Dear Handling topical editor David Carlson,

We are very happy to hear the positive feedback on our datasets and thank you so much for your great work and insightful comments for improving our manuscript. Please find the attached response to the questions raised by your side and small suggestions by third referee. We hope the revised texts and responses are to your satisfaction.

Best,

Youjiang Shen.

Review by editor (David Carlson)

Comments to the author:
Thank you for sharing products of complex data processing effort.

I read some residual language uncertainties, due perhaps to Chinese-English translation. I assume Copernicus language experts will solve these. Authors will need to provide close attention and frequent correspondence during proofing steps.
E1C0: Thank you so much for improving our manuscript and we will pay close attention on these language uncertainties and give frequent correspondence during proofing steps.
Three questions remain as we move forward:
1) Authors frequently make the point that these data cover 50% of national water storage capacity. What about remaining 50%. Why these? What about other 'missing' data. Do authors plan future studies on other 50%?
E1C1: Thank you for your question. This issue is mainly due to the low spatial coverage of current satellite datasets. We need to be aware that the satellite altimetry ground track is rather sparse. The majority of the remaining 50% reservoirs are not crossed by the ground tracks. Therefore, no altimetry data is available. Future satellite missions such as SWOT mission with higher resolution may fill the data gap. Yes, if future products cover these reservoirs, we will update this dataset.
The corresponding revised texts are marked in red in our texts (Section 5) and copied here for your convenence.
Nonetheless, for reservoirs accounting the remaining 50% water storage capacity, current satellite altimetry missions are not able deliver enough useful observations or detect these reservoirs given by their sparse altimetric ground tracks, therefore, not included in our products. Developing more general algorithms with better performance regardless of the reservoir's attributes and using satellite altimetric data with higher temporal resolution (e.g., Surface Water and Ocean Topography mission, Biancamaria et al., 2016) will be our next studies. Overall, our study fills such a data gap by incorporating various satellites into a comprehensive reservoir data set at national

scale. We envision this dataset can be immediately applied to some scientific areas described in Sect. 4, and can provides strong support for many aspects such as hydrological processes and water management studies.

References:

Biancamaria, S., Lettenmaier, D. P., and Pavelsky, T. M.: The SWOT mission and its capabilities for land hydrology, Surv. Geophys., 37, 307–337, doi: 10.1007/s10712-015-9346-y, 2016.

2) Authors say most reservoirs lie in eastern and central China. Map in Figure 1 shows distribution but also raises a classification issue. With good latitudinal coverage but relatively narrow longitudinal coverage, most reservoirs lie in lower (elevation and flow) regions, with hydrological impacts? Understand about availability of in situ gauge data but, related to question about other 50% above, what biases if any do authors expect from somewhat restricted geographic focus. E.g. if most of this water used for irrigation rather than power generation, then users should expect different seasonal patterns of water withdrawal. Withdrawal patterns might vary upstream vs downstream. As a caution to users, authors need to more explicitly defend their selections?

E1C2: Thank you for your question. Hope the above response partly addressed your questions. Firstly, this is true that Chinese reservoirs are unevenly distributed across the nation, i.e., most reservoirs lie in eastern and central China. And our products show the similar distributing pattern. Regarding our selections of these reservoirs, still, this issue is mainly due to the availability of satellite datasets or in situ gages. Therefore, only reservoirs covered by satellite altimetry datasets are selected for further processing. For the main use of reservoirs in our products, their attributes are summarized in datasets reservoir_attributes.xlsx.

3) Authors allow confusion about 338 vs 93 reservoirs. Help readers better understand validation processes on 93 and extension of those to 338?

E1C3: Again, it is mainly due to the availability of in situ data. We try to help readers to better understand this validation processes. In the section 2, we firstly introduce the initial reservoirs that are used for processing and our collected in situ datasets.

In this study, we selected all reservoirs for which geographical information is available from the GRanD database (http://globaldamwatch.org/grand/, Lehner et al., 2011). We obtained daily water level and storage data spanning 2015–May 2021 for 93 reservoirs from the local watershed agency (http://xxfb.mwr.cn/index.html) and National Hydrological Information Centre for validation (http://113.57.190.228:8001/web/Report/BigMSKReport).

Followed by the methodologies, we then give a data description in section 3.1.

In this study, we generated the remotely sensed reservoir datasets for 338 Chinese reservoirs, with a total of 470.6 km^3 storage capacity (50% reservoir water capacity in China). In the directory of 01_res_loc, we provide two ESRI shapefiles (the location of

338 reservoirs and 93 reservoirs with in-situ observations for validation) and one Excel file describing their associated attributes.

In section 3.2, we explained why 338 reservoirs are finally retained in our products.

In total, 921 reservoirs are visited by the six altimetry missions over China during CryoSat-2 era, providing basic WSE information. After outlier removal, time series construction and combination, and visual inspection, we finally retain 338 reservoirs that have enough valid measurements. Note that, most reservoirs are removed due to the insufficient altimetry data points rather than other reasons.

4) Zenodo data link shows two versions of 01 res_loc files. One apparently for MACOSX? Good description of upper files but please also explain (or remove) lower files?

E1C4: Thank you for your suggestions. I deleted the MACOSX version and checked the data set. A more detailed description of is enclosed in ReadMe file, and my email/(future published DOI) is also posted on Zenodo so that users can contact me if any inconvenience to download these datasets happens.

Review by third referee (Anonymous Referee)

I appreciate the authors' great efforts in addressing my comments. The manuscript has been much improved compared to the previous version. I think it is almost ready for publication in ESSD. Before that, I would suggest clarifying what kind of A-E relationships (e.g., R2 threshold) have been considered as valid relations to estimate reservoir storage variations in your product. Because storage estimates would be useless if they were based on poor A-E relationships.

R3C0: Thank you for your insightful comments for improving our manuscript. This question has been also explained in response 5 to second referee.

Firstly, we will say that 0.5 R^2 threshold value is used as valid relations to estimate reservoir storage variations in our product, which is also used in previous studies (Busker et al., 2019; Li et al., 2020).

Secondly, in our revised dataset, we performed strict data quality control to eliminate any potentially problematic data points, resulting a reliable A–E curve for most reservoirs (84%) with R^2>0.5.

Thirdly, we used in-situ observations of 91 reservoirs as an important reference to validate RWSC dataset, thus bringing the good level of confidence in our data quality.

Furthermore, we provided monthly RWSC time series from 2010 to 2021 in two modes: one is to use WSE and SWA from satellite altimeters and images, while another one is to use satellite SWA and area-storage model developed by DEM, as suggested by referee 1.

References:

Busker, T., de Roo, A., Gelati, E., Schwatke, C., Adamovic, M., Bisselink, B., Pekel, J.-F., and Cottam, A.: A global lake and reservoir volume analysis using a surface water dataset and satellite altimetry, Hydrol. Earth Syst. Sci., 23, 669–690, doi: 10.5194/hess-23-669-2019, 2019.

Li, Y., Gao, H., Zhao, G., and Tseng, K. H.: A high-resolution bathymetry dataset for global reservoirs using multi-source satellite imagery and altimetry, Remote Sens. Environ., 244, 111831, doi: 10.1016/j.rse.2020.111831, 2020.