The Cryosphere Discuss.,
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The Cryosphere Discussions

# *Interactive comment on* "Brief communication: The influence of mica-rich rocks on the shearstrength of ice-filled discontinuities" *by* Philipp Mamot et al.

**Anonymous Referee #1**

Received and published: 6 March 2020

General comments:

A well written Brief communication that complements the earlier work (Mamot et al 2018) very well.

1. Does the paper address relevant scientific questions within the scope of TC? yes

2. Does the paper present novel concepts, ideas, tools, or data? Yes, new data

3. Are substantial conclusions reached? Not substantial, but a valuable contribution to the understanding of behaviour of ice filled rock joints.

4. Are the scientific methods and assumptions valid and clearly outlined? yes



5. Are the results sufficient to support the interpretations and conclusions? Some additional comments are requested for points (i), (ii), and (iii) of the discussion (please see below)

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes, but some additional comments are requested on the sample preparation (see below).

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? yes

8. Does the title clearly reflect the contents of the paper? yes

9. Does the abstract provide a concise and complete summary? yes

10. Is the overall presentation well structured and clear? yes

11. Is the language fluent and precise? yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? I recommend combination of Figure 2 and Figure A1.

14. Are the number and quality of references appropriate? yes

15. Is the amount and quality of supplementary material appropriate? yes

Specific comments:

Line 55 / Figure 1: also give the coordinates of the Zugspitze location

Line 65 sample preparation: Please comment on the alignment of mica parallel to the surfaces of the samples used in the experiments: presumably the samples were cut parallel to the foliation. How does the mica content on the sample surface compare with the mica content in the thin sections? Were the samples cut through mica-rich

bands (weak bands and therefore more likely to form fractures in a rock mass)? How many samples were prepared and what was the variation of these samples in terms of mica content?

Line 68-69: a strain rate is compared with an acceleration. Please make sure that you compare like for like.

Line 83: I suggest to replace “stronger polarity” with “higher concentration of negative surface charges”.

Line 94: replace “rock-ice” with “concrete-ice”

Figure 2 and Figure A1: I recommend to include the limestone data points from Figure A1 into Figure 2, as this makes it easier for the reader to directly compare the data. I may become necessary to increase the size of Figure 2.

Figure 3: please add a comment on the reliability of the data: how was the failure type observed? Can you give an error estimate for the failure type identification?

Lines 129-132: Point (i): Please comment on the alignment of mica parallel to the surfaces of the samples used in the experiments: natural rock fractures form along mica platelets that are not perfectly parallel. A cut rock surface therefore will expose cuts through a mica grain rather than the surface of the silica sheet. Can you give an estimate how the surface charges of a cut surface differ from the surface charges of a natural fracture?

Point (ii): I agree with the statement; however, in your experiments you use surfaces with the same roughness. Can you comment on the effect of the different surface roughness on the shear strength of natural joints in limestone vs. joints in gneiss or mica schist?

Point (iii): I suggest to replace “presumably” with “possibly”. Please comment to what extent the reduction of shear strength from (ii) and the increase of shear strength from (iii) cancel each other out.



Line 136: I suggest to replace “systematic increase” with “slight increase”. The highest points of the data clouds of the silica samples are higher than the highest points of the limestone samples; however, the data clouds overlap and about half of the limestone data points are also above the failure criterion.

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