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Interactive comment on "Brief communication: 4 Mm^3 collapse of a cirque glacier in the Central Andes of Argentina" *by* Daniel Falaschi et al.

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This submissione documents the catastrophic collapse of a glacier tongue in the Central Andes. The volume can be considered small compared to the well known 2016 twin collapse of Tibetan glaciers (around an order of magnitude smaller) but large compared to ice avalanches typically encountered in Alpine terrain. The described event dates back to 2007 and occurred in a remote area, consequently little evidence is available and the analysis evolves around satellite-derived digital elevation models and images.

The study cannot provide much physical insights into the processes leading up to the collapse, but this should not be expected given the relatively sparse catalog of observations. On the other hand, the 2016 glacier collapses in Tibet vividly illustrated

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that catastrophic runaway surges of low-angle glacier tongues can occur and may be related to climate, a matter that previously had been largely overlooked by the glaciological community. So I agree with the authors that this short note contribution is of interest to the glaciological community and well suited the Cryosphere journal.

To my mind the manuscript requires a considerable amount of modifications, however. In particular, several figures are poorly presented, annotated and referred to in the text, which obscures some important information on the collapse event. Some of my points of criticism may be misunderstandings on my side but I nevertheless urge the authors to consider and clarify them and make the necessary adjustments to convey their message in this short note. Below I detail these points and provide further minor questions and comments. Fabian Walter.

MAJOR COMMENTS FIGURES I have to admit I was puzzled when looking at the details of Figures 1-3. It may sound picky, but I was confused because I did not understand the authors‘ conception of the glacier outlines. Usually I think of avalanche debris as not being part of the glacier, i.e. a calving event (dry or wet calving) causes the glacier to retreat. If I understand the outlines in Figure 1 correctly, then the authors consider the avalanche debris as lying within the glacier extent. Whatever the case is, this should be clarified and my personal suggestion is to define the glacier outlines by the ice that has NOT detached from the glacier in the form of avalanches. Moreover, in Figure 1, there are several grades of red lines, which are difficult to distinguish on the image. It would be better to use different colors or line symbols. The figure would also benefit greatly from two panels, one showing the glacier before and one showing the glacier after the collapse. Within the figure I would also label the avalanche debris as well as the LIA moraine, which is discussed in the text. Once this is clarified, it will be easier to understand Figure 2. Here I was wondering for a long time why the Leña Glacier tongue had thickened. Is this a result of surging behavior? Then I noticed that what I thought was the tongue was actually the avalanche debris. It would help to see the extent of the glacier tongue before the break-off in addition to the shown

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scarp head (note also that some of the text in this figure is likely too small). Similarly, in the different panels of Figure 3 I suggest drawing the glacier outlines. Finally, the photographs in Figure 3 are not self explanatory but do seem to contain important information. I suggest annotating the photographs extensively (e.g. glacier terminus, LIA moraine, avalanche debris, outwash planes, etc.).

TINGUIRIRICA GLACIER Compared to Leñas glacier, Tinguiririca Glacier receives less attention in the text. It is only illustrated in two panels of Figure 2. The reader needs a map view equivalent to Figure 1 to get a feel for the glacier extent and geometry (for both glaciers it would be helpful to see a few contour lines which helps identifying steep parts and planes) and more explanations, otherwise it seems that Tinguiririca Glacier was half-heartedly added to the study.

SURGE HISTORY The topic of glacier surging receives little attention in the manuscript. Do the satellite DEM's provide some hints for surge behavior? In any case, it would be good to write 1-2 sentences on this subject to put the collapse into context of the Aru Co and Kolka events. This could be built into the second paragraph of the Discussion section. Currently, there is some mentioning of a thermal regime change, but no specific evidence or context is provided.

MINOR COMMENTS Figure references: At several parts of the manuscript it is not clear what the autor's assertions are based on. For example, in the first paragraph of Section 3 no references to figures are made, but if I understand correctly the described observations are based on information shown in the figures.

Line 68: It would help to give a rough estimate of avalanche volumes for the 16 events of the WGMS.

Line 134: "(e.g. due to decrease in glacier slope)" is unclear. Line 140-141: Do detachment scarp and crevasses really disappear or were they simply covered by debris?

Near Line 150: How was the absence of bedrock beneath the glacier confirmed? Using

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boreholes? Could exposed bedrock be concealed by deposited sediments? Please mark/annotate figures accordingly.

Line 152: Reference to Figure 4a is unclear. Please mark/annotate figure accordingly.

Line 156-157: The smoother hammocks and thermocarst should be highlighted in the respective figures.

Section 4: It would help to show parts of the meteoroligical analysis in a plot. Also, some specifics on the acceleration criteria would be of interest.

Line 183 (and elsehwere): It would help the non-expert to specify what is mean by "ordinary“ ice avalanches.

Discussion: It may be worth considering the possibility that the event happened as a series of small break-offs rather than a single rupture. Such cases are known to exist and it is not clear which conditions favor one scenario over the other. https://www.geopraevent.ch/project/weissmies-glacier-velocities/?lang=en

Line 229 and following paragraph: When discussing the permafrost conditions it seems that the authors present arguments for and against permafrost. It was not clear to me what the actual conditions are believed to be. Also, it is not clear what the implication of the last sentence is (reference to Kolka).

Line 244: Specify "same method“.

Line 262: "time difference“ → time lag.

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