

## ***Interactive comment on “Grounding and Calving Cycle of Mertz Ice Tongue Revealed by Shallow Mertz Bank” by X. Wang et al.***

### **Anonymous Referee #2**

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The authors use bathymetric, ICESat, and Landsat data products to estimate the firm air content, depth below sea level, re-grounding locations, and advance rate for the Mertz Ice Tongue from 2002-2008. They find that grounding along the Mertz Bank resulted in slight rotation and rifting of the Mertz Ice Tongue that would have resulted in the ice tongue's eventual collapse in the absence of any additional triggering mechanisms. Further, they suggest that the ice tongue collapse has a periodicity of  $\sim 70$  years and that this periodicity results in periodic variations in local sea ice formation and bottom water formation. Although the topic of the manuscript is interesting, the limited presentation of the methods and irregular quality of the writing make it difficult to follow. In addition to the major revisions listed below, I recommend that the authors go through the text in detail to check the writing and to make sure that all figures are legible.

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1) In the data and methods sections, the authors frequently refer the readers to other publications rather than describe the data processing procedures in detail in the text. I find this to be particularly concerning for the freeboard inversions to estimate ice thickness because small errors in freeboard can lead to large variations in the estimated tongue depths. In order to have confidence in the provided tongue depths, I recommend including more detail on the relocation and interpolation procedures. Similarly, more information regarding the uncertainty of the bathymetry data used to identify grounded regions would be incredibly helpful.

2) It's really difficult to follow the firn air content approximation. I assume the bed elevations are really well constrained under the targeted icebergs and you are simply iteratively estimating the iceberg depths for gradually decreasing values of the mean iceberg density. The units obtained for the firn air content estimated using this method require explanation. I assume that they represent the difference in iceberg depth assuming a constant ice density and the final ice density estimated through the comparison with the underlying bathymetry since the units are in meters, but this is not presented anywhere. It would be helpful to also present the final density inferred for the firn column so that it is easier to compare your estimates with other observations. The error estimates obtained for firn air content should also be presented in more detail. I am particularly concerned with the assumption that the ICESat tracks capture the thickest portion of each iceberg. I'd be more confident in the firn air content estimates if I was also shown that there are relatively small variations in iceberg freeboard along the ICESat tracks because that would increase confidence that the iceberg grounding location is captured by the ICESat data.

3) The addition of the iceberg scour section at the end of the discussion is somewhat out of place with the rest of the manuscript. I suggest removing it entirely.

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Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-3, 2016.

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