Response to the editor

16 Jul 2022
Topical Editor decision: Reconsider after major revisions
by Kenneth Mankoff
Comments to the author:

Dear Authors,
The manuscript is much improved based on the two rounds of reviews, but I still have some concerns about the depth of the validation, and the presentation of some of the data. I would like to see additional changes before I again consider publication.
[Response] Thank you very much your constructive comments. Here we respond all your comments point by point.

L62: Citing "Mankoff /et al./, 2020" here is not relevant and therefore incorrect. Unfortunately this citation now raises concern with the rest of your citations, which I am not as familiar with.
[Response] Thank you. We have removed this incorrect citation and went through the main text to make sure all citations are reasonable and relevant.

Eq1: Missing "d" from "Ban_NIR"
[Response] This has been corrected to '$Band_{NIR}$'.

Table 1 should be labeled GLCS1 and Table 2 should be labeled GLCS2 in the caption.
[Response] We have corrected this to: 'Table 1. Classification system of glacial lake types (GLCS1) …' and 'Table 2. Classification system of glacial lake types (GLCS2) …'

L297: Shouldn't lake elevation be constant? If it isn't this is a metric of DEM quality?
[Response] Thank you for this question. Yes theoretically, the lake elevation should be fairly constant. However, we found that lake elevation varies slightly within the lake extent due to DEM quality, acquisition date of the used DEM and lake evolution. So we agree that this may be a metric of DEM quality. As a result, and decided to employ the widely used SRTM DEM (acquired in 2000) to calculate the centroid elevations to represent individual lake elevations. We did not analyze the accuracy of DEM quality which is beyond the scope of this study.

L300: I tried to download your data to look at Lake Volume but could not download it. Do you include lake volume uncertainty? I notice in the version I have downloaded there is "Perimeter" "Area" and "Uncertain". I assume this is area uncertainty and not perimeter uncertainty? I could not be sure about this. Is Orbital number and image source the actual scene ID? Or just path/row? It is important to easily be able to find the source/original image. I suggest include SceneID, not just path/row and time/date, which can be used to figure out scene ID, but is complicated.
[Response] We have updated our lake dataset at the Mountain Science Data Center. The dataset is now open to reviewers and the editor, please download from https://cloud.imde.ac.cn:5001/sharing/nyzEXaYha with a password of imde123456. The dataset

will be open access after the publication of our article. Before that, the dataset is available upon reasonable requests to the corresponding author.

This uncertainty attribute is the uncertainty of the mapped lake water area. For improved clarity, we have renamed the attribute name to be 'AreaUncer'.

We have also replaced "IMGSOURCE" by "SceneID" which contains identifying information, consisted of the orbital ID, sensor ID and acquisition date (YYYYMMDD) for Landsat image, or the orbital ID and acquisition date (YYYYMMDD) for Sentinel-2 image. Everyone can identify individual original Landsat or Sentinel-2 image using a combination of the orbital ID and acquisition date, which is unique. In the pre-processing, we unzipped the original image files, did band composition and renamed the new stacked bands using our defined naming rule, and did not keep all original images for saving storage volume. Herein, we can not fill the SceneID using original image file names. Thank you for your understanding.

Table 3: Volume units should be cubic not square.
[Response] Revised to 'cubic meter'.

Figure 8: Should this be ylog?
[Response] As your suggestion, Figure 8 has been revised to xlog for a better presentation, considering that y-axis represents relative error (%). Then we also deleted the previous panels b-d and f-h.
The Figure 8 has been revised to be:

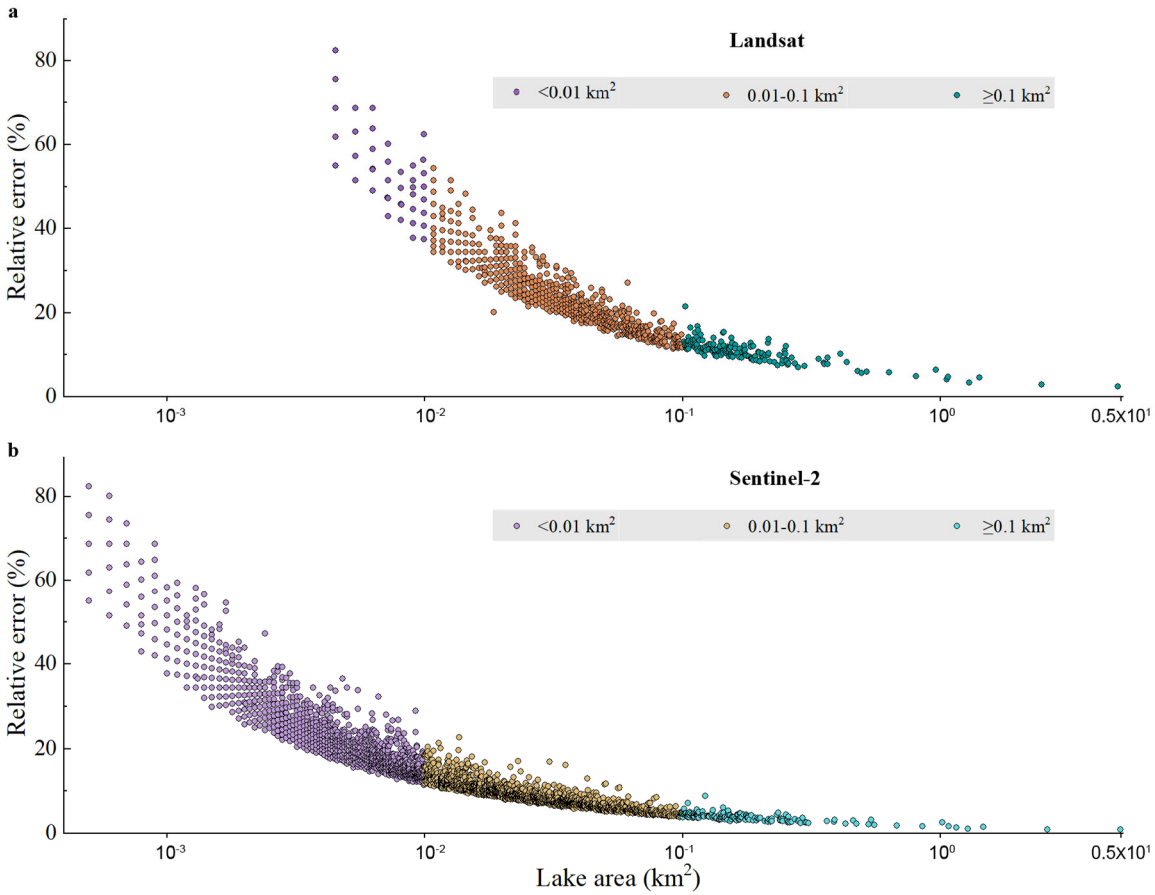

Figure 8. Estimated relative error for glacial lakes of all or specific size ranges in study area. Error estimation is based on the modified equation and lake data extracted from Landsat (a) and Sentinel-2 images (b).

Figure 9: I'm concerned that you're presenting log-distributed data over a wide range so that it appears to fit well, but the small values may have large disagreement. This can be remedied by using a log scale (if appropriate - I'm not sure if it is), and possibly using a Tukey mean-difference plot (a.k.a Bland-Altman plot). I used this, in combination with a heatmap density plot, in my 2020 "Freshwater" paper https://doi.org/10.5194/essd-12-2811-2020 (don't cite it! Not appropriate!) in case you want to see what I think might be a better presentation than Fig 9.

[Response] Thank you. We adopted Bland-Altman plot to present the results validated by Google Earth high-resolution images derived lake data in Figure 9c-d.

The Figure 9 has been revised to be:

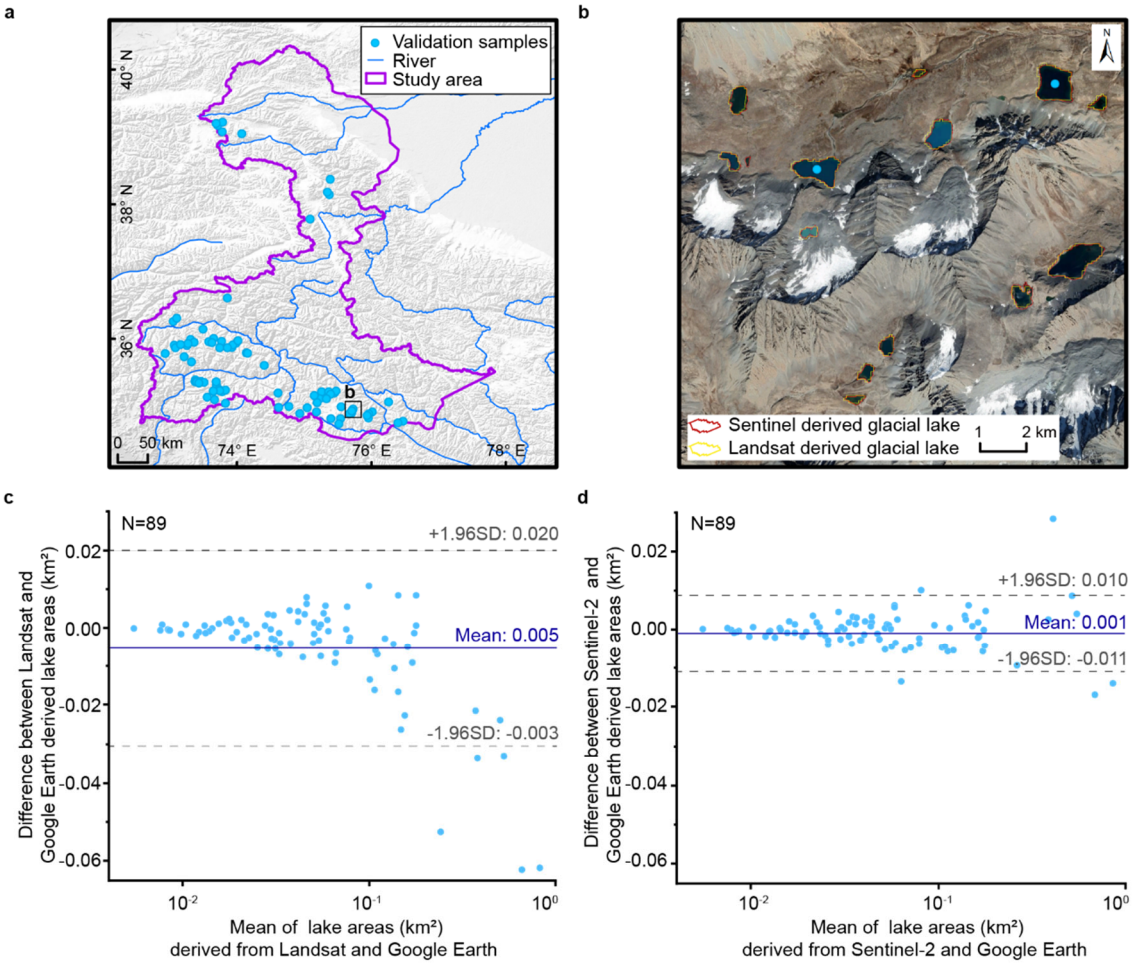

Figure 9. Distribution of validation samples (a), comparison of glacial lakes derived from Landsat and Sentinel-2 overlaying Google Earth image (© Google Earth 2019) in a zoomed site (b), and glacial lake product validated by Google Earth derived lake boundaries (c and d).

L501: I still disagree that you present evidence of dramatic changes between 2020-08-25 and 2020-09-19 and that this is not just changes due to satellites in Fig. 11. Furthermore, the 'dramatic' change seen in panels c1/c2 is same date and therefore only due to satellite. Writing of c1/c2, why are the two dark blobs in the lower right quadrant not considered lakes?

[Response] We agreed that the detected lake discrepancy resulted from both satellite image sources and the temporal changes of glacial lakes. To absorb this point, we have modified this sentence to be: '… The example is given to supraglacial lakes which showed considerable changes during a short period of time between the applied Landsat and Sentinel-2 images …' Panels c1/c2 were designed to represent that some narrow portions of the lakes (Figure 11 c1/c2) were mapped from Sentinel-2 imagery but were unable to be detected from Landsat imagery. The two dark blobs in the lower right quadrant were mapped as glacial lakes in Sentinel-2 derived dataset (not shown in previous panel c2, now we added the lake boundaries in panel c2.) but not included in Landsat-derived dataset due to lake areas less than the minimum mapping unit of 4500 m^2.

Finally, you have one validation section against Google Earth. Unfortunately Google Earth is

non-reproducible. Because of the nature of Google Earth I do not know what images you validated against. It is even possible that Google presented some of the same images to you, so you were performing a self-validation with high autocorrelation and the differences are only due to operator or interface differences. I would still like to see a more thorough validation against existing data products, and I note other reviewers have requested this too.

[Response] Google Earth images can be qualified as "valid" and "good" validation data, because (1) they are of higher resolution than our mapping source images and (2) we have digitized the lake boundaries carefully from the Google Earth. During the digitization, we zoomed the Google Earth images to be very high resolution scale in order to survey the lake boundary in situ nearly and avoid using any of the same images (Landsat or Sentinel-2 images). Truly, we do not know what images we validated against, but we make sure digitizing a lake boundary based on image with a spatial resolution of ～2 m. To shorten the difference caused by acquisition date, the Google Earth images we used for validation were mainly acquired in the circa 2020 (2016-2021) from the similar date of our mapping source images around 2020.

In Section 4.5.2., we have revised this to 'A total of 89 glacial lakes were selected by stratified random sampling and manually digitized based on the Google Earth images in circa 2020 with a spatial resolution of ～2 m acquired from WorldView, GeoEye, Pleiades etc. satellites to further validate the absolute error of our glacial lake products in 2020 …'

We did not use any Landsat or Sentinel-2 images in the Google Earth as a reference to digitize lake boundaries, so we removed a self-validation with high autocorrelation.

As your suggestion, we added a validation against existing Landsat-extracted data produced by Wang et al. (2020). It now reads 'We also validated the sampling Landsat-derived 89 lakes by the existing Landsat-extracted lake data produced by Wang et al. (2020). A total of 83 lakes are available in Wang's data with a mean difference of 0.005 km^2 in lake area (Figure A8). This also shows an improvement of our lake product in contrast to the existing dataset.'

In your latest reply-to-reviewers you have removed a section "Comparison with previous similar dataset". I think a quantitative version of this comparison, carefully comparing like with like, is a necessary requirement for publication of this data set. Please add it back in. The last version had a good discussion of different methods, but did not include a like:like comparison of a subset of the data.

[Response] As requested we have added back the section "Comparison with previous similar dataset". We also did a specific areal comparison for lakes that appeared in both inventories (with the same minimum lake size). Accordingly, we have also revised the related main text. Thank you for this suggestion.