

The Cryosphere Discuss., referee comment RC2
<https://doi.org/10.5194/tc-2021-370-RC2>, 2022
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Comment on tc-2021-370

Anonymous Referee #2

Referee comment on "Three different glacier surges at a spot: what satellites observe and what not" by Frank Paul et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2021-370-RC2>, 2022

General comments

Authors report on the surge behaviour of three glaciers in the same valley discussing differences in timing, extent and progression of the surges. For this purpose, they use a comprehensive dataset comprising different optical and radar satellites to map glacier advance, flow velocities and elevation changes.

The paper is well written with high quality figures and it also gives a good overview on the literature about glacier surges.

There is only one aspect that should be elaborated more carefully: In addition to the analysis of the surge behaviour of the investigated glaciers, authors compare results from different sensors in order to discuss their suitability for similar studies. This intercomparison has to be done in a more quantitative way. Statements like "average differences are insignificant" or "agree very well" are not enough in this context and error measures should be given (see specific comments).

I suggest to accept the manuscript after minor revisions.

Specific comments

line 212 Could you please briefly state what kind of DEM datasets?

line 507 "some surface lowering": How much?

line 562 Which area was used to calculate the volume loss of Sarpo Laggo Glacier? In Fig. 11 a) and b) there is volume gain visible in the part of the glacier that is not covered in Fig. 11 c and d.

Section 5.6 Uncertainties should be placed before 5.5 Sensor intercomparison. As a result, the differences between the sensors can be quantitatively compared to the determined uncertainties.

line 572 Give error measures and compare with the sensor uncertainties derived in 5.6.

line 597 "agree very well": Compare it quantitatively with the stable terrain accuracies (Table S3).

line 630 MAD: Table S2 only lists mean and std. Either explain how you derive std from MAD or adjust text and table. Check all numbers cited in 5.6.2 accordingly.

line 667 Explain why "maximum flow velocities in summer" are atypical.

line 740 Can you comment on the influence of crevassing on the volume determination? Are the crevasses resolved by the DEMs? Does the DEM of the crevassed surface represent a mean elevation or is it more like an envelope curve?

line 770 basically identical: But they are from different seasons and Fig. S12 shows the differences. I suggest to give median and MAD to quantify this statement.

line 858 Was Sentinel-1 used in Section 5.1 or only in the animation? Sentinel-1 images are not listed in Table S1.

Technical corrections

line 27 same region: I'd narrow it down to the same valley, even.

line 43 Is it ICESat-2 ATL03?

line 102 by Hugonnet et al. (2021): Please make it clearer that this is an external dataset.

line 107 35.94°N

line 139 At their historically recorded maximum extent

line 181 Sentinel-1 is not included in table S1.

line 295 Correct date format.

line 299 Which standard processing steps? If these are listed in the following passage, use a colon (:) at the end of this phrase.

line 305 "We also excluded data voids": Seems clear. How could you alternatively include voids?

line 438 Replace "afterwards" with "further down".

line 450 Fig. 7a confirms this observation:

line 451 "(up to 0.2 m d-1)": Two lines above the maximum is 0.4 m/d.

line 472 Replace "3 km" with "km 3" like in line 474

line 474 What do you mean with "maximum velocities near km 15 changed only slowly over the entire glacier length"? Do you refer to the location km 15 or the entire length?

line 475 Replace "10 km" with "km 10".

lines 590, 592, 597: Specify subfigure in Fig. S6 (see comment on S6 below).

line 643 median elevation differences to the reference DEM "on bedrock"

line 670 Replace "implies" with "imply".

line 708 "location of the maximum away from the centre": Do you mean centre line?

line 764 strictly or strict?

line 799 short-term variation

line 834 in the same valley?

line 836 Also give the duration of the active phase in comparison to North Chongtar.

Table 3, line 1150 numbers

Figure 1 Add map grid

In some figures (e.g. Fig. 6, 7) colours are hard to distinguish. Please check whether you could use colours that are better distinguishable.

Figure 9 State direction of cross profile. West to east?

line 1219 with respect to

Supplemental Material

Table S1: Add Sentinel-1.

Table S3: Why are some lines in italics? I suggest to add NMAD.

Fig. S1: Check dates, resolutions and dataset names as they are inconsistent with Table 2. Subfigure d) Use the same clipping as in a)-c).

Fig. S5, line 60: What are "biased accumulation areas"?

Fig. S6: Consider numbering all panels as subfigures. It makes it easier to refer to a specific panel in the text.

line 66 2 February 2019: Does not coincide with date on map. Shouldn't it be December?

Fig. S7: clockwise? The main paper has the usual order from left to right (e.g. Fig. 5). Please adjust.

Fig. S13: Dates (and order of dates) do not coincide with the ones in the figure for a) to d).