

## ***Interactive comment on “Detecting of Cave Floor Ice Dynamics based on Selective Cloud-to-Cloud Approach” by Jozef Šupinský et al.***

### **Anonymous Referee #2**

Received and published: 10 June 2019

This paper does fit within the scope of TC, in that it investigates ice caves using remote sensing techniques. The survey techniques used to acquire the TLS data are very good, and the resulting dataset is excellent, however, the opportunities provided by this data have not been fully explored. The main aim of the paper is not clear. It is uncertain as to whether the paper is arguing for novelty in using selective Cloud-to-Cloud registration, or for novelty in creating complex 3d models/DEMs from this dataset. The title of the paper and the level of detail within the methods section suggests that the paper is trying to present a new methods approach, but these methods are well established and the paper does not add any improvement or novelty to these. Furthermore, it is not clear why ice caves are important.

Throughout, the paper could be made more concise and clearer. It is recommended

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that the authors get a native English speaker to proof read the manuscript, as in some areas, meaning seems to get lost in translation, which affects the content of the paper. The paper has used good methods to derive DEMs and to assess changing ice volumes within the cave at an unprecedented spatial and temporal resolution. However, the use of this data to understand the dynamics of the cave floor is poor. DEMs of difference are used to identify areas and magnitudes of change and the timescale over which this happens. To further understand whether there are differences in changing ice volume with variations in the cave floor (ie transition between rock and subsoil, stone debris with subsurface ice) a single cross-section through the cave has been assessed. Although the location of this cross-section was chosen to cover the variety of floor types, only one cross-section does not provide sufficient evidence to better understand why ice volume changes spatially.

Discussion of the results is severely lacking; results are presented and brief possible explanations for changing ice volume are given, however, the paper lacks any depth of discussion with not a single reference within this section to support interpretations or compare with other ice caves. No consideration is given to the factors controlling ice formation within caves. This lack of discussion means that the 'dynamics' of changing ice volume are not addressed, with the paper only showing that ice volume and elevation decreases. This work is hindered by not incorporating data from temperature monitoring within the cave and rainfall stations located around the cave, which it states are available but have not been incorporated into the work. Without these datasets, it is not possible to accurately identify potential causes/processes of ice change, as air circulation and cave temperatures are crucial for the formation of ice in caves. Conclusions are drawn based on no supporting data or evidence, with ice volume decreases being related to extremely dry years but not climate warming. This is quite a major conclusion to reach without having addressed any temperature or meteorological records in the paper. As it stands, the manuscript simply provides results. Unfortunately, the quality of the figures are poor and they are often too small, with captions severely lacking in detail. Due to this, they often do not add a great deal to the reader's

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understanding.

Authors are encouraged to revise the paper and resubmit; unfortunately, I feel that the work required for this would not be encompassed under the recommendation of 'major revisions' as the content would change considerably. The basis for an excellent paper that improves our understanding of ice coated cave dynamics is there, but considerable work is needed to demonstrate the processes and drivers of such change. Furthermore, the write up of the investigation needs substantial improvement. Please see the supplement for line-by-line major and minor comments identifying where the manuscript could be improved and some suggestions for this improvement.

Please also note the supplement to this comment:

<https://www.the-cryosphere-discuss.net/tc-2019-82/tc-2019-82-RC2-supplement.pdf>

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-82>, 2019.

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