This paper describes a glacier inventory in two basins in the Karakoram, and glacier changes from 1973 to 2011 based on Hexagon and Landsat images from various years. With recent focus on glacier changes across the Himalaya, the focus of the paper is important in filling gaps in the understanding of glacier changes in an area of Hindu-Kush Himalaya which is less explored. The papers shows interesting results, confirming different behavior of Karakoram glaciers (little or no change in area) compared to the Himalaya, where the tendency is of glacier shrinkage. However, there are a few general aspects of the paper that I feel could use much improvement:

1. The paper is cluttered with numbers, which make the big picture less evident. It would be desirable to refer to tables, and rather than having all the numbers in the text, to focus on their significance. A lot of the results read like reporting of numbers. It is also not clear if the focus is on comparing the different behavior of the two basins chosen, or to extract a common signal of these two basins. This should be clarified.
2. Concepts of glacier area change are mixed with glacier dynamics (notably glacier surges) and a few references to climate. However, neither the concept of glacier surge nor the climate trends are well argumented. Overall, it is not clear whether the lack of area change, or the glacier growth is due to climate influences or, simply to glacier dynamics (surges). These two effects should be discussed in more detail.
3. The delineation of debris-covered glaciers is not described at all. Especially since the Karakoram glaciers are heavily covered with debris, and this is an area of high uncertainty, the authors should explain in detail how the debris-covered glaciers were delineated. Also, I would be interested to see the area change treated differently for clean glaciers vs. debris-covered glaciers.

Specific comments:

Abstract

L 9-10: "On average, the glacier area in Chang Chenmo basin exhibited no changes during the study period"

I think the authors mean "no significant change on average", since they do show some change (l .11, -0.7 +/- 0.03 km2). So, the term "no change" is not adequate in this case.

Numbers here are less relevant than % area change. I suggest presenting % area change to make it easier for readers to put it in context with other studies.

Introduction

P1 L 21 – 24: please be more specific when talking about glacier melt. It is glacier ice melt? Also, specifify which basins you refer to, and also what you mean by glacier melt not being influenced by summer monsoon PPT. These phrases are used very often in publications, but they should be clarified.

P1 l.25: "lesser shrinkage" should be "less shrinkage"

P1 l.25- 26: this statement needs reference

P2 l3: Kulkarni et al 2011 reference is not right, their paper talks about glaciers in Himachal Pradesh and Zanskar, not in the karakoram. They do not shoe glacier advance, but overall 16% glacier change in that area in the last decades. Please clarify , or remove this reference.

P2 l8 – 10: the climate connection is not clear here. What do you mean by "diverse trends?". Also, it should be explained what the connection is between T decrease and glacier growth in this area of the Himalaya (talk about its impact on precipitation at high altitudes, etc…)

P2 l 23 add "s" to "region"

P2 l 24 "abundant potential" sounds vague.

P2 l 24 clarify "regular intervals"- days, weeks, months?

P2 l 26 "influencing variables" sounds awkward remove influencing or specify what is influenced

P2 l 30: GLIMS reference- need to explain what GLIMS is for readers not familiar with it. Also, mention other global studies such as Randolph inventory (Arendt et al 2012)

Study Area

P3 l 6 – 10: the order od the basins is quite unrelevant, I suggest removing it

P3 L 15: reference?

P3 l 20 – 25: "Chemical investigations of snow and glacier ice…"

What do you mean here? Isotope studies?

I also suggest mentioning the glacier regime in this area (see for example Thayyen and Gergan paper for a discussion of the regimes across the Himalaya and Karakoram)

Thayyen, and Gergan (2010), Role of glaciers in watershed hydrology: a preliminary study of a "Himalayan catchment", *The Cryosphere*, *4*(1), 115-128.

Methods

P4 l1 "spatial resolution 30 m)- add in the mutli-cpectral

P4 l7: what do you mean by :"reference imagery"? please explain.

P4 l13 "images matched well"- sounds descriptive, please quantify. P4 l 16 :

P4 l16: "projective transformation algorithm"- I am not sure what algorithm you are talking about, please clarify/detail.

P4 l 16 – 19: "Hexagon KH-9 (1973, 1974) images were divided in 8 parts and each part were co-registered based on ∼ 50 ground control points (GCPs) derived from the 2002 Landsat ETM+ imagery by spline adjustment using ESRI ArcGIS 9.3"

I do not fully agree with the approach used here. First off, why were the Hexagon images split into 8 parts? This should be explained. Secondly, the Hexagon images need to be ortho-rectified, not only georeferenced (in my experience, a spline algorithm is not appropriate in the case of Hexagon images, but a full orthorectification using a camera model with no parameters and a DEM). This is a standard procedure. Please address this issue in detail, as the lack of orthorectification can introduce substantial errors in the area change estimate.

P5 l 16: remove "glaciers" before "outlines since it is repeated after

P5 l 19: what you refer to as "average length of stripes with 50 m distance"- this is unclear

P6 l1 – 9: this paragraph should be moved before the previous one

P 6 l 5: need citation for these studies mentioned

P6 l 6: this is the first time you introduce identifying surges as a concept. This is not mentioned in the objectives of the paper, and should be clarified

Results

Overall, results contain a lot of numbers. I suggest, rather than listing all the numbers, to refer the readers to tables, and instead, to discuss the results in light of other studies (for example, the mean elevation results, the distribution of glacier area, which are common in other studies as well). Otherwise the results section reads like reporting.

P7: In glacier characteristics section, it is not clear whether you focus on a comparison between Shyok and Chang Chengmo basins, since the description oscillated between the comparison, and the results on a regional scale. The focus should be clearer here, to tell the reader what the message is.

P6 l 18: Remove "whereas" from the beginning of the phrase, this is not correct unless part of the previous phrase.

p 7 l7: not sure it is worth mentioning there is no correlation between glacier size and median elevation, unless you provide background, i.e, why would you expect a correlation between the two?

P7 l 10- 14: Again, there is no detail on how debris covered glacier were identified. This needs to be addressed.

P7 l 15: "Glacier variability" – I think here you mean glacier "change". Variability refers to an inherent characteristic of a phenomenon, which differ in space or time.

P7 l 16: "glaciers..exhibited no change in area"- again, check the language here. I thin you mean no change on average, no significant change, or similar, since on the following line you show that there WAS a change of – 07 to +0.2 km2, and that some glaciers exhibited growth. Please revise this throughout the manuscript.

P7 l 26: "It was found that there is no significant relationship…" sounds awkward, and the verbs should be both in the past tense. Delete "It was found that…", it is unnecessary. What statistical relationship do you refer to" Correlation" Linear regression? Please clarify.

Again, explain what the reasoning is between conducting a correlation between area change and topographic parameters.

P 8 l 3 -8: here you focus on one glacier only, but this is not mentioned in the methods. I suggest adding the various scales of analysis in the methods to guide the reader.

P 8 l 11-13: first phase of this section is redundant with the results, please reprhrase

The discussion of the differences with the GSI maps is confusing, as this is not presented in the methods or data sources. Did the authors compare their outlines with GSI numbers, or with the actual glacier outlines from GSI? In the methods, it is specified that old outlines come from the Hexagon images. If the purpose is to re-establish a baseline dataset based on Hexagon maps, this should be mentioned. Otherwise, I do not see the point of the discussion of the GSI maps here.

P8 l23 "The objective of a study has an influence on the glacier count" –

This phrase makes no sense, please rephrase or remove.

P8 l 24-28: these lines belong to methods

P 9 l 8: reference for this statement?

P9 l 11- 12: here the OrbView3 images are introduced, but there is barely a mention of them before. How were they used (visual comparison,etc.?) The authors skim over the delineation of debris cover.

P9 l 14: "here we report for the first time.." – what do you mean by "first time"? First time in this area? Please clarify.

P9 l 19 – 20: "These advanced in glacier area can mainly be attributed to known surging activity of the glaciers in the area"- this sounds like an overstatement, the authors do not show results of the surging activity. This should be marked as a possibility, not a certainty.

Also, here the concepts of glacier area increase and glacier mass gain are confused. Glacier area increase and mass increase are not comparable at the same time scale. Glacier area change may be a result of cumulative positive mass balance over a few decades (in this area), whereas glacier mass balance is an annual response to climate. So, comparing the results directly with Gardelle et al 2012 is not entirely appropriate, or a more complete discussion is necessary.

P 9 l 26 – 30: this is a new topic, does not fit here. I appreciate that the authors bring up the topic of uncertainty in the Hexagon images- however, the discussion is brief and does not provide much information.

P 10 l 1 "Surging glaciers"

Again this is not one of the objectives, as stated in the beginning of the paper. It should be clearly stated that focusing on one glacier and studying its evolution in detail is one of the goals here. Also, how representative is this glacier of the entire range? A discussion is needed.

P 10 l4 "Our results show that figures (number and area)

    This is awkard language- either refer to the numbers directly or remove this

Similar to my comments above, there si a lot of reporting of results rather than referring to a table and discussing of the results here.

P10 l 22 -29 and p 11 l 1 -5: This is a lot of general discussion and does not seem to fit

P 10 l 5 -12 here the authors introduce a discussion of climate trends, mixed in the surging section. This seems out of context, and without a rigorous climate analysis it does not provide much convincing info.

P 10 l 13: "mystical"??? please replace this word, it does not belong to scientific language

P 10 l 13 – 20 this whole paragraphs is vague and contains a mix of concepts related to surges and glacier volume. Please revise / rewrite with more concise info.

Tables and figures

Table2: This would work much better as a figure (frequency distribution vs glacier area)

Table 4: ;'variability" should be "change". Also, not sure it is so interesting to the readers, since it's a list of numbers of glaciers retreating, advancing, or no change. Please keep in mind the big picture when reporting these results.

Table 6: in Area numbers, there are either 1 decimals, or two. Please check. I think one decimal is enough.

Table 7 does not do much. I suggest removing

Fig 2 is redundant info with table 2, so remove Table 2

Fig 3: not necessary since there is no significant trend. Same with Fig 4

Fig 6: Maybe I missed this, but is there a discussion of the different response of these two glaciers, and potential explanations?

Fig 7: I would rather see, instead of just two glaciers shown in detail, also an image of glacier change over a selected subset area, which shows the advances of glaciers compared to one time (for example 1974 – 2011). Again, consider the big picture.