

Interactive comment on “Tracking the impacts of the Aru glacier collapses on downstream lakes” by Yanbin Lei et al.

Yanbin Lei et al.

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Received and published: 10 August 2020

In its present form the paper lacks however clarity in language, structure and explanations, which make it difficult to follow the findings presented. The purpose of the study should be explained better and the results presented accordingly. As now, for some of the results it is unclear how they tie into the investigation of the collapse consequences. I recommend that at least the senior co-authors carefully revise the manuscript to make it clearer. This recommendation refers not only to language editing, but more important to the explanations given, precise language usage, and logical structure of presentation of results.

Response: Thank you very much for the constructive comments and suggestions. The

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language, structure and explanations have been carefully revised according to these comments. About the structure of the paper, we will make substantial revisions as following: 1, Lake bathymetry and water storage at the two lakes will be moved to study area section. Lake level changes at the two lakes will be moved to new section 4.3. 2, Section 4.1 will mainly focus on the 'The instantaneous impact of Aru-1 glacier collapse on the morphology of Aru Co'. 3, Add a new section 4.2, which is about the meltwater estimation of the two ice avalanches. The meltwater will be estimated by degree-day model according to the meteorological data and in situ measurement of glacier mass balance. 3, The impact of the meltwater on the seasonal lake level changes of Memar Co will be discussed in section 4.3. Lake level seasonality and the hydraulic connection will be moved to this part. 4, Add a discussion section, which will discuss attribution of the rapid lake expansion on the western TP and the potential risk of natural hazard on the TP.

About the purpose of the study, we will address it in more detail in the introduction. Although the mechanism of Aru glacier collapses has been investigated, its impact on the downstream lakes in the following years is still not investigated until now. Based on comprehensive observation, we will address its impact on the downstream lakes after the ice mass has melted in the following years. This study will be helpful for understand the relationship between glacier mass loss and lake behaviour in the Third Pole region under a warming climate.

About the explanation of the result, we will give more in-depth analysis. For example, we add a new Fig. 5, which is about the dynamics of the intruding ice into Aru Co. GF-2 satellite image (1 m resolution) is used to detect the floating ice over the lake surface. The extent of the intruding ice into Aru Co in summer 2016 is shown.

The paper lacks a discussion section and some discussions seem to be part of the results section. The authors should clearly separate results and their discussion/interpretation. Uncertainties in the results are hardly mentioned.

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Response: A discussion section will be added in the revision. Lake level changes at Memar Co and Aru Co in the discussion part are moved to result section. In the discussion part, we mainly discuss the attribution of the rapid lake expansion on the western TP and the potential risk of natural hazard on the TP'. Uncertainties of lake level changes, water storage and lake surface temperature are evaluated in the revision.

The abstract and intro most urgently need revision of language. As an example (line 39), not the Aru glaciers are giant, but their collapses! Professional language editing will likely not capture such errors. Another example, the authors say the shoreline was pushed. Did the avalanche really move the shoreline? Or did the shoreline change due to deposition of sediments? Or (line 340), does "rapid lake expansion of 0.8m/yr" refer to the lake level increase or lateral expansion of lake area? Another example for lack of clarity: in line 48 the authors talk about lake increase due to glacier melt. A few lines later (53) they write about drastic precipitation changes as cause behind lake growth.

Response: Thanks for pointing out these errors. We will carefully revise the abstract and make it more accurate. The third paragraph in the introduction section will be moved to discussion section.

Section 3.4: To my best knowledge, the most extensive study on lake volume changes in Tibet is Treichler et al. 2018 (<https://tc.copernicus.org/articles/13/2977/2019/>). The authors could compare their findings for Memar Co to the regional aggregations by Treichler et al.

Response: Thanks for the good suggestions. In the discussion section, we will read this paper and discuss glacier-lake interaction at Memar Co basin in the background of the whole Tibetan Plateau, especially the western TP.

Section 3.5: Any uncertainties behind the MODIS temperatures? For instance bias from undetected clouds, or lake ice?

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Response: We agree that MODIS derived lake surface temperature is easily affected by clouds and other factors, especially in summer. We will evaluate the uncertainties of MODIS derived temperature in the study method section.

At line 161 the lake seasonality after 2016 is presented, but it would be important to relate that to seasonality before the collapses. This is then touched upon much later.

Response: We add a new section about impact of glacier collapses on lake level seasonality. Lake level seasonality before and after the glacier collapse will be compared according to Cryosat-2 satellite data and in situ measurement.

At several occasions the authors classify the changes as "drastic" or "dramatic", for instance the 2-week lake surface cooling by 2-4 deg (line 289). Why is such change, or the other changes dramatic?

Response: If the changes are abrupt or larger than normal status, we classify it as dramatic. For example, the lake surface cooling by 2-4 deg in a short period is abrupt and much larger than normal status.

Fig 3: what is the meaning of the colored areas in panels b and c?

Response: The different colored areas indicate different periods of lake level changes. The three colors indicate monsoon season, post monsoon season and ice covered season. We will address this in the caption of the figure.

The lines in Figs 7 and 8 are difficult to compare. Better have the lines for each year combined in one plot per area? I.e. not separate plots per year but per area.

Response: Thanks again. We have changed this figure according to the suggestion.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-117>, 2020.

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