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## Reply on RC1

Jiaming Chen et al.

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Author comment on "A dataset for lake level changes in the Tibetan Plateau from 2002 to 2021 using multi-altimeter data" by Jiaming Chen et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-313-AC1>, 2022

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The authors would like to express thanks to the anonymous reviewer for his voluntary work and the constructive comments to improve this manuscript. All of the comments are of great benefit to us. During the past few days, we did much work to revise the manuscript according to the reviewer's comments. All of the comments have been addressed as following:

**RC1:** 'Comment on essd-2022-313', Anonymous Referee #1, 17 Nov 2022

**Q:** This study provides the time series of water level for lakes in the Qinghai-Tibetan Plateau between 2002 and 2021 using altimeter data from Envisat, ICESat-1, CryoSat-2, Jason-1, Jason-2, Jason-3, SARAL, and Sentinel-3A. The water level data in 2002-2021 provided by this study is not new, and have been reported by couple of previous studies. This study did not present well such as time series of lake level and not story focused such as the mention the discharge without close relation with study study. Moreover, the authors did not know the background information of lakes over the Tibetan Plateau well. I can not recommend the publication of this manuscript (dataset).

**Reply:** Although the water level data provided by this study is not new, we provide the largest number of monitored lakes among the available studies. In the revised version, we added the analysis of the variation of lake level in different basin, while the discharge mentioned in the manuscript is mainly to illustrate the application of lake level data, which refers to the fact that we can explore the regulation of the rivers associated with the lake using lake level data.

**Q:** 1) Although this study provides the time series of water level of lakes in the Qinghai-Tibetan Plateau from eight altimetry products, this dataset is not new compared with published studies, especially in a limited period (2002-2021). Hydroweb and other websites have provided open access lake level data since 1992, which has covered the altimetry data used in this study.

**Reply:** These eight altimetry products are already used in published studies, but the number of lakes monitored based on them is very limited, as can be seen in the following table.

Paper	No. of Lakes	Period	Data Source	Dataset Public or not
Jiang et al. (2017)	70	2003-2015	IceSat-1, Cryosat-2	N
Zhang et al. (2017)	68	1989-2015	IceSat-1, Landsat	N
Li et al. (2017)	167	2002-2012	IceSat-1, Envisat	N
Hwang et al. (2019)	59	2003-2016	Jason-2/3, SARAL, IceSat-1, Cryosat-2	N
Li et al. (2019)	52	2000-2017	Jason-1/2/3, Envisat, Cryosat-2, IceSat-1	Y
Zhang et al. (2019)	62	2003-2018	IceSat-1/2	Y
Hydroweb (Cretaux et al. 2011)	36	1993-2022	ERS-2, Envisat, T/P, IceSat-1, SARAL, Jason-1/2/3, Cryosat-2, Sentinel-3A	Y
DAHITI (Schwatke et al.)	62	2003-2022	ERS-2, Envisat, SARAL,	Y

2015)			Sentinel-3A, Cryosat-2, IceSat-1, Jason-2/3,
This Study	362	2002-2021	Envisat, SARAL, Y IceSat-1, Cryosat-2, Jason-1/2/3, Sentinel-3A

As we know, a large number of lakes exist on the Tibetan Plateau, and monitoring the water levels of these lakes is very important for understanding the water cycle on the this plateau. Our study monitored the largest number of lakes with an area greater than 10 km<sup>2</sup> compared to previous studies. We believe that considering more lakes will be useful to find more details, driving mechanisms, and patterns of changes in the Tibetan Plateau. So this is also the objective of this manuscript.

**Q:** 2) The presentation of this study is not good such as Figures 3 and 4. Flowchart 1 and 5 should be combined together. For a scientific paper, the figures should be drawn by a scientific standard. Moreover, the offset among the different altimetry data was addressed? How?

**Reply:** Thank for your comments. We have combined the Figure 3 and 4, and drawn the figure again, please see the revised manuscript. Since Flowchart 1 and 5 represent different processes for altimetry data, Flowchart 1 is mainly the waveform retracking processing of altimetry data, while process 5 is mainly the fusion processing of water level data extracted from multi-source altimeters, which are different and not suitable for merging, so the two flowcharts are retained.

In this manuscript, the main merged method removes the offset between different altimetry data by subtracting the mean discrepancy obtained during the overlap period.

Thus, we will pick the dynamic reference time series to make the merged time series as long as possible for each time in case there are no overlap period.

On the other hand, it also exists some lakes with no overlap period when merging ICESat-1 and Cryosat-2. In this case, we will consider using a combined linear-periodic-residual model (Liao et al., 2014) to simulate and forecast lake-level time series in the no-overlap period, and then make it possible to obtain the offset between ICESat-1 and Cryosat-2. These details are presented in section 3.2.

**Q:** 3) What is the difference of boundaries between Qinghai-Tibetan Plateau and Tibetan Plateau? How the comparison of time series of altimetry data and in-situ? Why the streamflow and discharge data are used, but the analysis of water level and advantage of your study are not clear?

**Reply:** There is no difference of boundaries between Qinghai-Tibetan Plateau and Tibetan Plateau. In China, people used to call Qinghai-Tibetan Plateau (QTP), but internationally, it is used to call Tibetan Plateau (TP). To avoid misunderstanding, we have revised as the Tibetan Plateau in this manuscript.

Due to the unknown datum of in situ data, here we consider comparing the water level anomaly between in situ data and lake level in this study by removing the mean value over the validation period. In the revised vision, in order to show the validate results of lake level in this study, we added a figure comparing the in situ data with the lake level in this study.

The streamflow and discharge data are used to show that lake levels can be used to explore the regulation of the rivers associated with the lake, and this is just one case of the application of lake levels. In addition, we added the analysis of water level changes in lakes in different basin, so it further indicates that our study is much clear in reflecting the spatial and temporal variability of lakes on the Tibetan Plateau.