Conventionally, sea ice motion from passive microwave observations is extracted from aggregated brightness temperature daily products covering the entire Arctic or Antarctic domains. This paper investigates the possibility of deriving sea ice motion vectors directly from the overlapping AMSR2 individual swaths (S2S scenario) as opposed to the daily products (DM scenario) and implications on the future ESA CIMR mission. A well-established ice motion tracking algorithm based on the Continuous Maximum Cross-Correlation (CMCC) approach was applied to derive ice motion vectors in both the S2S and DM scenarios. The authors demonstrated that a much larger number of ice motion vectors with higher accuracy (as validated against in-situ buoys) is derived in the case of S2S compared to DM scenario. The S2S ice motion extraction scenario is recommended to be applied to the future CIMR mission, which will provide a higher spatial resolution compared to AMSR2. This is an interesting paper, but I have the following comments which need to be addressed before the manuscript can be considered for publication.

We thank the reviewer for his/her comments and provide some elements of answers below.

Major comments:
1. In this study, the authors used only winter time periods for both the Arctic and Antarctic. What about the summer time? Could S2S approach provide better (or any reasonable) ice motion tracking results compared to the DM approach in summer time? Would lower remote sensing frequencies be recommended in that case (due to the larger penetration depth) as opposed to the higher frequencies? I think the paper will look much better if quantitative evaluation of ice motion provided by S2S versus DM during the summer time is presented.

We agree with the reviewer that a quantitative evaluation of ice motion during the summer season would be useful. Since this is also noted by the other reviewer and the editor, we agree this should be done. As already mentioned in the manuscript, a major limitation to today's ice motion retrieval during summer is the relatively coarse resolution of the 18.7 GHz imagery channels of the AMSR2 sensor. Adopting an S2S versus DM approach might help, but the step-change will be the spatial resolution at CIMR, which we cannot test at present. This is even more true for lower frequencies (10.6 GHz or 6.9 GHz). We will include an analysis of summer sea-ice drift from AMSR2 18.7 GHz (DM vs S2S) in the revision of our manuscript.

2. The authors discuss the differences in sea ice motion tracking from different frequency channels (mainly Ka and W due to their relatively high spatial resolution). However, polarization options were not discussed. What are the differences in terms of the number and accuracy of ice motion vectors derived from the horizontal and vertical polarization swaths? What optimum polarization option or polarization combinations are recommended for the ice motion tracking?

These are good questions, and we now see that we have not included some relevant elements of the motion tracking methodology in section 3.1. We indeed already use both vertically and horizontally polarized imagery channels, as described in Lavergne et al. (2010) section 2.3 "Combining Several Imaging Channels". In short, for each microwave frequency, we combine the information content of the vertically and horizontally polarized imagery by finding the maximum of the sum of the cross-correlation from each polarization independently. This retrieves a single motion vector from two polarization channels.

We add the following text to section 3.1:

Second, for a given microwave frequency, the information content of both the vertically and horizontally polarized images are combined within the optimization of the cross-correlation

function. In practice, and following Lavergne et al. (2010), the solution sea-ice drift vectors are at the maximum of the sum of two cross-correlation functions : one from of the vertically polarized imagery, and one from the horizontally polarized imagery. The reader is referred to the discussion in Lavergne et al. (2010, section 3.2) for a description of this approach. In the remaining of our paper, despite mentioning only the microwave frequency, we do use both polarizations in the motion tracking.

Technical corrections:
There is some language inaccuracies in the paper. I tried to point out some of them below with suggested changes.

Consider to mark figure panels with letters (a), (b), etc.

This will be implemented.

Line 37. “These can...”. It seems that some word between “These” and “can” is missing.

The missing words were “on-ice buoys”.

Line 194. “over a Northern and a Southern Hemisphere grid.”. Should “a” be replaced with “the”?

Indeed, this was changed.

Line 232. “A first” => “The first”. Line 234. “...very different characteristics to the DM products...” => “...very different characteristics compared to the DM products...”

Both implemented.

Line 242. “...these mean times associated with the DM ice drift product are averaged values...” => “...these mean times associated with the fact that the DM ice drift product are averaged values...”

We revised our sentence to read : “… these mean times associated with the DM ice drift vectors are values averaged over several overlapping swaths... ”

Line 278. “...the low number of validation data...” => “...the lower number of validation data points...”

Implemented.

Line 284. “...but this time studying...” => “...but this time we consider...”

Implemented.

Line 285 and 289, and throughout the text. “100 mn => “100 min”.

Implemented throughout the text.

Line 318. “Fig. 6 is a repeat of Fig. 5... “. In fact, Fig. 6 is similar to Fig. 5 (left, NH) and not the entire Fig. 5. Please reflect it accordingly in the text.

Indeed, this was implemented.

Fig.7 and Fig.8. Please move the figure title to the figure caption.

Thank you, this will be implemented.