

Interactive comment on “Antarctic grounding zone characteristics from CryoSat-2” by Geoffrey J. Dawson and Jonathan L. Bamber

Anonymous Referee #1

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This paper attempts to characterize the Antarctic grounding zone using Cryosat 2 standard and swath elevation data. The authors provide 41% coverage of the larger floating ice shelves and outlet glaciers in Antarctica. The adopted grounding zone mapping methodology has already been presented in previous literature and uses an auxiliary tidal model.

I have several major criticisms both related to methodologies and conclusions:

- 1) The methodology adopted requires a 3 year moving window hence limiting the ability of capturing grounding line dynamic nonlinear retreats.
- 2) The author claims this method could potentially monitor retreat in the Amundsen Sea Embayment (ASE) . They also claim no significant changes in grounding line position

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were detected over the ASE in the period 2010-2017. This contrasts with DInSAR measurements performed during the same period (See Milillo et al 2017 for Pien Island, Milillo et al 2019 for Thwaites). In my opinion this methodology might result misleading in areas where tidal amplitudes are small and is in fact providing wrong results. The authors should also comment on the discrepancies between the aforementioned studies.

Milillo, P., Rignot, E., Mouginot, J., Scheuchl, B., Morlighem, M., Li, X., & Salzer, J. T. (2017). On the Shortâ€term Grounding Zone Dynamics of Pine Island Glacier, West Antarctica, Observed With COSMOâ€SkyMed Interferometric Data. *Geophysical Research Letters*, 44(20), 10-436.

Milillo, P., Rignot, E., Rizzoli, P., Scheuchl, B., Mouginot, J., Bueso-Bello, J., & Prats-Iraola, P. (2019). Heterogeneous retreat and ice melt of Thwaites Glacier, West Antarctica. *Science advances*, 5(1), eaau3433.

3) The authors compare their Cryosat2 results with DInSAR Grounding line measurements, However DInSAR data have not been acquired at the same time of the Cryosat data. This important detail might result in a further misinterpretation of the results.

4) The authors use a simple elastic beam model to investigate the relationship between ice thickness and grounding zone width. The elastic model assume a fixed grounding line position whereas It has been proven in recent literature (Milillo et al 2017, Milillo et al 2019) that a simple elastic model does not explain tidally induced grounding line migrations commonly observed in nature.

For these reasons I believe this study is still immature to be published in the proposed Journal.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-196>, 2019.

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