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Interactive comment on "More dynamic than expected: An updated survey of surging glaciers in the Pamir" *by* Franz Goerlich et al.

Anonymous Referee #2

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The paper describes a new inventory of surging glaciers in the Pamir Mountains derived using optical satellite images and based on existing studies. This is a valuable research and can be used as a basis for further studies of surge dynamics. In line with the objectives of the journal, the paper presents the data accessible in an open repository. To fulfil the catchy title, a more detailed discussion of how the region/the glaciers are more dynamic than expected would be desirable.

Apart from the minor comments below I see two major issues which have to be clarified before publication: In the introduction the authors point out the importance of discriminating between surge-type and surging glaciers and state that their study deals with surging glacier, i.e. glaciers actively surging during the observation period defined from 1988 to 2018. But there is an inconsistency within the inventory when they map

maximum and minimum extents including images back to 1968. I guess this is the reason for the "strongest advance" (l. 414) at Garmo Glacier, which judging from a time lapse in Google Earth did not advance more than 6 km during the observation period 1988-2018. Guessing from Figure 3 the maximum extent was mapped in the 1968 Corona image, but this extent would refer to an earlier surge and thus is an "indirect evidences" for a surge-type glacier. As the authors explicitly study surging glaciers, properties should be restricted to the observation period (1988-2018).

The second issue is a technical one referring to the data files in the repository. Checking the maximum advance of 6665 m mentioned above I found that this number was given for another glacier (see comment l. 414 below). Likewise other large advances in the attribute table do not correspond to glaciers showing a large advance in their outlines. I suspect an error in the attribute table Gl-3min.dbf. Should I be mistaken I apologise in advance.

With respect to the data structure in the inventory, I suggest to add a detailed description of the columns as another supplement. Most columns are self-explanatory, but not all. The correspondence between the paper and the data in the repository can be improved by adding the column names when describing e.g. the classification scheme on page 9. The order of the columns (dist_class dur_class srg_type tongue) in the data file (GI-3min.dbf) should be the same as used to form srg_code to be more comprehensible.

Minor comments:

l. 10 What are "capable data"?

l. 82 glacier names or glacier's names

l. 113 Insert glacier in "mean elevations" and check the numbers, they are not the same as in the cited paper.

l. 154 From Figure 1, it's not only west of Fedchenko. Maybe you could say west of

lake Karakul.

l. 154 I suggest "with a resolution of up to 6 m" instead of "up to a resolution of 6 m".

l. 161 Give more information on the sources within GE and bing.

l. 224 "Their inventory", which one?

l. 235 What are the "slightly different samples"?

l. 242 delete "c."

l. 258 Which "indirect evidence" did you introduce to the classification?

l. 292 Check this sentence, esp. the two occurrences of the expression "own surge"

l. 308 "medium distance": Shouldn't code 2123 mean long distance?

l. 313 Give elevation data source here again. How is the aspect sector derived? Explain for readers not familiar with glacier inventories or give reference.

l. 317 186 surging glaciers: In Gl-3min there are 198 glaciers, in Gl-3max 202. What is the reason for different numbers?

l. 317 What are "spatially distinct surges"? In your data you have repeated surges for individual glaciers. So, do you mean temporally distinct?

l. 319 It is difficult to relate the geographic description to the map, because the names are given in none of the figures.

l. 328 and 332 Combine sentence about small glaciers into one.

l. 330 You should mention here, that the tributary Bivachny is a surging glacier.

l. 347 "mean aspect sector distribution": Explain in few words what this is.

l. 355 "scatter plot showing mean elevation vs. mean aspect", Figure 9 reads: "Mean aspect vs. median glacier". Is it mean or median elevation?

l. 363 Mean or median? If different elevation averages are used, explain why.

l. 381 Revise sentence structure.

l. 382 surge duration: But all glaciers in the file have years associated. Do you mean the ones that started before 1988?

l. 392-394 But Fig. 13a only lists the 27 surges that started in 1989. Adapt either text or label of the first bin.

l. 398 Replace "started in 1989 or later and ending in 2017 or before (black bars" with "started after 1988 and ending before 2018 (grey"

l. 402 Out of curiosity: Do these 9 glaciers have something else in common? Size, aspect, elevation...

l. 414 See above. Check the advance of Garmo (80). While the outline in Gl-3max seems to be the maximum since 1968 it is not an advance during the study period you defined as 1988-2018. I looked for this advance in the file Gl-3min (arg_adv_m) and found it given for glacier 198 (Kuokuosele Glacier). Garmo (80) has an advance of only 509 m in the file. Furthermore, I had a look on other large advances and they don't coincide with glaciers that have large differences between their minimum and maximum extents. Maybe I got something wrong, but I strongly recommend checking the attributes in your data files.

l. 476 "real number of surging glaciers" Following your distinction in the introduction, these would be surge-type glaciers.

l. 495 How did you assign the class for multiple surges of the same glacier for criteria D and E when they fall in different classes? The most extreme one?

l. 523 see line 317 and adapt line 17 in the abstract

l. 526 see line 382

l. 528 "central ... mountain ranges": But you say there is a gap in central Pamir (l. 320).

l. 529 What is special about a descend of more than 800 m? In line 424 you say: "∼1300 m further down at their maximum extent." How does this match?

l. 580 In Finaev et al. (2016) give full details: 9(3):88-105, doi:10.15356/2071-9388_03v09_2016_06

l. 632 In Osipova (2015): Ice and Snow, 55(1), in Russian. Add "in Russian" where applicable.

l. 633 Ice and Snow, 50(4)

l. 687 Table 3: In the introduction you say you map surging and not surge-type glaciers. Which ones do you list in the table?

l. 690 Table 4: Refer to criteria B-E in 4.2. What does DEM refer to?

l. 691 "distance criterion" instead of "duration criteria"?

l. 710 Fig. 3: Better give the years of elevation difference than the data source or both.

l. 715 Fig. 4: Give type of Image: Landsat 8, panchromatic?

l. 747 Fig. 12: What is the additional value of this figure? There is no meaningful pattern that can be interpreted with the glaciers listed by their IDs, but individual glaciers cannot be examined either. Which glacier ID is it? There are 198 glaciers in GI-3min.

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