Response to the referee comments (RCs)

Anonymous Referee #2

Edward Park

R: I suggest a moderate revision for this manuscript. The article is well-formulated and addresses an academically significant topic with a technically robust methodology. The authors are recognized experts in this domain, and the methods employed are sound. The manuscript tackles the critical issue of reservoir constructions, compiling a valuable database of storage changes in one of the global hotspots, with significant implications for water resource management and the global population in Southeast Asia. The study is timely and has the potential to serve as an important resource for both the scientific community and policymakers working on water-related issues in the region.

Given the nature of the journal, ESSD, where the emphasis is on "resource/data publication," innovation may not necessarily be the highest priority. Instead, the value lies in building a platform that supports future research utilizing this data. Since the methods presented are sound, my comments are primarily focused on strengthening the narrative and justifying the study's broader scientific and practical implications.

A stronger justification of the research gap would enhance the manuscript. The current gaps presented seem incremental rather than innovative, improving on existing models, datasets, or studies rather than breaking new ground. While incremental research is meaningful, the study could benefit from highlighting novel techniques or scientific insights.

A: We thank the reviewer for the positive feedback. We will carefully address all your comments to further strengthen the manuscript.

R: On line 72, the paragraph starts with a question. Instead, I suggest stating the research question in a more formal manner to improve clarity.

A: We will rephrase the opening of this paragraph by clearly stating the research question.

R: On line 103, "dams" should likely be replaced with "reservoirs" for consistency and accuracy in terminology.

A: Yes—thank you for spotting this inconsistency.

R: Section 4 stands out as particularly interesting and potentially valuable. The authors provide insights into how storage patterns have evolved over the years and across different basins. This part of the study could serve as critical baseline information for future research in this domain.

R: The final section is also commendable, as it validates the utility of the database and demonstrates its application with a specific recent example. The analysis of the impact of the 2019–2020 drought on surface water storage effectively highlights the significant effects of extreme dry weather events on water resources in Mainland Southeast Asia. The demonstration of MSEA-Res's utility for hydrological modeling and other applications adds significant value to the manuscript.

A: Thank you for your positive and encouraging feedbacks.

R: Regarding figures, Fig. 1a would be more informative if the river network were included on the map. This would provide additional spatial context for readers.

A: Please find below the revised version of the figure that we plan to include in new version of the manuscript.

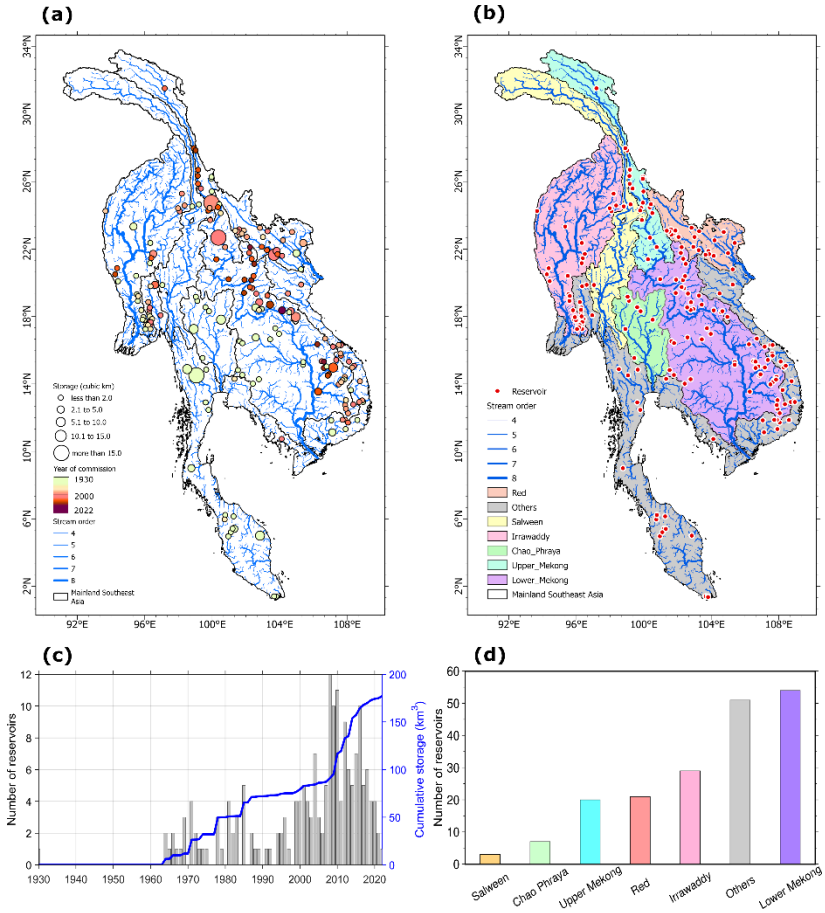

Figure 1: *Spatial distribution and evolution of reservoirs in Mainland Southeast Asia. (a) Map showing reservoir storage volume (km^3), where the size of the circle is proportional to the reservoir capacity while the colour represents the year of commission of the dams. (b) Basin-wise distribution of dam location (red dots), stream network, and order. (c) Number of dams built per year and their corresponding cumulative storage capacity. (d) Basin-wise total number of reservoirs built until 2023.*

R: For Fig. 3, it would be helpful to include an example map or image alongside the text description for each static component. This would improve clarity and accessibility for readers unfamiliar with the methodology.

A: We also believe this addition would improve clarity and accessibility for readers. The static component (only the Area-Storage-Elevation Curve) is illustrated in Figure 4, which we have updated to show the maximum water extent and frequency maps, and thus, keeping Figure 3 unchanged. The updated Figure 4 is attached below for your reference.

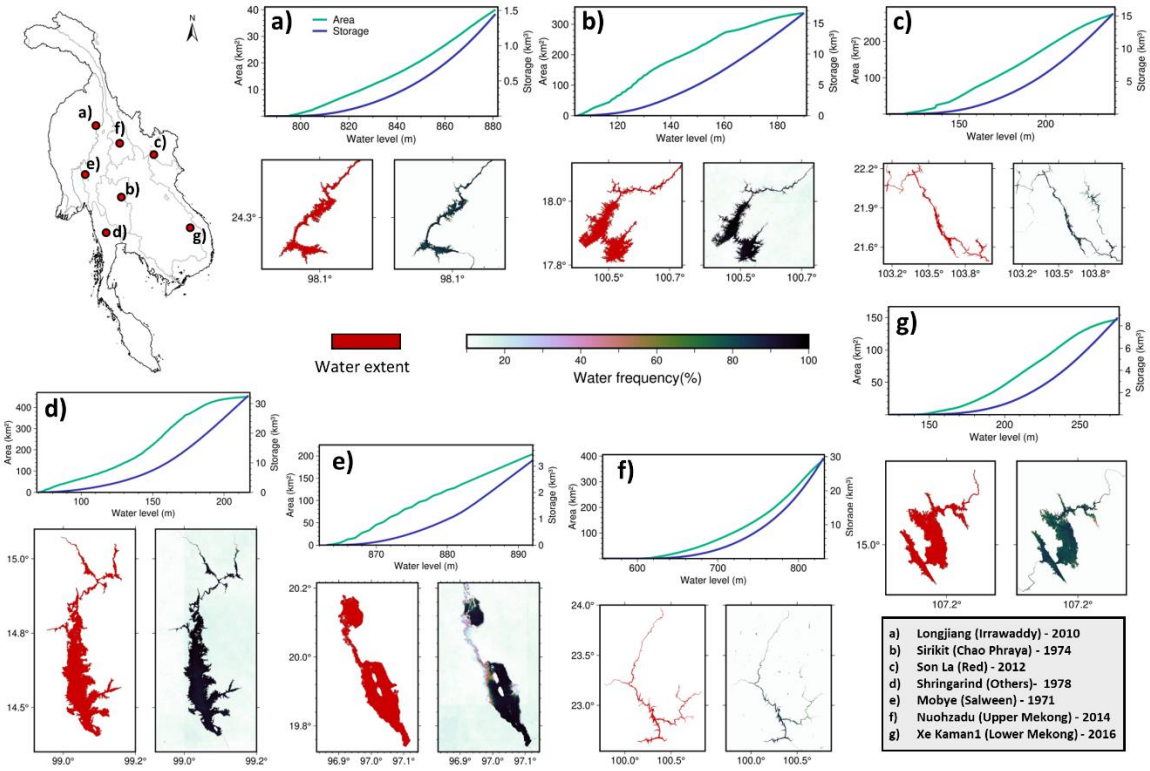

Figure 4: *Illustration of the static components of MSEA-Res database (Area-Elevation-Storage relationship) for seven reservoirs, one in each of the major river basins, based on their maximum storage capacity. In each panel, (top) Elevation-Area (E-A) and Elevation-Storage (E-S) curves are shown in green and blue, respectively; (bottom-left) maximum water extent map, and (bottom-right) frequency map. The dates refer to the years of commission of the reservoirs.*

R: On line 367, the authors removed three low-performing reservoirs to improve the correlation. It would be beneficial to provide a clear justification for why these reservoirs were excluded from the statistics. Additionally, addressing the reasons behind the underperformance of certain reservoirs compared to others, as well as discussing the overall accuracy of the dataset, would strengthen the manuscript. For example, Fig. 8A suggests a potential systematic spatial distribution of R^2 values. If this is indeed the case, it may imply a methodological bias, which should be addressed in the discussion.

A: Our point was to emphasize that the majority of the selected reservoirs (17 out of 20) showed good agreement (average $R^2 = 0.68$ and average nRMSE = 17%) between estimated and directly observed storage, while only three (out of 20) did not agree well. This said, we understand that the current version of the paragraph could be misleading, so we will revise it to also include the average R^2 and nRMSE for all 20 reservoirs.

In the revised manuscript, we will also discuss the reasons behind the underperformance of certain reservoirs, which is likely due to the combination of two factors, namely:

(1) potential inaccuracies in the hypsometric curves used to transform inferred water surface into (inferred) absolute reservoir storage, and

(2) The quality of satellite data (cloud free data availability and gap filling) for NDWI estimation, which can be enhanced by satellite image pre-processing such as contrast stretching and histogram equalization.

Please also note that, to further prove the reliability of our data, we will compare the derived maps (maximum water extent and frequency) with the other data products, such as the Global Surface Water Dataset (GSWD) (Pekel et al., 2016). This is a comparison that was recommended by reviewer #3.

References:

1. Pekel, J. F., Cottam, A., Gorelick, N., & Belward, A. S. (2016). High-resolution mapping of global surface water and its long-term changes. Nature, 540(7633), 418-422.