

The Cryosphere Discuss., author comment AC1
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Reply on RC1

Tom Mitcham et al.

Author comment on "The instantaneous impact of calving and thinning on the Larsen C Ice Shelf" by Tom Mitcham et al., The Cryosphere Discuss.,
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Our responses to the specific comments of Referee #1 are attached as a Supplement to this author comment. Below, we respond to the general comments that were common to both reviews to prevent repetition in our specific responses to each referee.

General response to both referees

We thank both referees for their thorough reviews, and their positive assessments of both the scope and relevance of the study.

It was suggested by both referees that the instantaneous nature of the experiments conducted needs to be emphasised more throughout the manuscript. We will certainly clarify this point in each section of the revised manuscript as suggested.

Both referees also proposed that we could, or should, include some transient experiments in this study.

The aim of this work is to identify where in the Larsen C Ice Shelf (LCIS) buttressing forces are generated, and their impact on grounding line flux (GLF). This can be analysed by looking at the instantaneous response to perturbations, as buttressing is an inherently time-independent process, relating to the state of stress in the ice.

The results of transient experiments - examining the mass redistribution in response to perturbations - are best presented in a separate paper for two main reasons: firstly, also examining questions of mass redistribution would distract from the key messages of this paper, which are the assessments of the total buttressing of the LCIS, and where this buttressing arises in the shelf; and secondly, including additional transient experiments - with the necessary additions to the introduction, methods, analysis, discussion and sensitivity testing - would make the paper overly long.

We are currently in the process of conducting transient experiments, and while this transient work is still ongoing our initial results suggest that the impact on GLF is largest immediately after the perturbation before decaying back towards the initial GLF as the tributaries thin in response to their initial acceleration. As stated above, we think that a thorough treatment of the transient response to these perturbations, and an analysis of the reasons for this behaviour, would far extend the scope of the current study, and possibly lead to confusion as we would be discussing two different, distinct processes in

the same paper (i.e. ice-shelf buttressing versus transient mass redistribution). We are, furthermore, confident that all our results in the manuscript will not be affected or need to be revisited once our transient simulations are finalised. We intend to submit the results of the transient experiments in the same journal in due time.

Please also note the supplement to this comment:

<https://tc.copernicus.org/preprints/tc-2021-105/tc-2021-105-AC1-supplement.pdf>