Review 17 February 2023
Earth System Science Data

A new sea ice concentration product in the polar regions derived from the FengYun-3 MWRI sensors
Chen et al.

This paper describes a new sea ice concentration (SIC) data product produced using a modified version of the ASI algorithm and a new intercalibrated brightness temperature data set from the FengYun-3 series of satellite Microwave Radiation Imager. The paper provides a thorough intercomparison of the new SIC product with similar passive microwave SIC products from AMSR-E/AMSR2 and SSMI/SSMIS as well as a comparison of the derived sea ice extents to other existing sea ice extent products. In general, the new dataset compares similarly to the other products and the authors do a nice job of framing their new data set as an independent measure of SIC while new sensors for the other SIC products come online in the future. The paper also describes the common limitations of their data that affect all passive microwave sea ice concentration products. The dataset is publicly available at the PANGAEA repository, and I was able to download and read a sample of the data without any problems.

I think this work provides a good contribution and is appropriate for publication in ESSD pending a few minor revisions as described in my comments below.

Minor Comment
I have one minor comment regarding the intercomparison of the gridded SIC product with ship-based observations discussed in Section 3.3. Specifically, I disagree that larger disagreement between the satellite SIC and ship observations in the low SIC categories automatically means that the satellite SIC is less accurate. There is a more complex relationship here related to the distribution of sea ice within the gridded cell versus an observation at a single point or along a transect. I suggest the authors add a bit more discussion about how the differences in the scale of these two observation types are not a one-to-one comparison. The remainder of my comments listed below are very minor technical suggestions.

Technical Comments
L64: Change "easily ignored by the PM observations" to "unresolved by the PM observations"

L73: Grammar - change "which is only use" to "which only uses"

L131: Change "It is notes" to "It is noted"

L132: I recommend deleting "Besides" from this sentence.

Figure 7: The color scale below the figure does not seem to map to the data in any regularly spaced bins, other than dark blue = 0, white or grey = 3, and dark red = 55. This makes some lower percentage proportions (e.g., 5 – 15 range) appear to be more significant (pink and red)

than they may be. I suggest binning the data into a regularly spaced color scale and not using a diverging color map.

L345: An observer on a ship is reporting the concentration of sea ice immediately surrounding the ship, not the concentration of ice distributed around the full area of a grid cell. Wouldn't the bigger differences between MWRI-ASI SIC and the ship observations in the lower sea ice concentration groups be related to differences in the distribution of sea ice within the gridded observations versus a point observation from a ship? I think the conclusion at line 345 that MWRI-ASI SIC is more accurate in high concentration regions is more complex than stated.

L375 and 376: Typo? Should "lightly" be "slightly"?

L416 – 422: Do not introduce a new dataset and results in the discussion section. I suggest moving this up to the results section.

L428-430: Is this future work? "in the next step" suggests that you will address it in the next section of the paper. I recommend changing the wording here to say this will be future work.

L455: I recommend changing "Besides" to "Additionally" to make it clearer that these biases are also provided with the SIC data set.