.

Thanks, we have cited all these valuable studies in the main text.

Introduction: Results of this study facilitated managements of reservoirs and relevant studies such as hydrological modeling, environmental studies, and climate research in the spatially explicit context of reservoir catchment-level (Galelli et al., 2022; Dang et al., 2020).

Summary and applications: This is particularly true if the reservoir inflow is also utilized. Recently, the gridded natural runoff provided by Gou et al. (2021) provides exciting opportunities for quantifying the human water regulation in combination with Res-CN (Dang et al., 2022; Shin et al., 2020).