Responses to comments by reviewers of manuscript tc-2020-301 “The flexural strength of bonded ice”

We thank anonymous referees for additional comments on our work. We have modified our manuscript according to them. Please, see all the responses in red.

Comments from Referee # 2

Comment 1. My encouragement about expanding the discussion to include the relationship between linear-elastic brittle beam theory (equation 1 in the paper) and other theories such as 2 or 3-D stress-failure criteria has not been done. It is not essential for the paper as it is mostly an experimental study, but would make the paper more interesting and useful. In appendix A you have included Hookes law and a plastic development law (flow rule). None of these are (or should be!) compared with Equation 1. If you want to do this you need to include equation for yield (or failure) criterion, not pre-failure (elastic) or postfailure (flow rule). To get the paper accepted you should either remove the appendix and the text in lines 122 - 124. Or you should include one, or more equations for yield (or failure) and compare these with the beam theory. **I would like to underline that it is OK if you don’t want to spend time on this and leave it out of the paper**.

We removed Appendix A and text in lines 122-124 as recommended. Since our work is an experimental study we decided not to focus on the development of precise theoretical models.

Comment 2. The words strength. It is not correct that you use flexural strength about the peak stress in the outer fiber. You use the word flexural strength about the value you get from equation 1. Further you argue that this is probably similar to the extreme stress in the outer fiber. There is an important difference here (se point further down) that I think you should use the opportunity to explain.

Tensile and flexural failure. It is good that you enhanced the discussion on this. But, it would be great if you could explain the very simple fact that these should only be equal if the material is linear-elastic and brittle (takes one sentence and a reference). Then you could explain that in your case the linear-elastic-brittle assumption is probably fine and the explanation have to be elsewhere. If you read in the literature there are many ice-paper where linear-elastic-brittle assumption is used on analysis of field data without discussion. In this paper you have a chance the help to enlighten thew ice mechanical community on this and I hope you use this opportunity.

We added clarification that we assume linear-elastic and brittle material when compare tensile and flexural strength (lines 119 and 194). We also provided the reference to the work by Ashby and Jones (2012), as recommended, where the authors compare flexural and tensile strength and indicate that the material is brittle linear-elastic.

Comment 3. Appendix B. I can only recommend that this paper is published if you take way Appendix B and all the references to it. In the derivation you have assumed that Fourier's number characterizes the process without any discussion or justification. You could have assumed a linear relationship between time and length and the practical predictions of the time would equally well fit your data. In other words, the derivation does not help building credibility in your results. It is not so that I don't believe in your results, on the contrary I think they are good and solid. But, you should avoid arguing without substance. I am sorry to be so categoric, but it is important to compare with theory in a rational way. If one really wants one can make most theories fit a set of experiments.

We removed Appendix B and all the references to it as recommended.