

We thank the reviewer for the time dedicated to our manuscript and the detailed comments. We addressed these in our comments below (RC comments in red, AC in black).

Dear Authors, Dear Editor,

The manuscript reports enormous mass loss in five cave ice deposits and two small glaciers from SE Europe. Following the detailed evaluation of the meteorological conditions the Authors conclude that extreme precipitation events occurring in summer of 2019 led to catastrophic loss of ice. The study is well-structured and easy to follow; however, some revision can be recommended. I encourage the authors for the revision because the paper has the potential to become a key reference in the field of ice cave science.

best wishes, Zoltan Kern

Thank you for the detailed observations, comments and suggestions, we used them to improve the overall readability of the paper and clarify some of the potential ambiguities. Please find below our point-by-point responses and the resulting changes to the text.

General comments:

-I've found a bit confusing the usage of the term "glacier" in the paper. sometimes it seems that the Authors include both surface and cave glaciers in this term sometimes only surface glaciers. I suggest using the term "glacieret" when speaking about Snezhnika and Sudohol. It might help to avoid confusion.

Thank you for the suggestion, it is most welcome, as these ice bodies are indeed glacierets. This change would also help clarify some of the ambiguities in understanding our manuscript.

-I missed two highly relevant references from the discussion (Colucci et al., 2016, Colucci and Guglielmin 2019), and suggested additional references or replacing the currently cited reference with a more pertinent one at a couple of places. Colucci RR, Fontana D, Forte E, et al. (2016) Response of ice caves to weather extremes in the Southeastern Alps, Europe. *Geomorphology* 261: 1–11. Colucci, R.R., Guglielmin, M. 2019 Climate change and rapid ice melt: Suggestions from abrupt permafrost degradation and ice melting in an alpine ice cave. *Progress in Physical Geography* 43: 561-573 <https://doi.org/10.1177/0309133319846056>

Thank you for reminding us of these two nice studies - we used them to better support our conclusions (see below).

-The name of one of the studied ice bodies is frequently written with a spelling mistake. "Basnki" should be corrected to "Banski" e.g. in line 114, 262, 266 or Fig4. I've marked this spelling mistake where I realized in the annotated PDF. I will not list them among the specific comments.

Corrected.

Although I marked few potential typos in the PDF, I note that I cannot provide a detailed linguistic review since I'm not a native English speaker.

Linguistic corrections were provided by a native speaker, dr. Sevasti Modestou (Canada/Norway).

specific comments:

line52: Citing this book chapter is not really relevant here, maybe the Authors wish to cite from the same year from the same author this paper: DOI:10.1017/RDC.2018.96

Done.

line62: A recent evaluation of CMIP5 simulations for this region (<https://doi.org/10.1007/s00704-020-03361-7>) confirmed the increase in winter precipitation, however showed that the models which reproduced better the decadal hydroclimate variability of the 1850-2005 period show less reduction in summer precipitation (instead increase). This suggests that it is more likely that summer precipitation will not decrease so highlight the importance of the topic of the study. It might be a relevant info here.

Thank you. We have used this and other references (Giorgi et al., 2011, 2016) to support these findings.

line68: I think Kern and Thomas 2014 is a more pertinent citation for this statement than Kern et al., 2013

Yes, it is also cited two lines above.

line76: Eisreisenwelt is not counted among the top5? If so then please, revise this statement.

For marketing reasons, Eisriesenwelt is considered to be "the largest ice cave in the world" – indeed it is the largest cave (42 km) *with* ice. The overall surface covered by ice is about 28,000 km<sup>2</sup> (Spoetl, 2018), but the volume is unknown and the ice does not occur as a single glacier, but as several distinct ice body. Anyway, it could be the 5<sup>th</sup> in terms of volume, after Dobsina (SK), Scarisoara, Focul Viu and Bortig (Ro), so we have modified the text accordingly.

line85: Is it really 'equilibrium' or just a moderately negative mass balance?

Compared with the tendency between 1947 and 1970s, we interpreted the post 1975 changes in ice level as indicating equilibrium, but the overall tendency is one of slight ice loss. We changed the relevant sentence as follows: "Monitoring of ice dynamics since 1947 (Persoiu and Pazdur, 2011) showed a rapid melt of ice during the 1950s due to changes in the morphology of the ice block, followed by alternating periods of ice growth and loss, superimposed on a moderate melting tendency."

line98: Geographical coordinates are lacking for Crna Ledenica.

Added now.

lines187-188: Are the described changes (retreat at the lower end of the two glacierets, increase in the width of the rimaye separating them from the cirque headwall) visible in Fig4? If yes, please refer to the figure.

Yes, they are. Ref to fig. 4 is being made in the text.

line238: Which zero isotherm do you mean? MAAT, Summer meant, July mean T? Please, be more specific.

Mean Annual Air Temperature. Info added in the text.

line238-241: I think a supporting reference for this statement is needed.

This is the case for all ice and snow accumulations at the bottom of shafts. With very few exceptions, ice in caves does not move horizontally, and when it does, it is only for several meters (at most) due to the restrictions imposed by the rock walls of the caves. We have inserted a reference to Perşoiu and Lauritzen, 2018 (Ice caves).

lines276-278: for instance, this is a place where Colucci et al., 2016, Colucci and Gugliemlin 2019 could be incorporated to the discussion.

Yes, indeed. We expanded the discussion to include these and other references.

Some additional minor comments are marked in the annotated PDF.

We have addressed all minor issues highlighted in the annotated PDF file.

Figures

Fig2: decimal places in the y-axis values can be omitted.

Done.

Fig3: The caption says that the changes are illustrated "since 2016", however the date of the first photo is 10.08.2014. Please, clarify this.

Typo, it is 2014

Fig6: I cannot see the panel codes in the figure. In addition, please, increase the characters in the title of the maps and use uniform character size for the titles.

Done.

Fig7: I cannot see the panel codes in the figure. In addition, please, increase the characters in the title of the maps and use uniform character size for the titles.

Done.

Fig8: Comment1: Could you add a color scale to help a better interpretation of the illustration. For instance, I guess reddish colors show warmer temp and bluish colors show colder temp, however it should be indicated in the caption. Comment2: Why the global temperature? European or SE European temperature changes could be much more relevant.

Explanations for the color codes were added in the caption. We used the global temperature, at it would make it easier for readers from different parts of the world to contextualize our findings.

Please also note the supplement to this comment: <https://tc.copernicus.org/preprints/tc-2020-287/tc-2020-287-RC3-supplement.pdf>

We have addressed all minor issues highlighted in the annotated PDF file.