

RESPONSE TO REFEREE#2

We thank the reviewer#2 for the review. We have carefully modified the manuscript according to the comments and suggestions. Below, we provide our responses (normal texts) to the comments (**Bold texts**) made by the reviewer#2. The *italics texts* are used to highlight the specific changes that were made in the manuscript.

The revised dataset can be viewed and downloaded using the following link:
<https://www.pangaea.de/tok/6d533482a662ef2124ed91eabdeec7b358dd8058>

1: Data Section 3.1, line 101: Landsat datasets used for multitemporal inventory for the year 1977 varies for +-5 years. For the other years variations is 1 year, which is understandable considering cloud and snow conditions. However, knowing the status of the change of snout of glaciers is it justifiable to consider one result from datasets with 5 years span period.

Response: Thank you for the comment.

We have used a total number of 17 scenes from 1972-1980, out of those 12 are from the year 1976-1977, 3 from 1979-1980 and 2 from 1972. However, 3/5 scenes outside the year 1976-1977 has been used to aid the digitization process as the same scene also exists for the year 1976-1977 (TABLE S1). The remaining scene, from outside 1976-1977 period, was used to digitize 14/246 (5%) glaciers of Leh basin and 37/256 (15%) glaciers of Zaskar basin. Overall, the scenes from outside 1976-1977 period was only used for a fraction of glaciers of Ladakh region i.e. 51/2257 (2%) glaciers.

We believe that this will have an impact on the results to some extent in individual basin even though the numbers are quite small. However, availability of the data from earlier Landsat period in this region is rare. Therefore, the dataset from 1977±5 should be acceptable and well justified.

We have revised the section for more clarity

“This study utilises multiple Landsat level-1 precision and terrain (L1TP) corrected scenes (63 scenes in total) from four different periods: 1977±5 (hereafter 1977), 1994±1 (hereafter 1994), 2009 and 2019±1 (hereafter 2019). Scenes from the 1970s are majorly (12 out of 17) from the year 1976 and 1977 however due to higher cloud cover and less availability of imagery during the earlier Landsat period, five scenes from 1972, 1979 and 1980 were also included to aid the digitization of glaciers (Table S1).”

2: Glacier Mapping, section 3.3., line 162-163: authors have fixed map scale for digitization to reduce error. Landsat is a medium resolution data, which can produce a map of scale of 1:25,000. Pan sharpen data will give larger scale map. Zooming to 1:10,000 may distort pixels which can make the digitization a little difficult. Setting 1:10,000 map scale for MSS data having 60m spatial resolution will further have deterioration. How authors have dealt with this minor but practical issues related to digitization should be made clear.

Response: We have used a fixed scale of 1:10000 for the majority of the scenes that involve larger glaciers and our analyst didn't face any difficulty in digitization. However for MSS and smaller glaciers, we have also used 1:25000 whenever required.

We have revised the section for more clarity on this.

“Furthermore, some mapping errors are still expected to be present in this inventory due to a possible misinterpretation of glacier features, and the quantification of such errors are difficult owing to the lack of reliable reference in-situ data in the Ladakh region. Such errors were minimized by keeping a fixed map-scale of 1:10,000 in most cases, and undertaking a quality check on glacier outlines using high-resolution images. In case of MSS images and smaller glaciers, a map-scale of 1:25,000 was also used whenever required.”