We thank S.J. Khalsa for his suggestions to improve and strengthen this paper.

His remark that the research questions asked on page 5198 are not fully addressed in the paper is correct, and this mistake results from the fact that parts of the original paper have been removed during the discussion among the authors. The section on climate will be removed according to the suggestion of the second referee, so that the research question will be changed to sharpen the focus of the paper.

5197-line5 “All these research” should be “All this research"

5197-line5 Correct, all this research.

5197-16 delete “of older data”

5197-16 The term ‘older data’ was placed only to stress that there is no choice on the characteristics of historical data. This sentence can be reworded.

5198-17 “downwasting of glacier area” is incorrect. downwasting is the thinning of ice, not loss of area (only of volume)

5198-17: ‘downwasting’ can be replaced by ‘decrease’, then the wording should be ok.

5199-6 Avoid use of the passive voice so that it is evident who did the action. Rather than “inventories have been compiled: : :” use “X has compiled inventories: : :”

5199-6: We will split up the information in this sentence to the next two ones, as the persons who compiled the inventories are named in the next two sentences.

5199 Data - section 2.1 should only describe how the inventories were compiled and updated. the results should be moved to a later section.

5199: The suggestion to remove results in the specific section might concern mainly section 2.4, which will be removed according to the suggestion of the second referee. We will shift the other contents to the results.

5199-9 please explain what is meant by homogenized

5199-9 The term ‘homogenized’ here refer to the compensation of different dates of data acquisition in the GI II. Lambrecht & Kuhn (2007) developed an estimate for the year 1998, accounting for changes between the acquisition of the orthophotos and 1998. We can include a short description of this procedure, and an explanation that this procedure was only used for the total glacier area, but not for the individual shape files.

5201-23 “to the glacier” is repeated

5201-23 Thank you, ‘to the glacier’ indeed is repeated.

5202 section 3.2 needs more detail on the methodology. for example, provide a graphic illustrating delineation of glacier margins based on surface roughness in lidar data. show how orthophotos were used to update glacier margins. Move information on accuracy to data section and to uncertainty discussion in section 5.

5202: We will be glad to use the additional space we win by skipping the climate part to show in more detail the steps of the analysis of the LiDAR data, which was previously included by citing the paper on the method (Abermann et al., XXXX).

5205-24 do not begin a sentence with numerals. Spell out “Fifty percent: : :”

5205-24: We will spell the 50 % out.

5205-19 GI II should be GI III

5205-19: You are right, it should be GI III

5207-10 two decimal places in accuracy estimates is not warranted

5207-10: It is correct that the number of decimals is too high, we will discuss if we use one or no decimal.

5208-3 how was the figure of 10% arrived at? could it be 20%? 30%? In fact, isn’t there a fundamental limitation in estimating LIA glacier area (as opposed to just mapping the ablation zone margins)? i.e, there is no firm basis for estimating accumulation area.

5208-3: This number actually was derived based on Groß’ estimate of the area of glaciers which disappeared between the LIA and today as well as on the accuracy of the moraine mapping at the glacier tongues and the uncertainty in the firn areas. It fact, we do not believe, that the error could also be 20 or 30 %. We can illustrate that by adding additional information on the LIA ice cover as well as by adding an example of LIA areas. The federal maps are partly available from 1817 onwards for all glaciers since 1870, as well as a number of detailed maps by e.g. Sonklar and Keil and additional images and photograph. All this is in detail explained and illustrated in the paper of Groß, (1987), but apart from citing that, we can add some of the information to this paper.

5208-10 GLIMS has established a system for identifying glaciers and parent-child relationships. Reference Raup, B.H., and Khalsa, S.J.S. (2010) GLIMS analysis tutorial, 15 pp. Available at http://www.glims.org/MapsAndDocs/assets/GLIMS_Analysis_Tutorial_a4.pdf

5208-10: Thank you for pointing out the parent and child system in the GLIMS Tutorial.

I found following helpful parts:

6. If no flow takes place between separate parts of a continuous ice mass, they should, in general, be treated as separate units, separated at the topographic divide. However, for practical purposes, such an ice mass may be analyzed as a unit at the analyst's discretion, if delineation of the flow divides is impossible or impractical. If the same system is analyzed in

the same way later, it will have the same glacier ID, and can therefore be compared. If the system is analyzed in more detail later by breaking it into its component glaciers, those pieces will get new IDs (ID of system will be "parent icemass" ID for each part), and future analyses of those pieces, if done in the same way, will be comparable.

7. It is possible that an ice body that is detached from another may still contribute mass to the latter through ice avalanches, or it may no longer do so. It is practically impossible to tell which is the case from a single satellite image. Therefore, within GLIMS, adjacent but detached ice areas should, in general, be considered as different "glaciers", regardless of whether they contribute mass to the main glacier through snow or ice avalanches. However, at the analyst's discretion, detached ice masses may be included as parts of one glacier. This is similar to the situation described in 5 above. If the pieces are analyzed separately later, each piece should be given a new GLIMS ID, the old one being used as the "parent icemass" ID for all the pieces.

This is a very good solution for breaking up glaciers. We in fact had the problem that our later analysis did not result in new childs (smaller glaciers), but in new parents (larger glaciers). I did not find a description to handle this problem in the GLIMS outline. In fact, there is a sort of parent ID included in the GI I and GI II, by naming the rivers (and therefore parent LGM glaciers) the glaciers now drain to. Another point I did not really get reading the tutorial, is how the GLIMS recommendation is on how to calculate area changes between the parents and the childs (compare the area of the parents to all the childs, despite an possible change in ice dynamics and topography?). We will try to figure that out and cite the solution.

5210-11: no results were presented to support this conclusion

5210-11: It is correct that this conclusion is weak and not supported by the analysis, as this conclusion could be more easily drawn from the length change data, which is not subject of this paper, As the total climate section will be removed, this sentence will be removed also.

5210-23: I did not notice any such proposed relationship between summer temperatures and area change

5210-23: The relation was part of an earlier draft, unfortunately some parts of this previous version are still in the submitted version and will be removed.

5216 Table 1, include acquisition dates

5216: We can include the acquisition dates in the map, as there have been several campaigns per line in Table 1.