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Interactive comment on "Inter-comparison and evaluation of sea ice type concentration algorithms" *by* Yufang Ye et al.

Anonymous Referee #2

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Summary:

This paper compares eight different sea ice type concentration products, consisting of passive microwave derived products and combined scatterometer/passive microwave products. Evaluation is done in comparison to three sea ice type products and two sea ice age products. Quantitative analysis is done via comparison with tie point values (pure surface types) and qualitative analysis done via comparison with interpreted SAR imagery. The results indicate that the best overall SITC performance is from the combined scatterometer and passive microwave products.

General Comment:

This paper provides a quite thorough assessment of several different SITC products

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and the conclusions are well-supported. It makes sense that using the combination of passive and active sensors would perform best. The analysis demonstrates the differences between the various products quite well and thus acts as a solid baseline reference point for understanding uncertainties in the different products. SITC is an important parameter, increasingly so as the Arctic is transitioning from primarily MYI-dominated regime to one that is FYI-dominated. While SIT (MYI vs FYI tagging of pixels) is fairly common, useful SITC is more challenging. This paper shows the value of the SITC products and indicates the best products. The paper is well-written, the results are logically presented, and figures are for the most part clear (comments below) and illuminate the results. I recommend publication after address a few minor issues.

One overarching thing is that the paper does not address summer melt at all. I know that summer melt obscures the backscatter and emission from the ice and SITC are not retrievable. But a reader not as familiar with microwave characteristics of sea ice may not realize that. Nowhere in the paper is the melt effect mentioned. I think a sentence or two in a logical place early in the paper (e.g., somewhere in the Intro or Section 2.1) to note this and explain why your results only cover the months of October through April and why all the case study comparisons with SAR take place during those months. Other comments are below by line number.

Specific Comments:

80: I'm a little confused by the use of "backtracking". At least for the NSIDC-SIA, I would simply call it "tracking". I guess it's backtracking in the sense of one is counting from back when ice first formed. But the actually method simply tracks parcels in ice forward in time an increments the age.

133: "OW" is used here without explanation. It should be spelled out as "Open Water" the first time it is used.

139, Table 1: It's good to note the resolution in the table, but it seems like the differences in the resolution might play some role? The products that include scatterometer

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data perform the best, but these are also the products and double the spatial resolution. So, there is the question of whether the scatterometer input is what performs better or if it is the better resolution? I actually think it is largely the inclusion of backscatter as another source of information, with better resolution probably being fairly minimal. However, better resolution may have some effect and I think this is worth acknowledging as a potential (small) contributor.

157: This a pet peeve of mine, but I don't like the use of "proof" in science papers. Science is always provisions, subject to further data or evidence. In particularly "concrete proof" here is much stronger than warranted. I would suggest "concrete evidence" or something similar. This occurs elsewhere (as I point out below, but I may have missed some).

179: "It can be seen. . ." add "in Figures 4 and 5"

181: Typo "NSIDC"

218: "sets of ice pixels" sounds odd to me. Maybe "regions of interest"?

Figures 6-8: These are nice and I like how you see the year-to-year variation. But it does crowd things. I would change these figures, but I might suggest adding a figure (or figures) that show an average seasonal cycle from all the years. Then you could have a plot that is just October-April and it would be easier to see the differences between the products. I realize that characteristics vary between years, but still I think an average seasonal cycle might make it easier to distinguish the major features of the various products.

Table 4: What do the bolded numbers indicate?

Figure 9: I wonder if maybe instead of grouping the 8 products by 5% bins, group the concentrations by the product. Either way there are 8 categories. But I think having all of the % bins together for each product would be clearer. I find myself trying to read the different % bins of each product and that's difficult to do as they are plotted. I might

also be careful about the colors – there may well be color blindness issues with the color palette used.

269: Another “proof”, suggest “evidence” instead.

275ff: This is really nicely done – the figures look great and overall everything is quite clear. The main question here is who is interpreting the SAR imagery and how? SAR sea ice imagery can be quite difficult to interpret in some cases and the backscatter characteristics can vary for different ice types. This is why usually interpretation is done at ice charting centers by expert trained analysts. I don’t disagree with the interpretation, but I’m not an expert in SAR sea ice imagery. So, I just wonder who interpreted the images and what is the basis for their interpretation. There are sometimes “analyzed” SAR imagery done at ice charting centers – i.e., imagery with outlines of different ice types drawn in by analysts. This would be ideal, but I don’t think such annotated imagery is generally available. Again, I think the approach is fine and the interpretation seems reasonable, but I’d like a little more detail on the basis for the interpretation. Otherwise, it sounds a bit “hand-wavy”.

Figures 10-15: As note, overall these figures are very nice. The one thing a little hard to discern is the SAR images. Is there a way to increase the contrast on the images? It’s hard to distinguish some of the subtleties in the grey scale for some of the regions discussed. The other thing a little hard to see is the wind vectors. They’re quite small and thin.

275ff: As noted above, the fact that retrievals are not possible during summer is not stated in the paper. And Figures 10-15 are between October and April to avoid the melt issue. One question is how “close” to the “shoulder” season can one go? I guess once melt appears in the signal, you lose ice type information. But the exact timing depends on location and local conditions. For example, the Fram Strait example, on March 1, seems like it could (if conditions were right) cause surface melt, though in this case the winds are from the north. But temperatures do appear to be approaching 0 C near the

ice edge. This comment is mainly just to further suggest that melt effects should be discussed and this section may be one area to include that.

319: “proof”

360: “proves”

376, 378: I prefer “perform” over “work”, which sounds colloquial to me.

382: “few” instead of “little”

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