The Cryosphere

Open Access

EGU

Discussions

Interactive comment on "A lead-width distribution for Antarctic sea ice: a case study for the Weddell Sea with high resolution Sentinel-2 images" by Marek Muchow et al.

Anonymous Referee #1

Received and published: 15 September 2020

The manuscript aims to compare lead-width distribution estimates from an Arctic setting to an Antarctic setting. Within the manuscript a set of lead-width distribution algorithm parameter estimates are being calculated using a set of Sentinel-2 images. The algorithm parameter was found to be lower compared to the estimates for the Arctic sea ice areas. As the Antarctic sea ice areas are significantly less investigated compared to the Arctic sea ice areas the subject is interesting and timely. Unfortunately, the manuscript is poorly written and it's very unclear what the overall aim and the novel scientific contribution is.

Specific comments

It would be beneficial if the method is also used on a set of images covering the Arctic sea ice to see if the change in parameter setting relates to the Antarctic conditions, the method or the satellite data. In the Abstract it is stated that you compare exponents from the Arctic sea ice that do not agree with each other to your estimates for the Antarctic sea ice. Why do the estimates from the Arctic sea ice not agree?

As far as I can understand the nilas areas include both open water and nilas. Please confirm. It is unclear why these two lead types are not separated from each other, and if this separation was done in the scientific work by others that the lead parameter settings are compared to. This needs to be clarified.

Why are leads with dark-gray sea ice (up to 10cm thickness?) and light-gray (up to 30 cm thickness?) sea ice not included in the analysis? It is specifically stated in the methods section that you are investigating threshold for four different sea ice types. Do the studies compared to within this paper include those other sea ice types?

A schematic figure outlining the processing steps would aid the reader to understand the different steps within your method. How are the classified images validated? How many different individual leads were used in this study?

Overall the manuscript is poorly focused, many sentences difficult to follow and references to appropriate work is missing. The presented aim is the lead-width distribution however, the manuscript focuses on the algorithm parameter setting and not on the outcome of the lead-width estimates. Please either change the aim of the manuscript or change the manuscript to reflect the aim.

Technical corrections

Why was the Weddell sea picked for this study? Does it have a high/low frequency of leads compared to other areas of the Antarctic sea ice areas? Work by e.g. Willmes and Geinemann (2016) have indicated that different parts of the Arctic Ocean have different regional characteristics.

P1. R4-5. Unclear sentence please revise.

P1. R7-8 after the comma is a repeat of what was said on row 4-5. Please remove.

P1. R12. Replace bigger with larger or greater than

P1 R21. Please insert a reference.

P2 R34. How wide is a very narrow lead?

P3 R4-5. Unclear sentence please revise.

P3 R6. Insert references to these studies.

P3 R13-14. This is better suited in the discussion.

P3 R21. Are you using data from November to February or November to April? The way this is written now is confusing.

P4 R5. This section deals primarily with identifying thresholds and not classification of surface types. Consider changing the title. Moreover, the classification step is done in section 3.2 and should be reflected in the title there. I'm sorry but I could not follow how the lead width information was extracted from the images. Please clarify this.

P4 R9. Unclear sentence please revise.

P4 R16-18. Unclear sentence please revise.

P4 R28. Not only nilas but also open water.

P4. R30. What is apparent lead width? Please define.

Figure 2 Consider indicating the different TOA-reflectance areas that results in the different ice types, e.g. introduce a gray scale indicating classification areas. At the moment this figure is difficult to understand.

P5 Figure 3 text. What does "The swath does not cover the whole image area" mean? Either the Sentinel-2 image exist or not. Should image area be study area?

P4 R30 -P5 R1. Unclear sentence please revise.

P6. R2. What is x_width?

P6 R3. Where did the values for parameter C come from? This needs to be clarified.

P6 R13-14. Please add the 10m to the equation, or specify how the 10m were added to the equation.

P6 R17-18. This section is not results but should be put in the method or data section.

P6 R30. References missing.

P6 R29-30. Do the TOA values reported here also correspond to the values for the Arctic sea ice? The comparison here appears to be only for Antarctic data.

P7 R6. Compared to what?

Figure 5 is difficult to see. As the discussion primarily revolve around the for the two different methods for the two different mediums, why not combine the open water areas in one figure and indicate the different methods in the legend? Or better yet combine everything into one figure for easier interpretation. Consider also changing the color scheme as the colors are too similar and it makes it difficult to analyze the figure.

P8 R7-8. Unclear sentence please revise.

P9 R6-8. Unclear what you are trying to say here. Please discuss why different results are achieved and what this means.

P9 R24-26. According to Table 2 the resolution of the Wadhams papers are 5m. It is unclear what you are saying here. Please revise.

P9 R34-35. Please specify what these other data sources could be.

Section 4.3. This section does not belong in the results but should be moved to the data section instead.

Table 2. The table needs to be updated so that it is clear to the reader that the two values reported in the present study are for open water and nilas+open water areas. It is unclear from the present manuscript what the other reported values have used as criteria for their power law estimates? Are these values reflecting values for open water, nilas or leads generally? For the two different thresholds used in Marcq and Weiss (2012), do they also separate into two different lead types or are the two values a result of two different methods? If it is the latter please separate the values reported in the same way as is done with the present study results.

Reference Willmes S. and Heinemann G, (2016), Sea-Ice Wintertime Lead Frequencies and Regional Characteristics in the Arctic, 2003–2015, Remote Sensing, 8(1),4, https://doi.org/10.3390/rs8010004