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Interactive comment on "Evaluation of Historic and Operational Satellite Radar Altimetry Missions for Constructing Consistent Long-term Lake Water Level Records" *by* Song Shu et al.

Anonymous Referee #2

Received and published: 25 November 2020

The paper evaluates water levels based on almost all historic and current altimetry missions and their standard retrackers over 12 lakes of different sizes. Here, especially, the results of the older missions are interesting. The main issue with this paper is the small sample size. 12 lakes are too small to provide any solid recommendations. Having a larger and more representative sample size would make this paper much more valuable. The Paper is well written and organized. The paper can be accepted if the review comment is addressed. Here, especially a discussion of low sample size is needed and the conclusions should be modified accordingly.

General comments: To make solid statements and recommendations about the rekrak-

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Discussion paper

ing performance, 12 lakes are too small a sample size. This should at least be mentioned in the discussions section. However, the results in the paper support similar results in the literature.

The method section is vague and must be extended so it at least summarizes the methods from the mentioned reference studies. Hence, The MAD is estimated but what is the threshold to reject an observation.

A main point in the paper is to construct consistent long-term time series and one of the issues is the intermission/retracking bias. In section 5.2 the gauge is used to estimate the biases. However, as discussed in the Discussion Section a gauge is not always available and therefore the bias should be estimated relative to a reference(s) mission. Why did the authors not test this approach?

Why do the authors select evaluation targets in ice-covered regions when measurements during ice-covered periods are removed anyway?

Why only use 1 track from each mission in the time series if more are available, this would improve the temporal resolution and the statistical foundation. Anyway, some of the missions are in different orbits anyway. For this reason, C2 could also have been included. Several authors have successfully applied C2 for lake level estimation.

Specific Comments

L296: Shu et al, 2020 is not the reference of the standard S3A retrackers.

L306: why only use such a small time period of S3 and Jason-3 in the evaluation?

L331: add a reference to EGM2008

L361: which criterion is used to remove outliers

L364: "through" -> over

L393: The r indicates -> the Pearson correlation r ...

L420: When you calculate the data loss rate is that based on the "valid" measurements or all measurements

L440: This only makes sense to state if the gauge and altimetry has the same vertical reference

L448: is the bias calculated w.r.t the gauge? then add this

L495-503: Put all the numbers in a table

L510: Such conclusions are difficult to state based on just a few lakes

L582: How would you determine which mission provides the best measurement?

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