Earth Syst. Sci. Data Discuss., referee comment RC3
https://doi.org/10.5194/essd-2022-266-RC3, 2022

Comment on essd-2022-266

Anonymous Referee #2

Referee comment on "GloLakes: water storage dynamics for 27□000 lakes globally from 1984 to present derived from satellite altimetry and optical imaging" by Jiawei Hou et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-266-RC3, 2022

Hou et al. presented a nice study on creating a new time-varying dataset on global lake water storage. Understanding the lake storage variablity is critical for securing freshwater supplies. The authors leveraged multiple datasets to produce a global dataset with hundreds of thousands of lakes included, which seems to be an impressive work. However, I have a few major comments on the method and data quality.

Pekel et al. used a global model to classify water and land. The authors depended on the Pekel et al.'s data to track water area changes in each lake locally. It is not clear to me whether the global model is suitable for studying each individual water body, for example, how can lake area change be accurately captured by the global model in each lake?

The monthly lake areas were generated from recovering water areas from contaminated images as in a previous publication by the authors (Hou et al., 2022). This is not new as quite a few recent studies have done a similar thing. As monthly lake areas are critical for generating monthly storage given monthly level data is pretty rare, the uncertainty of the recovered water areas seems to have non-negligible impact on the derived storage change. Had the authors assessed the uncertainty of areas from contaminated images? How did the generated time series compare with other existing approaches?

I do not believe the Geo-statistical model used by Messager et al., 2016 to predict the total volume of a lake can be used to derive actual lake bathymetry here. The Geo-statistical model was based on global DEM products which have an uncertainty of several meters on average. Additionally, the water level conditions at the DEM acquisition time vary. As the used DEM data in Messager et al., 2016 cannot retrieve the true land surface elevation underneath water, I think this would introduce an even larger uncertainty (e.g., dozens of meters) when the authors extrapolated water levels beneath the level at the DEM acquisition date.

The validation appears to be insufficient. How did the authors select the 238 lakes for the validation and why this is a comprehensive evaluation? Did the authors consider the performance of the method on cold-region lakes (e.g., in Canada). What the accuracy for smaller lakes given this method is only significant on small lakes as existing studies did a fairly good estimate on large lakes. Why the authors use relative metric R given R only gives a correlation estimate? For example, if the storage was scaled from area, no matter how large the level error is, the R value remains the same. Without a comprehensive validation, it is hard to foresee that the produced datasets would be useful for scientific inquiries.

Specific comments:

Line 64: I would suggest replacing "a larger number" with the actual number.

Line 86: It seems that Avisse et al. is not the only study on estimating lake storage change based on DEM data. Maybe also highlight other relevant studies here.

Line 280: the authors only show a few case studies for the validation. It would be better to have a figure or table to show all data used for the validation.