

Interactive comment on “Inventory, motion and acceleration of rock glaciers in Ile Alatau and Kungöy Ala-Too, northern Tien Shan, since the 1950s” by Andreas Kääh et al.

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It is a very high quality paper, written by some of the best specialists of the topic and of the methods used. The paper provides a valuable and comprehensive dataset, on an area for which few data were available so far.

The work presented uses a combination of various methods and various types of optical and satellite imagery. A combination that was rarely achieved at such a level in a single study. This allows a cross-checking and validation of the results, which therefore appear as very robust. The use of image archives allows a back-analysis from the 1950s onwards and the interpretation of the evolution of velocities over time. If this

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is not new, the above mentioned combination of various image types and methods allows a higher and more detailed temporal resolution, and reveals short lived velocity changes that could not be observed by using a single type of images.

The paper provides therefore an innovative contribution both for the results and the methodological approach.

Therefore, there are no fundamental comments, and the paper should be accepted with the minor improvements listed below or proposed by others.

p. 4 – l. 6 "Landslides and rock avalanches": there is a problem of vocabulary. In English, the word "landslide" is used as generic term for all types of mass movements on slopes, and thus includes rock avalanches. The authors probably wanted to distinguish slides (= "Rutschungen", "glissements") from rock avalanches. The adequate term in this case is "slide". If they mean deep seated slope movements (= "Sackungen", "Talzuschub", "tassements", "glissement rocheux") the most adequate concept would be DSGSD (for Deep Seated Gravitational Slope Deformation). As generic term for designating all mass movements, we recommend to use "mass movements" instead of "landslide", the latter term causing much confusion among french or german speaking readers.

Fig. 1 + part 4.1: the figure legend indicates 1 "landslide" (see also comment above), but this is not mentioned in the text.

Fig. 1 is small and hardly lisible. It should be provided in full format as downloadable supplementary data

Figures 3, 4, 5, 6 and 7: the velocity color scale is not the same in all figures, which hinders a direct comparison of the different cases and can lead to misinterpretation. In figure 4 for instance, at a first and quick view, the Morenny RG could appear as slower than the Archaly RG, which is not the case. A common velocity color scale would be

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better.

p. 24, l. 20-25: you mention the influence of snow thickness/insulation and amount of meltwater as factors possibly explaining the acceleration in the 1960s. I agree with this general statement, but it can be refined. The data series of the Laurichard rock glacier (see Bodin et al. 2009, you already have in your references) and ground surface temperature measurements at many places, show that the most relevant factor is the onset date of the snow cover. An early onset, for instance in October, before the coldest days of November-December, prevents the ground from cooling and keeps the accumulated summer heat in the ground. On the opposite, a late onset of the snow cover, by end of December or even January, will allow a strong cooling of the ground surface and a deep seasonal frost in non permafrost areas. The Laurichard time series shows that the reaction is asymmetric: it needs several "warm" years (years allowing a warming of the ground, with hot summer and/or early snow cover) to induce an acceleration, but a single "cold" winter (with late onset of the snow cover) is sufficient to reduce velocities. Do your meteorological data allow to establish the onset date of the snow cover (insulation is provided with a minimal thickness in the order of 60-80 cm)? If yes, it could reinforce your interpretation.

Author contributions: there are two AK among the authors! Who is AK? And what was the contribution of the second one?

Acknowledgements: the two first lines are duplicated in the Financial support section. Remove from here, and leave under Financial support.

References

Check formatting of abridged journal names: - for PPP: your text mentions Permafrost Periglac. (Processes is missing) – numerous references - p. 35 Kääb et al. 2017: NHESS (Sciences missing)

p. 33 - Gorbunov 1983: volume missing

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p. 33 - Haeberli 1985: volume number in the collection missing

p. 34 – Kaufmann 2012: journal missing

p. 36 – Roer et al. 2008: incomplete (volume, pages, ...)

Please also note the supplement to this comment:

<https://tc.copernicus.org/preprints/tc-2020-109/tc-2020-109-RC2-supplement.pdf>

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-109>, 2020.

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