

Dear Dr. Howell,

Thanks for your and the reviewer efforts. We have addressed the minor comments from reviewers - importantly, the horrendous-looking Figure 6 (which escaped us during review of the submission) was re-plotted and looks as intended.

Best,

Christopher Horvat on behalf of the authors.

Reviewer 1

- Figure 4 is much better now, and I think it is acceptable to use this to explain the peak in dark leads during July and August. However, this could be more clear if you show the individual monthly points instead of the dashed line. I think this is an important part of the analysis and the figure doesn't make it clear. A mean seasonal cycle would maybe be easier to justify this too.

This seems to refer to the LIF_{ND} plot which is as a dashed line. We now replot Figure 4 with the monthly data with scattered dots to show the differing values there, since these are only two months. The revised caption reads:

(a) Arctic sea ice extent of 6 PM-SIC products (dashed colored lines) compared to the area well-sampled by IS2 (black line, black scatter) from October 2018-December 2023. Black line with blue scatters is the IS2 extent when excluding areas with more than 2.5% dark lead fraction, LIF_{ND} . "Summer months" have red background.

- Figure 6 obviously needs a lot of work to improve readability, that was a little disappointing. Yes, this was an embarrassing oversight that must have happened on generating a final figure file - the version that appeared in the submission is not what we have locally or should be produced. Please see the much-more-legible Figure 6 in the revised submission.

Reviewer 2

- This paper describes a thorough analysis of errors associated with a new linear ice fraction product from ICESat-2 in comparison with sea ice concentration products from several passive microwave products. The linear ice fraction product has potential to enhance current sea ice concentration data products.

The revised manuscript is much improved. The authors have addressed the concerns raised in my initial review to my satisfaction. I have a couple of minor technical comments for clarification noted below. Otherwise, I recommend this paper for publication in The Cryosphere.

- P11, L243: The two AMSR2 sea ice concentration products are stated here, but why are they presented as either/or in this sentence? Maybe this needs clarification or just a revision to the sentence.

Thanks - we rewrote this sentence as we use both products.

We also include two algorithms using brightness temperature data from the Advanced Microwave Scanning Radiometer 2 (AMSR2) sensor on board the JAXA GCOM-W satellite, computed using (5) the NASAteam2 algorithm (Meier, 2018), and (6) the ASI-ARTIST algorithm Spreen et al. (2008).

- P11, L254: The NASA sea ice concentration algorithm for AMSR2 is the NASA Team 2 algorithm. I would abbreviate this product as AMSR2-NT2 throughout to paper to clarify that it is not the NASA Team (NT) algorithm applied to AMSR2 brightness temperatures. Related to this abbreviation, I noticed the labels for AMSR2-NT[2] and AMSR2-ASI in Figure 4 have typos.

This is a good point. We now fix throughout, and in the figure change AMRS2 to AMSR2.

References cited

- Meier, W.: AMSR-E/AMSR2 Unified L3 Daily 25.5 km Polar Gridded Brightness Temperatures, Sea Ice Concentration, & Snow Depth, Version 1, <https://doi.org/10.5067/TRUIAL3WPAUP>, tex.doi+duplicate-1: 10.5067/TRUIAL3WPAUP, 2018.
- Spreen, G., Kaleschke, L., and Heygster, G.: Sea ice remote sensing using AMSR-E 89-GHz channels, *Journal of Geophysical Research*, 113, C02S03, <https://doi.org/10.1029/2005JC003384>, 2008.