Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on essd-2021-28

Anonymous Referee #1

Referee comment on "Evaluation of the global and regional glacier inventories and assessment of glacier elevation changes over the north-western Himalaya" by Shakil Ahmad Romshoo et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-28-RC1, 2021

The authors present a new glacier inventory for north-western Himalaya, which is mainly based on manual glacier mapping using different data sources. They compared the new inventory with existing inventories and figured out limitations and differences of the individual inventories. Additionally, the authors used InSAR DEMs to compute glacier elevation changes between 2000 and 2012 of the study area.

The paper is well structured but the sections regarding the glacier elevation/mass change computations are very unclear and confusing. The authors are talking about mass balances but never provide any mass balance values. There are many flaws in the respective sections. Thus, I would suggest to remove the elevation/mass change computation sections completely, since the main focus of the paper is the evaluation of the glacier inventories.

Moreover, the results sections are too long and can be strongly condensed by focusing on tables and graphs.

At many places it is unclear, if the authors talk about mean/media values of certain variables (e.g. elevation, slope ….) or pixel wise values. A more precise wording is needed throughout the paper. (see details below).

The computation of several “uncertainty” values is unclear. Please provide formulas (see details below)

The computation of the average aspect values is unclear and might be buggy (see details below)

The comparison of the different glacier inventories is OK but can be certainly extended. It would be interesting to compute the the overlap ratio r_ov also for e.g. DC, clean and shadowed glaciers to evaluate the difference between the inventories.

It is also unclear, if the topographic parameters of the other inventories were taken form the inventory meta data or computed by the authors. The used DEMs might differ. Thus, it would be more meaningful to use a consistent source for topographic information before doing the comparison.

Once, the paper is revised it should be properly proof read. I am not a native speaker, but I got the feeling that the English can be improved. Many sentences are quite complicated and unclear or maybe got just grammatical errors.

Detailed comments (* significant issues):

L31: delete “for the study area”

l35: by “a” Digital…

l37: to glacier areas…

L40: are you talking about the mean or median glacier elevation?

L44: whats the meaning of the “R” values. Completely unclear.

L48: 2000 an 2012

L71: what about Brun et al. 2017

L97 and following: please list here more recent publications

l104: please list some of the variables

l106: why is the reproducibility not assured? Not clear.

L109: what about Brun et al 2017, Shean et al. 2020?...

L110 and following: please move the comparison to the discussion section.

L118: which basins and where? Not introduced

L123: there exist already elevation change data sets for the same period (Brun et al.2017, Shean et al. 2020). So there exists already information on the glacier behavior.

L125: please rephrase this sentence. A quite weak motivation for this study.

L130: UIB not introduced

L132: “and” 73….

l136: when is this area covered? All year long?

Fig1: Please provide country borders and names in the overview map (upper right corner) for a better orientation. Please indicate the glacier coverage also outside the 3 basins. What are the sources of glacier outlines, debris cover and glacier volume?

*L154: are you talking about mean or median altitudes? Not clear, the same for the other basins in the following.

L163: … in the northeast of the study area..

L192: ...use of…

*Table1: could you please add the Path and Row numbers of the Landsat data. ASTER GDEM not listed. URL for ICIMOD inventory is missing., please provide also the date ranges of the inventories for your study area

l208: add “C-band”

l211: please introduce the abbreviation “DEM” at the place, where it is used the first time.

*l209: please rephrase. TanDEM-X is still acquiring data. You are talking about the worldDEM phase

l234: between or only in 1999 and 2003

l298: no capital letters for Base and Target

Section 4.3: This section is a bit unprecise and many details are missing. e.g. which DEMs did you use? How did you estimate the penetration bias

l350: cite here Rolstad et al. 2009

*l352: Seehaus et al. 2020, did not use the total glacier area for A. They used the area of each glacier complex.

Section 4.4. b) This section is quite confusing and the equation to compute the uncertainty of the mass balance is missing. Please revise the whole section and use clear and individual variables!

*l365: How did you compute the glacier volume ? Not mentioned in the Methods Section

Table 2: How did you compute the glacier volume? Why does it differ so strongly e.g. between KUGI and RGI at Jhelum? How did you assume the uncertainty in glacier area for the different inventories? Not explained!

380 and following: are you talking about mean or media elevations? Or the total elevation span of the whole glacier?

Table 3,4,5,6,7: Units are missing. What means “A” and “N” and “DC”? not clear

l396. delete sentence. Already mentioned in the methods

*Section 5.1: The whole Section can be strongly condensed. All information can be found in the tables and does not need to be repeated in the text.

*Table 6: how did you compute the average glacier aspects? Please provide the formula somewhere.

l483: how did you estimate the variations? Not explained!!!

*Section 5.2: Same as for Section 5.1.! It can be strongly condensed and most of the information can be summarized in nice tables and/or graphs. The text is very long and the information is hard to find. Tables and graphs would be beneficial for the reader

*Table 10: How did you define the elevation category? All pixels with in the interval? Or all glaciers with mean/median elevation within this interval? Unclear! How did you compute the uncertainties?

Fig. 2,3,4: Please add a background. The glacier outlines would be also nice. The bar plot is too small an impossible to read. Does it show the mean elevation changes per glacier? Explain!

l629: Are you talking about average elevation changes per glacier? Please clarify.

Table 11: is the slope take pixel by pixel or is it base on the mean slope per glacier?

Table 12: same as for Table 11. is the aspect take from each pixel or the mean of each glaciers

l659: Maybe the bigger glaciers are located at lower altitudes? Please check

Table 13: Units are missing for area

l685: By inspecting Fig. 2-4, it looks like most glaciers are not south facing. Please check your aspect computation! Do not use a simple mean of all pixel wise aspect values of a glacier. See RGI6.0 technical report.#

Fig.5: Date and source of background image?

Fig.6: Date and source of background image? There are at least 2 glacier tongues. Most likely they were connected in the past, but the mapped state shows 2 individual major glacier tongues. Therefore it is not wrong to split the glacier are in 2 polygons. Please rephrase accordingly, also in the main text.

Fig. 7: the outlines are hard to see. Use different colors or wider lines. Date and source of background image?

Table 16: Can be merged with Table 2 to avoid doubling of data.

l794: Unclear sentence