RC - 1: I suggest the authors to re-organize the text to better emphasize their results, rather the method (as explained below). Briefly, I suggest:
1) detail the types of ice (and rock) dynamics in ice caves;
2) present what exactly you were targeting (ice volume changes, ice movement, rocky talus movement) and
3) discuss the results in a climatic perspective.

AC - 1: Originally, we aimed to emphasize the developed method. From our point of view, the ground laser scanning method has brought enormous possibilities for monitoring ice caves, but this does not mean that having a laser scanner is the only requirement for recording the ice volume. A developed methodology of how to scan, when to scan, how to process the acquired point data, how to create surface models and evaluate it are even more important. Based on our best knowledge, we have not found a publication in which a similar approach to the presented sC2C methodology would have been used for monitoring cave floor ice. From this point of view, we believe that the presentation of the methodological procedure is also scientifically beneficial for the community focusing on the cryospehere. On the other hand, we agree that is necessary to link results to climatic conditions. This is addressed in AC – 13 of this document.

Similarly to the response to the Reviewer 2, we are addressing that as first it is important to define and demonstrate a suitable methodological approach to detect subtle changes of the cave floor and evaluate the cave floor ice dynamics during a certain period in a reliable way, minimizing the uncertainty associated with measurement accuracy and mutual orientation of the scans. This problem defines the content of the submitted manuscript.

Research in the cave based on TLS measurements continues with the proposed methodology for monitoring the change of floor ice. To determine the reasons for changes in the volume of ice, a long-term observation is necessary, which will be linked in relation to the wider surroundings of the cave. In the revised version of the manuscript, we will concisely include interpretation of the findings with the climate data acquired by our team and by the state meteorological institute.

RC - 2: When discussing ice dynamics, a distinction needs to be made between the dynamics of large (e.g., several meters thick) ice blocks and that of smaller, seasonal ice speleothem. The later respond to day-to-day changes in climatic and hydrologic conditions in caves, whereas the former have a much longer response time (weeks months-years). Also, the dynamics of the former has two different components: ice melting/accumulation and ice flow. The manuscript deals with the long-term melting/accumulation of large ice accumulations and the introductions stresses this aspect only. I suggest the authors to detail the types of ice dynamics (briefly outlined above) and than explicitly state that they are addressing only one component of it. It would be of great benefit to also discuss the potential usage (advantages, shortcomings, pitfalls) for the other types of dynamics. Also, it should be discussed the potential use for high temporal resolution, as opposed to "high spatial resolution" (page 2, line 1).

AC - 2: We highly appreciate this comment which can improve our long-term research. Regarding the manuscript, we will add information on classification and theoretical issues recommended by the reviewer in the chapter 1 Introduction. High temporal resolution time series is a very interesting topic but, in this manuscript, we presented season by season and year by year resolution. The aim of this article is not to address as complex a problem as stated in the reviewer's comment on both high spatial and high temporal resolution of cave ice dynamics but it is interesting motivation for the further research.

RC - 3: The scope of scanning should be discussed in more details, e.g., was the scope to only show that this method is suitable, or was a specific research question being addressed - dynamics in a certain area, dynamics in relationship with position of the ice within the cave, external climatic conditions, possible movement of the ice etc? Also, to improve the quality of the results, I would suggest detailing the types of dynamics and movements that were targeted and discuss the results accordingly: ice dynamics (melt vs. flow), talus movement (moraine-like dynamics vs. periglacial-like rock sliding)

AC - 3: Ice dynamics in the cave Silická ľadnica is known for a very low altitude of cave ice occurrence in mid-latitudes and it was studied by several authors (e.g. Bella and Zelinka 2018), the results of which are presented in chapters 1 and 2. The aim of our research was to understand when the cave floor ice increases/decreases and what is the impact of surrounding conditions. Also important is the detailed quantification of the volume change and setting an objective approach for ice change monitoring. In the past, only short term air temperature measurements were performed and photo documentation exists from different years, but there was no detailed continuous mapping of the ice in the cave within one year. For this reason, we decided to monitor this cave in the long term in view of its specifics in Chapter 2. We approached the objectification using state of the art technology. At the same time, we think that this is an original research bringing results that have not been published yet.

RC - 4: P1, L18: ice in caves is dynamic, rather than the caves being dynamic. The term "cave" could refer to the morphological space (walls), that space plus the air inside, the same plus the biota etc, all with a specific dynamics, on scales ranging from millions of years (walls) to seconds (biota, climate, hydrology); hence calling a cave "dynamic" is somehow incorrect

AC - 4: Accepted and in the revised paper will be replaced. Cave dynamic will be replaced to ice dynamic in the cave.

RC - 5: P1, L21 delete "the surface of "

AC - 5: Accepted and it will be removed.

RC - 6: P3, L9 how was the age estimated?

AC - 6: Age of ice in the cave was approximated from Archeological findings by many authors such as Kunský, Roth and Bohm. Their proposal was also accepted by Droppa which mentioned that ice is in the cave 2000 years.

RC - 7: P4, L1 I would not stress the harsh environment as a potential factor preventing tachymetry-based studies of ice dynamics. Such methods have been used for decades, and the usage of TLS in caves is more difficult than tachymetry (as show in the introduction and in references therein: : :)

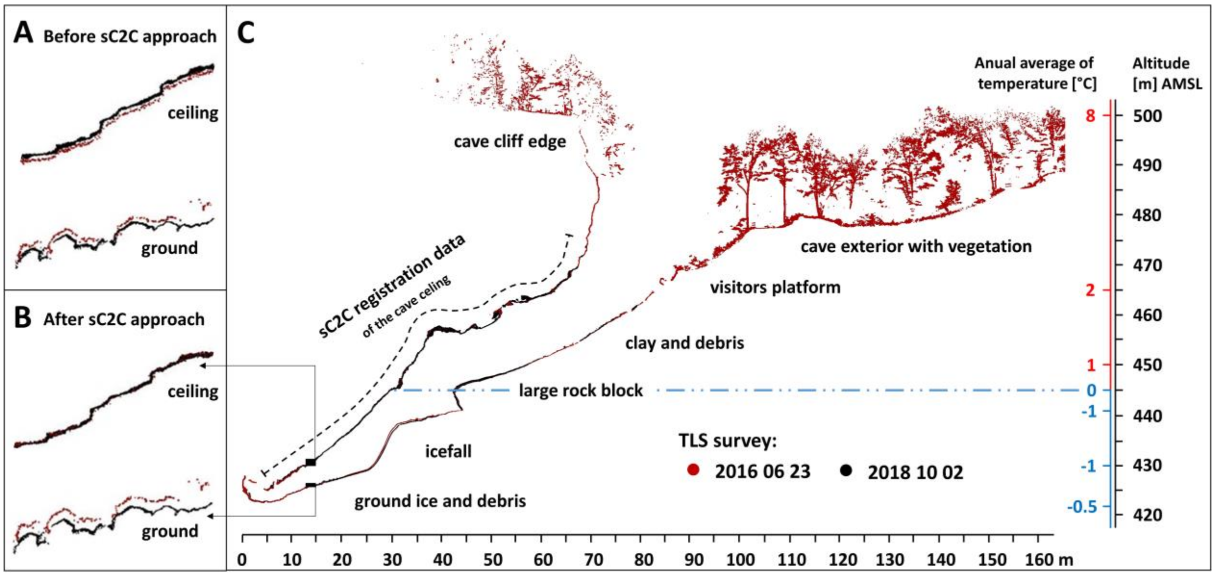
AC - 7: Speleologists perceive the environment as unpretentious, but it is challenging deploying surveying methods such as tachymetry. For detailed ice mapping with a density of more than 1 point per square meter, the use of classic tachymetry is a much more challenging task than comparing with TLS. This is not impossible, but it is very complicated and repeatable as it requires the enormous effort of the measurers. The problem is not the ice floor, but the icefall, moreover, we consider tachymetry as a contact/disturbing method, which leads to further complications in mapping for example stalagmites and stalactites. We will rephrase and modify the text to communicate this viewpoint clearly so that it is no misleading.

RC - 8: P4, l3: "obliquely falling bag" – "descending cave" (or similar) sounds somewhat better

AC - 8: Thank you for the proposal for describing shape of the cave. Descending cave or corrosive-collapsed abyss (Bella and zelinka, 2018) describe well the shape of the cave. The problem originates during the translation from Slovak. It will be rephrased as a descending cave.

RC - 9: P4, L3-9: this entire paragraph should be rewritten to be clearer. Also, add a cross profile of the cave (not only the map) and add here information on the volume of ice.

AC - 9: Accepted and paragraph will be rephrased with additional information. In Fig. 7, vertical range of the cave can be estimated. Roda et al. (1974) used drilling to measure the extent of the ice and they reported the ice surface area ranging from 710 to 970 m^2 and the ice volume ranging from 213 to 340 m^3 according to precipitation and temperature during last years. This information will be added to chapter 2.



RC - 10: P5, L9: "vertical gravitational ice forms" you mean stalactites?

AC - 10: Vertical gravitation is meant as all vertical ice speleothemes such as ice stalactites, stalagmites and stalagnates. It will be rephrased in the revised manuscript.

RC - 11: P5, L7-19: this historical paragraph can safely left out. I would discuss in more details the findings of StankoviclˇN and HorvalA¸th, 2004

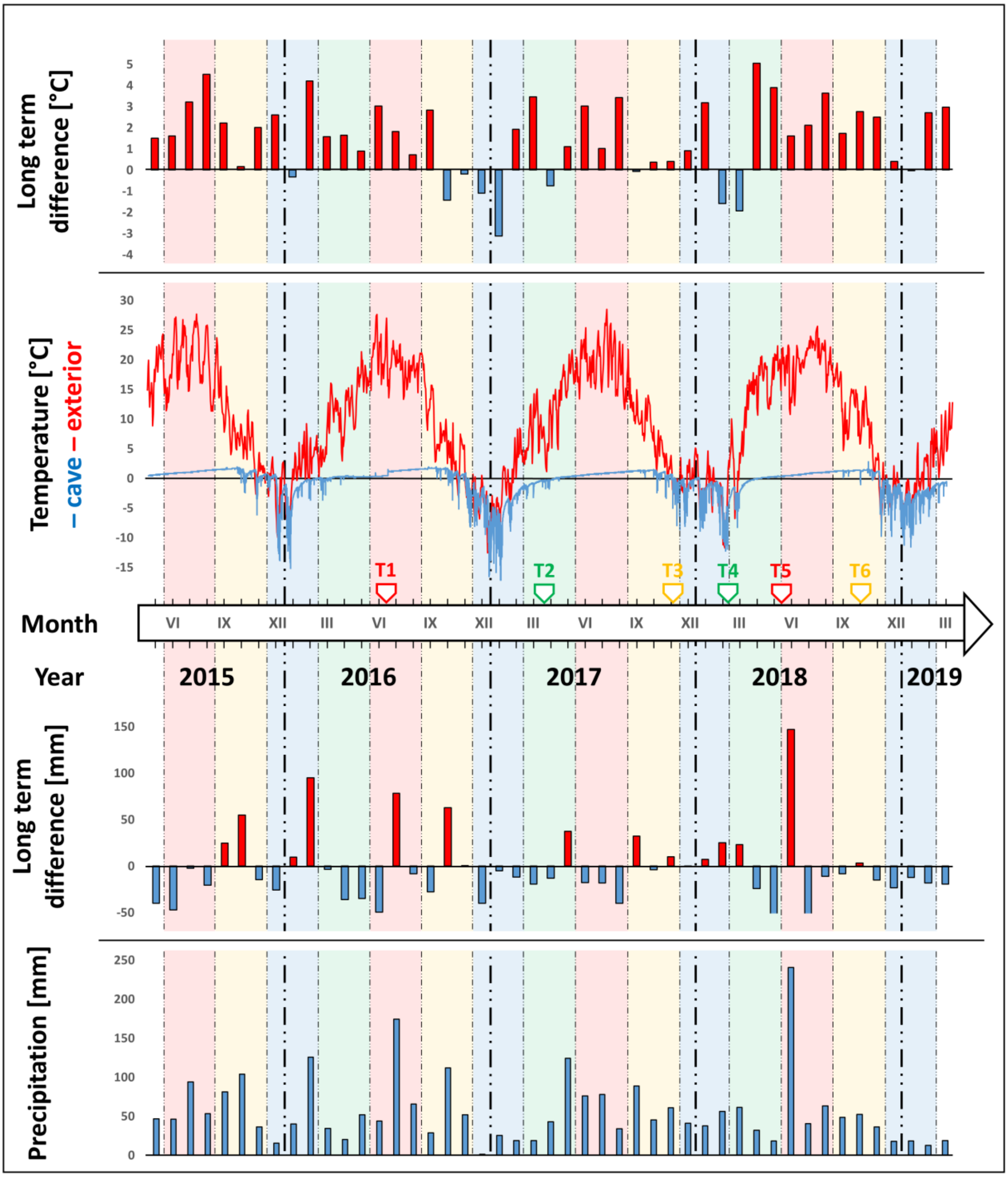
AC - 11: Accepted and will be removed.

RC - 12: P15, L4: I am not sure I understand the meaning here. Cave floor ice can be identified visually, you mean buried ice?

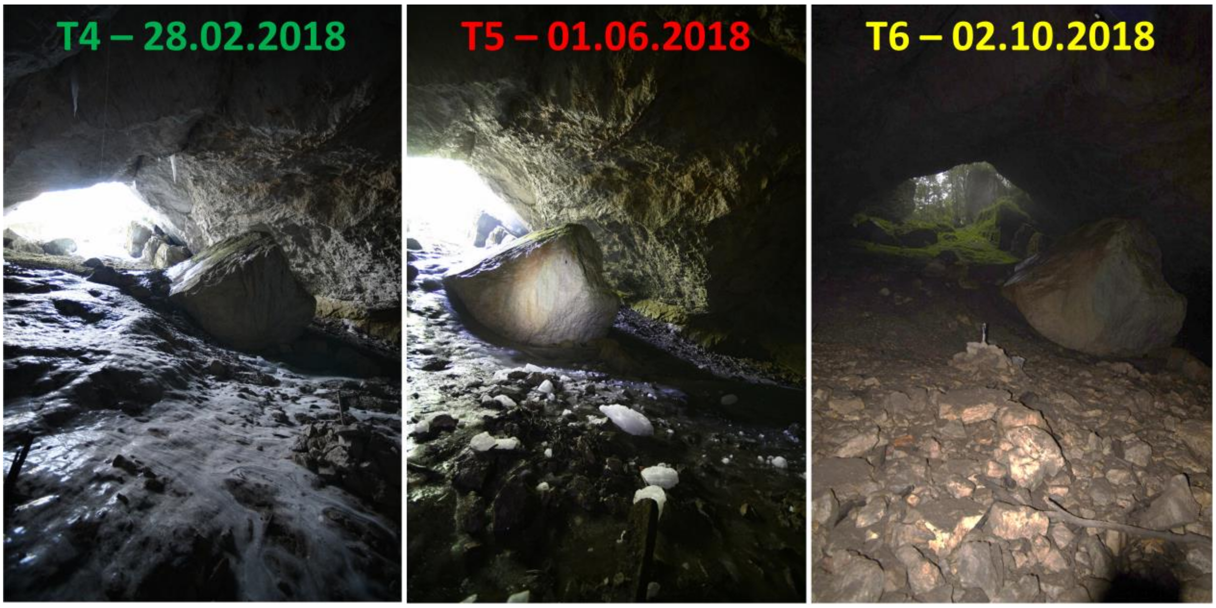
AC - 12: Not the all cave floor ice can be observed visually. In fact, we are speaking about buried ice, which is between small rocks and debris. We will rephrase the text to make it clear.

RC - 13: P15, L5-14 and chapter 4.2. this is one of the most important parts of the text, though it is not well presented and discussed. The information here is based (I presume) on previous observations. I suggest moving this text in the "cave description" section and than, use the TLS data to quantify the dynamics (calculate how much ice has melted/accumulated and see if you could correlate it with climatic conditions outside the cave).

AC - 13: We will modify the structure of Chapter 4. In the first part, change of cave floor ice based on cross sections will be presented. This part will be focused on ice flow, how the ice moves and in which direction. The second part will be focused on change in volume and the third part will link the volume changes with precipitation and temperatures during the monitored period. Added graph will be described with correlation to previous pictures of cross section and volume change as well as with table of ice volume change quantification.



The data is from the rainfall station near the Silica village which is about 5 km from the cave and the temperature data from the cave are based on our measurements from the datalogger, which position will be shown in Figure 3. Based on the graph and the volume change for ice growth is the most important precipitation occurring between February and April, if during this period there is a low amount of precipitation the increments of ice in the cave is small. On the contrary, if it rains in this period, it is reflected in the growth of vertical forms and the growth of floor ice, which is also documented by photographs from scans.


T4 – 28.02.2018
T5 – 01.06.2018
T6 – 02.10.2018