Re-review of paper "Rotational drift in Antarctic sea ice: pronounced cyclonic features and differences between data products"

1 Content

The authors de Jager and Vichi re-submitted a paper which analyses the differences between different satellite-based sea-ice drift products from EUMETSAT OSI-SAF (product OSI-SAF 405 c), namely five single-sensor-based products (AMSR2, ASCAT, 3x SSMIx) and a merged product based on the formerly mentioned ones. Much content has been added to expand the manuscript from the previously submitted "Brief communication" to a full-fledged research article. The major differences are the inclusion of an uncertainty estimate and analysis, the discussion of spatial variability and the restriction of the analysis to high-quality data as per the quality flags of the drift product.

2 General comments

I appreciate the effort which the authors made to submit this expanded version. I fully agree with their decision to extend the manuscript to a full research article, following the handling editor's recommendation. I enjoyed reading this manuscript and found my concerns from the first round of review addressed satisfactorily. However, I still have some comments which I would like to see addressed before publication. Line numbers in my specific comments correspond to the track-change version of the revised manuscript.

3 Specific comments

3.1 Abstract

L14: " ...Antarctic ice characteristics.": You might consider removing "Antarctic", since the need for methods to quantify sea-ice changes is also there in the Arctic.

3.2 Introduction

General: I find the Introduction quite long. The part after L72 was interesting and well-written, but the part before could for my taste be condensed. I suggest to build your

motivation on the increased storminess and the recent changes in Antarctic sea ice, but not so much on having an additional measure for assessing climatological trends as a complement to SIE.

L44-45: A reference would be good, for example IPCC AR6.

L72: You start your sentence with "Studies...", but then refer to only one. I suggest to either rephrase or add more references.

L77: "El Nino" $\rightarrow$ "El Niño"

L85: Replace "ice floes" by "ice pack"

L96: I suggest to use present tense throughout the paper whenever possible, especially when describing your own work.

L102: Please mention that all products are from OSI-SAF.

L105: "assess" $\rightarrow$ "to assess"

L106: Please specify the period by saying which years you refer to.

3.3 Data

Generally: Please spell out the acronyms when you use them for the first time.

L123: Is it intentional that you write "SSMIS-f17" or should it be SSMIS-F17 (also in the following lines)?

L125:"SSMI/S" $\rightarrow$ "SSMIS"

L136: Please provide a reference (URL) for the NSIDC projection.

L139: A reference for the limitations would be nice.

3.4 Methodology

L145: "SSMI/S" $\rightarrow$ "SSMIS". Please also check for other occurrences in the paper.

L152: "Acceptable" sounds quite subjective. Readers who are not familiar with the meaning of the single flags (such as myself) might wonder why you choose flag 20 as criterion. Please give very briefly some information about the meaning of the flag numbers, and your reason to choose flag 20 as threshold.

L159-161: I wondered if there may be cases where there is one cyclonic and one anticyclonic feature in D_r. If yes, taking their mean would erroneously return comparably small rotational activity. Can this happen? Please elaborate on this in the Discussion.

L168: 1) "resolution" should be "grid spacing". Also, I suggest to simply write "...a grid spacing of 62,5 km is fine enough to capture these features.", the current formulation sounds a bit odd.

L172: Dierking et al. (2020) is missing in your reference list.

Equation 2: ΔT is probably constant, right? Does this mean that σ_{vort} scales linearly with σ_{tr}? Please mention this briefly.

General: How is the merged product's uncertainty calculated? As a Gaussian error prop-

agation based on the other three product's uncertainties? Please describe this.

3.5 Results

Figs 1&2: These are important Figures, but it would be really helpful to use a density plot or 2d histogram instead of a simple scatter plot. With this amount of points, it is visually impossible to see the actual distribution of values. This would also help to assess the reliability and representativeness of the trend lines. Can you provide some estimation of the robustness of the fit lines, for example a standard error of the linear regression? Also, it would be good to add the number of points, the slope and the intercept, either in the Figures themselves or in the caption.

General: I was a bit surprised about the discrepancy between AMSR2 and SSMIS. Since they are both passive-microwave based, I would have expected them to be closer to each other than to the active-microwave based ASCAT data. Can you elaborate on this at some point?

L218: What do you mean by "gradient factor"? The slope of the fit line? If yes, I would suggest to call it "slope".

L237: "intensity" → "intensities"

L238-245: Are these the same features that went into Figures 1 and 2? If yes, you could consider to add the numbers of features either to Table 1 or to the Figure captions. Also, why does AMSR2 detect so much more features than SSMIS?

L261: "...than _for_ anticyclonic features."

L270: "into" → "of"

L278: What is meant by "statistical " mean?

L279: AMSR2 is in use since late 2012, it is the drift product which is available since 2015.

3.6 Discussion and Conclusions

L308: Please describe briefly what is new about your method.

L311: Would be more consistent to write that you use four products.

L317f: From this formulation, it sounds like the 450 km would be 6-7 times the scale of atmospheric weather. I suggest to reshuffle the sentence between the dashes and write " which is the scale of atmospheric weather and about 6 - 7 times..." to be clearer.

L321ff: Can you speculate on possible physical or methodological reasons for the discrepancy between a) the single-sensor products and b) the single-sensor products and the merged product? Having an idea about this would add much relevance to the study and help it to be even more than a description of an interesting finding.

L341f: It is not entirely clear to me why more variability would artificially intensify cyclonic rotation. Please explain in more detail.

L343: "observation" → "observations"

L352: See comment to L279.

L357-359: Are all the references needed? if not, please pick the two or three most relevant ones.

General: It would add much value if you could give the reader a recommendation in which cases the merged product is more appropriate and in which cases one might be better off with one of the single-sensor products.

3.7 Code

Thank you for including the code for the analysis. It would be good, however, if you could add a small readme file to the repository which instructs the user how to use the code. Even though the code is plain and well-written, I think that it would be of value if you could add some comments, so that potential users can use it right away.