

Strain response and energy dissipation of floating saline ice under cyclic compressive stress

by Mingdong Wei, Arttu Polojärvi, David M. Cole, and Malith Prasanna

Submitted to The Cryosphere Discussions

2nd Review

July 7, 2020

Summary

The authors have responded to the majority of my comments from my first review and I believe the manuscript has been improved as a result. In particular, I am happy to see more details provided on the method used to estimate values for E_0 and ρ and to see a clearer explanation of the temperature dependence of these variables and their relationship to the observed higher rates of strain for warmer “floating” ice. However, I am still surprised to find no discussion of the temperature dependence of viscous strain. I am also puzzled by the authors’ response to one of reviewer 1’s comments that the “original intention of this study is not to investigate the effect of temperature and floating condition on ice behavior”. I feel this understates the authors’ work and the resulting changes to the text detract from the overall quality of the manuscript.

Major comments

1. Still no discussion of temperature dependence of viscous strain component

According to equation 10, the differences in ice temperature between the wet and dry experiments ought to result in an approximately two-fold difference in the viscous component of strain, ϵ_v . This should be discussed on more detail in relation to the overall increase in strain observed in the “floating” ice.

2. Ambiguous premise of paper

In their response to reviewer 1’s comment 13, concerning the processes being tested by the experiment design, the authors state that “*the original intention of this study is not to investigate the effect of temperature and floating condition on ice behavior*” and the manuscript should instead be considered as a methods paper, as reflected by a minor restructuring of the conclusions section. I find this to be a disappointing climb-down, when I would have preferred to see a clarification of the conclusions that can be drawn from the authors’ novel laboratory method.

I also find this to be an entirely unconvincing argument. If the study was intended to be an investigation into the effects of temperature and floating conditions, why did the authors include experiments on both cold, isothermal non-floating ice and poly-thermal floating ice? Instead of removing references “wet” experiments, I urge the authors to revert to their nomenclature and instead spend a little extra text speculating on how floating, polythermal ice might respond differently to non-floating ice with an equivalent average temperature.

In its current form, the premise of the manuscript is ambiguous and despite removing references to “wet” experiments, the text still contains phrases like “Thus, the fact that the ice was in contact with water and had a realistic temperature profile ...” (line 365), which still contribute to the misunderstanding that the authors are studying the effect of water on ice behavior.