

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-178

Anonymous Referee #2

Referee comment on "Assessment of rock glaciers, water storage, and permafrost distribution in Guokalariju, Tibetan Plateau" by Mengzhen Li et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-178-RC2>, 2023

Review of Li et al, TC

General comments

This paper presents a new rock glacier inventory in the Guokalariju region of the Tibetan Plateau, then estimate the hydrological water stores and the permafrost index based on the distribution of rock glaciers. This is a good contribution as new inventories are needed globally, hence the work is relevant to the community. However, I find that the paper needs significant improvement both in terms of methodology writing and in the way that results are presented. There are some concerns about the terminology used, which have already been addressed by a previous review, so I will not comment of these here but I agree with them. My additional concerns relate to:

- **Methods:**
 - **RG delineation:** these are not detailed or specific enough, particularly with respect to the mapping. This is covered only in one or two sentences, and there is no information about how exactly RGs were delineated with respect to RGIK updated guidelines. Without this, it is hard to assess if this is a significant contribution as we now need to ensure that inventories are constructed using standardized methodology following existing guidelines
 - **Section is lacking Data sources** which makes it hard to follow which data were used and their characteristics and accuracy. Please consider adding one
 - **Topo-climatic factors:** there is limited information given about this, and it is mostly vague. Authors need to be more specific and carefully describe each factor
 - **The link with climatic conditions:** similar to what was suggested before, this needs to

be much more thought of; for example, the question of special resolution is not even mentioned, while most climatic data come at coarse spatial resolution

- Uncertainty section is spread throughout the paper, it would be much more convenient to have an uncertainty assessment as a separate section
- The logistic regression is presented too briefly, it needs to be clearer how variables were selected; besides, many of them were correlated- how was this dealt with?
- Results/discussion:
 - the main issue here is that the language is vague in many places, and not quantitative. I have marked these in the specific comments. The way the results are presented, it is hard to pick out what is important from these results. For example, R2 stands out as an anomaly compared to R1 and R3 in terms of estimated water storage- this could be interesting to make a more detailed analysis/comparison among the regions, doing some statistical tests to see if the difference is significant. This is at present not presented.
 - Also, the authors average the WEQ over the 3 regions then compare to Jones et al, which is not ideal. A weighted analysis would be needed
- Conclusions are brief and some are I find they tend to be speculative, and contradictory to some of the results (for ex the role of precipitation in the formation of RG). The authors present the possible links between climate and RG development but these are not on the same time scale! This needs to be addressed, or the analysis should be revised to present this as a climate" index" rather than temperature and precipitation values
- Figures are small and hard to see. Also, these need more extensive presentation.
- Reference list is adequate
- The language needs much improvement both in terms of the English language and in terms of scientific language, I am providing below very thorough edits to help with this, but it should again be checked by a language editor.

Specific comments

Abstract

L8 remove "more" because there is nothing given as comparison

L 9 specify on what basis (manual delineation etc).

L 11 what does the altitude refer to? mean altitude of RG? Please specify

L 12 "distributed.." -> a word seems to be missing here, distributed in what way?

L 13 remove "which are more" for conciseness

L 14-15 "A huge potential...was found.." i□ rephrase as it reads awkward. The potential is estimated not found, and "huge" is qualitative

Introduction

L32 "then causing" --> I suggest "with possible consequences on" since this is not a certainty

I 42 Add "The" before Tibetan Plateau

I 44 "mapped" --> "constructed" or "created" (an inventory is not mapped)

I 45 add "the" after "Nepalese"

I 48 I suggest not using the acronym of the region in the intro, but rather introduce it in the study area. Also what is meant by "is a typical region"?

I 51 "study... has mapped" is not correct, need a subject (author or person|). Also specify what method was used previously

I 54 "Thus" is not appropriate, replace ("To fill this gap" or "To address this..")

I58 remove "the"

Study area

L 60 see my previous comment, I suggest introducing the acronym here and first spell out the region name. Also refer to the figure here

L 64 "In the division of the tectonic unit" is ambiguous, rewrite

L 70 spell out ISM

L 70 is this R2 and R1? Then why not introduce them here directly?

L 72 073 reference?

L 73 is this across the region? please specify

L 78 "can be further divided" → "we divided"; also rephrase to clarify, "3 regions referred to as R1 (east) and so on"

L 80 split the phrase "The mean altitude" and specify this is about R1

L 80 -88 needs re-writing to be more compact. I suggest making a small table with the 3 regions, the MAGT, altitude etc.. in each, as the text is heavy. Some things are vague, for ex l83 "significantly greater" → there is no statistical text so this cannot be used

Materials and methods

This section needs work as the mapping methods are not clear, they are only described in a short paragraph from l 95 -100. Based on what criteria, exactly? How many analysts? What auxiliary data were used? Along the same lines, there is no data sources section so it is hard to know what was used. Please revise this section accordingly

L 90 remove "s" from glaciers

L 95 "Firstly.." l100 " secondly" and l109 "Thirdly" are not needed for each step, suggest removing

L 95 add "from" after images and remove parenthesis

L 102 add Jones et al papers

L 104 reference (RGIK group?)

L 107 – 109 I suggest removing the acronyms; it makes the paper harder to read and it is not particularly needed

L 109 "them" i□ "the shapefiles"

L 110 not sure how these can be calculated in Excel since these are spatial data!

L 112 present tense used here while past was used in previous phrase. Please check all manuscript for consistency

L 115 – 120 the uncertainty section is too brief and it is not clear, please address. Same with the Table on l125. A separate section on uncertainty would be needed

L 118 "In addition, we used..." i□ rewrite , for ex "All shapefiles were in XX projection" or move to the end, This is not an "addition".

L 119 – 124 this section as well is short and vague. How were the attributes derived, I assume mean of each glacier? What about lat long? Center of the glacier

Please put this in a new paragraph and add the necessary detail

L 120 ASTGMT2 DEM- there is no mention of the spatial resolution, no reference and no justification on why this was chosen. Please address.

Section 3.2 does not follow the order in the objectives on I55

L 128 – 133 this is background, please re-write

L 133 remove "that has been" for more conciseness

L 135 remove "a calculation by" so it reads "requires multiplying". Also, the equation is needed here upfront (eq 2 but for RGs). The detail each part of that equation into Eg1.

Also, remove "estimated" as the method in the ideal case requires the known thickness and ice content. Then in the following phase state that these were estimated as follows etc..

L 142 "lower, etc" is unclear- you mean the volume ranges?

L 147 this is confusing as it is not mentioned in the beginning of the section anything about clean ice volume, should be clarified on I 127. Also, same comment as before, there is no section on data sources and so there is not enough detail on The Second Inventory Glacier dataset (what year, what source?) and GlabTop2. I strongly suggest adding a data sources section to detail all these data.

151 "ice glacier" – revise, "clean ice glaciers"

L 153 "has been found" --> "has been used"

L 154 "has been applied" -idem

L 156 use past tense for consistency

L 160 -161 rephrase for English language; and move "using SPSS software at the end" explain what is the progressive forward method

"Was used to conduct correlation analysis" check English; vague, please be specific, correlation of what to what? Which variables exactly?

L 168 same comment as before, these data would be listed in a data sources section. What was the resolution of the climate data? Resampling it does not add any detail and this should be discussed (differences on resolution)

L 170 "by" --> "using". What method? Nearest neighbor? Bilinear? Also note that this is not a suitable method, as proper downscaling would be needed

Results

L 176 not clear : "categorized as visual uncertainty". Again, I suggest adding these separately in an uncertainty section which should be expanded

L 177 Certainty should not be in caps

L 179 see comment before, acronym can be removed

L 179 do you mean their mean altitude? Please be specific

L 181 vague, please quantify and remove acronyms

L 188 how is this different than previous paragraph? Seems to be the same topic (altitude) so please merge and re-write

L 189 "gradually" is vague, Is there a significant trend?

L 188 – 207 this entire section is vague and a lot needs quantification (eg "longer length, "higher altitude") and cluttered with acronyms so it is hard to pull out the important bits, please revise.

L 115- 222 same comment here.

L 221 "geometry classification" – check English. Not so sure of the utility of the geometry classification with the two sets of aspect figure, I suggest reflecting and picking the most interesting to show

L 225 there is no mention of PCA in the methods, please revisit and re-write the methods accordingly

L 226 here and elsewhere, avoid starting the phrases with "As shown in Fig xx. Rather, add it in parenthesis at the end eg (see Fig xx)

Not clear which environmental factors you refer too precisely

L 227 please use standard term , "correlation coefficient" i□ "Pearsons' r" and mention the confidence interval

L 277 which altitude? Mean? Also. Should be plural

L 278 this does not mean much, as PPT and T are often correlated. Table 3 needs to be presented in more detail, this section is too succinct

L 232 same comment as above "As illustrated in table.." in the beginning of the phrase

L 234 give these in percent

L 236 what is meant by regional area? Please check formulation

L237 "According to" is not correct, can only be used for a person, revise

L 238 confusion here, as it is not GlabTop2 model that estimates the WVEQ ratio, please revise and use active voice

L 243 name the topo -climatic factors and please be more detailed, re-state the dependent variable. How was the accuracy calculated, on the basis of which data? I do not think this is in the methods

L 248 "previous study results" "previous work"

L 257 – 260 this should be in methods, not introduced here. please explain ROC

L260 "some accuracy" and "closely related" is vague. Not sure what the purpose of l 260 -l 262 is, it does not bring much

Discussion

L 264 "on rock glaciers..." i□ something missing here. Rock glacier distribution? Characteristics?

L 263 -266 this should be presented as results, and here this decreasing trend should be discussed. However, as I mentioned before, it is not specified if this trend is significant

L 267 specify the difference with these regions, not just give the studies

L 273 here and throughout section, use present tense

L 279 "the number of RG increased with precipitation" i□ writing unclear

L 285 I suggest marking this as a speculation because the link between RG and T and PPT is not clear

L 302 – 303 writing is vague

L 304 remove "will"; use present tense throughout section

L 305 this strong negative correlation was not specifically presented in results

L 310 unlike most i□ unlike in the most

L 313 Factor analyses- you mean PCA? Please be consistent

L 320 "450 mm" shows up twice, phrase is circular

L 324 Starting the phrase with "While" is not correct replace with "In contrast,"

L 325 – 330 how do these study results relate to this background information? Please be

more clear

L 333 something missing here too. Consider "Hydrological significant of rock glaciers?"

L 334 "rapid melting" i□ reference? What time scale? Rapid melting is at decadal scale but RGs do not form on decadal scales

L 335 "The" i□ "Our"

L 225 – 337 already resented in results, here these should be discussed, rather, without repeating the results

L 349 writing is unclear, if 1:142 then RG store less than clean ice glaciers, except in R2

Here too, use present tense

L 340 this is too succinct and lack interpretation. The particularity in R2 is interesting and should be discussed more

L 343 "much higher" is vague. Give the % difference. However, it is not correct to just compare an average over the entire region without going a weighted average. This study results are quite consistent with Jones et al for R1 and R3, only R2 differs substantially, so an average is not adequate

L 345 here too, writing is vague "It is pretty similar.." and phase is long

L 349 unclear which region this is about

L 351 re0write "occurred" i□ was reported; "and the" i□ "where"

L 353 hard t draw any conclusions and the temporal scale is not given

L 355 "slightly smaller" is vague

L 362 what do you mean "does not include them in estimation?" estimation of what?

L 375 revise the title of the subsection, it is not clear. Perhaps "RG and permafrost distribution" or as "index to permafrost distribution..? it is not clear in the methods either

L 376 "very close" – vague

L 382 "significantly smaller" – idem. Need a statistical test

L 381 than **in** other studies

L 382 this is methods, please re-write (what is meant by raster comparison calculation)?

L 385 use present tense and mark this as a possibility not as certainty

I 398 "Conclusion" –" Conclusions"

throughout the section, use present tense for consistency (it is mixed throughout the section)

I 401 "increased and then decreased" – please revise I 403 this is contrary to what was stated before, that RGs were favored by increased PPT (I 307)

The remaining of the discussion section needs re-writing for ex I I 420 "have a good

indication", etc etc