

Letter to Reviewer 1

Valentin Ludwig (vludwig@uni-bremen.de), Gunnar Spreen, Christian Haas, Larysa Istomina,
Frank Kauker and Dmitrii Murashkin

May 28, 2019

Dear Reviewer,

thanks a lot for your constructive feedback. Your comments helped to improve structure and clarity of our manuscript. Please find our detailed response to your comments below. Your comments are marked by an **R**, our answers are marked by an **A**.

R: The research has potential use for all polynyas not just this unusual North Greenland polynya of 2018. The first paragraph of the Summary & Conclusions should be the only objective of the paper. Of the questions addressed, only question 1 should be answered in this paper, and probably should be expanded to include how much more information about a polynya can be discovered with this method compared to coarser resolution SIC data sets. Discussion and explanation of this polynya has been presented in Moore et al., (2018). Explanation of this polynya should not be an objective of this paper. The authors could present explanation and affects, e.g. how much sea ice grew, of this polynya in a different paper. I think the authors should focus on the method of creating their SIC dataset in this paper and that it can contribute to gathering more and/or better information about a polynya. A major revision would probably be necessary to narrow the focus. Sections 5 and 6 could probably be omitted or greatly reduced, as only some general statement(s) on the significance of this unusual polynya event would need to be made. I was most focused on the new method for SIC and its evaluation as the primary objective of the paper. The reasons for the polynya formation and processes that occurred in it Sections 5 and 6 were less interesting and seem to lack relevance to the new method. I agree that you need to demonstrate the method on a polynya, and that this was an interesting one and you gave a reason for studying it but I think it unnecessary to discuss in detail the environment and processes that happened in this polynya.

A: We thank you for the suggestion to focus on the merged SIC in this paper. However, we would like to keep the reasons for the polynya and the consequences which it had in the paper, as suggested by Reviewer 2. We are already planning a second paper which focuses on the development and evaluation of our merged SIC. The present paper is intended to be an introduction of the merged SIC together with a case study to show what it can be used for. We like the idea of investigating the polynya event entirely. We also think that we

investigated enough aspects which have not been covered by Moore et al. (2018) to justify including the environmental conditions during the polynya and the consequences which it had in our paper. If you agree, we would like to follow Reviewer 2 and keep sections 5 and 6.

R: Check that all the paragraphs all start with the same indent, or no indent, and space between paragraphs is consistent.

A: Done.

R: Abstract Line 4 change “which combines” to combining Line 7 change “as” to at Line 13 clarify that it is growth of sea ice thickness

A: All done.

R: Page 2 line 10 – 11. Give the instrument name AMSR2 first, then the band and algorithm.

A: Done.

R: Page 3 line 30 Change “this February” to February 2018; give the dates that the polynya existed.

A: Done.

R: Page 4 line 1 delete word “additionally”

A: Done.

R: Page 4 line 5 change “we use” to used

A: Done.

R: In both 2.1.1 and 2.1.2 add some information on the orbit characteristics of the platforms and a URL to those mission or instrument home pages.

A: We have included the inclination and equator crossing time for the platforms. In 2.1.2, we also added that the Aqua satellite has only 4 minutes time lag compared to GCOM-W1. URLs to the MODIS and AMSR2 home pages have been added.

R: 2.1.1 Are both the swath and daily grid data publically available?

A: The swath data were processed internally. We have added this in the text.

R: 2.1.2 Delete “flies”.

A: Done.

R: In some way more clearly state that the data records start in 1999 and 2002. Add URL for NSIDC DAAC for this data product.

A: We now explicitly state that Terra started in 1999 and Aqua in 2002. The URL

<https://nsidc.org/data/MOD29/versions/6> has been added.

R: 2.2.1 EASE-Grid or EASE-Grid2? Explicitly state.

A: EASE-Grid 2, now explicitly stated.

R: 2.2.3 delete "sealice.dk" in first sentence, it's irrelevant there. It is given as the url for the University in last sentence.

A: We deleted "sealice.dk".

R: 2.2.7 please give name of organisation at <https://sealice.uni-bremen.de> along with the URL

A: We added that it is a product of the University of Bremen.

R: 2.2.8 delete the paragraph at end of first sentence. The sentence is not a paragraph by itself.

A: Done.

We hope that we have addressed your comments in a satisfying manner. Please do not hesitate to contact us if questions remain.

Yours sincerely,

Valentin Ludwig (on behalf of the authors)

References

Moore, G. W. K., Schweiger, A., Zhang, J., and Steele, M.: What Caused the Remarkable February 2018 North Greenland Polynya?, *Geophysical Research Letters*, 0, <https://doi.org/10.1029/2018GL080902>, URL <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018GL080902>, 2018.