

Interactive comment on “Analysis of ice shelf flexure and its InSAR representation in the grounding zone of the Southern McMurdo Ice Shelf” by Wolfgang Rack et al.

R. Walker (Referee)

ryan.t.walker@nasa.gov

Received and published: 24 April 2017

This study touches on a very important issue, given that InSAR-derived grounding lines are frequently used and often considered to be the most accurate. The authors show here that near-grounding line ice shelf flexure can produce an apparent vertical motion that is actually caused by horizontal strain at the surface, and that this causes an error in estimating the grounding line position. The combination of satellite data, two types of ground-based instruments, and simple modeling is quite convincing. While the observations are from an atypical (though very well chosen) area, there is potential for this approach to be applied to more complicated situations.

Specific comments:

C1

Figure 1: Brown Island is referenced in the text but isn't on the map. For the editors, this figure looks nice online but it should be larger in the final print version.

Page 4, line 20) Here or in the Fig 2 caption, what tidal constituents were in the signals?

Page 5, line 9) To clarify, "flattened" means that the topographic effect has been subtracted?

Figure 2: A double y-axis plot may be easier to read than multiplying the horizontal signal.

Page 6) Unless I missed something, Figures 4 and 5 are referenced before Figure 3.

Page 6, line 5) Perhaps only reference 5a? You haven't explained 5b,c yet.

Equation 1) It should be noted that this comes from Smith (1991) with displacement and slope taken to be zero at $x = 0$. The "clamped" boundary conditions should be explicitly stated here.

Page 7, line 17) Figure 4a doesn't show stress and strain, just horizontal displacement.

Page 9, top) In your favor, the synchrony of the vertical and horizontal components on relatively short timescales does strongly suggest that the response is dominated by elastic behavior.

Conclusion) Although it doesn't affect the science, this would read better if the caveats were placed earlier and the (rather nice) results at the end.

My apologies to the authors for having been late with this review.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2017-13, 2017.

C2