

Response to Ref. #2

We would like to express our gratitude to Sarah Cross for her careful and thorough review.

1 General Comments

Schlusser et al. explain and investigate a range of atmospheric influences that lead to the anomalous sea ice decay in Antarctica in 2016. The rate of melt in this year was much higher compared with averages from previous years, at 2 Mio. km², and there are many variables that can explain this. The paper establishes that some factors affecting the rate of ice decay include cyclonic activity, regional evolution of Sea Ice Extent (SIE) and Sea Ice Area (SIA), and atmospheric flow patterns. Mainly through analysis of the ZW3 (zonal wave 3) feedbacks and the SAM (Southern Annular Mode). This is significant as some of the research covered in this paper can be used to determine the exact atmospheric influences on sea ice decay and how anthropogenic forcing can influence this, hence giving it relevance to climate change and other major controversies. There is a clear distinction between expected outcomes and unexpected outcomes in this paper.

The anomalous results were clearly explained and identified, whilst the expected results were outlined from the beginning and both were used in the discussion of the atmospheric influences on sea ice decay.

Specific Comments

2.1 The authors clearly outline the aim of the paper, to discuss the possible reasons for the anomalous ice decay, in the introduction. The further explanation and previous work is written in clear and scientific language, however one suggestion would be that terms should be defined earlier. The terms ZW3 and SAM are used in the introduction with no explanation, and whilst they are covered later in the text this could be initially confusing.

We agree that this might be confusing for readers not familiar with the subjects. We now give a short explanation where the terms occur for the first time in the “introduction and previous work” section (combined in the revised version) and leave the detailed explanation for the respective sections.

2.2 In addition, some alternative ideas could be discussed, for example Stuecker et al. 2017 discuss the role of greenhouse gases and ozone forcing in addition to other atmospheric influences. Although great detail would not be relevant for this paper, mentioning these factors could help to link the results to other important parts of the cryosphere and give a wider picture of the papers significance.

Stuecker et al. (2017) was published after we submitted our paper, we included it in the revised version. We also added some other points to the discussion, e.g. the occurrence of the Weddell Polynya (close to Maud Rise) in 2016 and teleconnections with ENSO.

2.3 Although relevant figures were used and they were well referenced in the text itself, having the figures and figure captions separate at the end of the paper was a little confusing. My suggestion would be to group them together and keep them at the end of the paper for ease of access.

We did this for the uploaded revised version. In the final version, the figures will be included in the text anyway in the usual TC layout.

2.4 Finally, the paper is well referenced and a large variety of literature was used. However most of these references were from before 2010 with one even dating back to 1902. One suggestion would be to use some more up to date references, as this is especially important considering the recent advances in this field of ice decay. The older references are not necessarily invalid however conditions and attitudes at the time of these papers were much different from today, and this could be clarified within the paper.

We agree. We added 15 new references in the revised version, of which 12 are not older than from 2012, 10 stem from the years 2016 and 2017.

Concerning the reference from 1902: We like to give credit to the researchers, who originally found the mentioned results, which was F. Nansen in this case. (Something that (in our (ES') opinion) tends to be neglected frequently nowadays, particularly when the reference is not available online.)

2.5 In summary, the paper clearly analyses a wide range of available data and draws relevant hypotheses based on this, the sections are well laid out and clearly labelled and there is strong emphasis on past work and a wide range of references are cited. However, there are some minor errors that could be amended, therefore I suggest a review of the paper to correct these, after which it could be accepted.

3 Minor Corrections

3.1 Line 85- there is an unnecessary bracket (Enomoto and Ohmura (1990) should be (Enomoto and Ohmura, 1990)

Corrected.

3.2 Line 128- misspelled December as Dezember

Corrected.

3.3 Line 129- an accent is required for El Niño

Corrected.

3.4 Line 243- the comma after “to investigate” is unnecessary

Corrected.

3.5 Line 360-365- sentence is too long, needs to be broken up

We re-wrote the entire paragraph, thus the sentence does not occur in the original form and length anymore (we agree that it had been too long and a bit hard to read).

3.6 Line 421- repeated word “accelerated ice melt melt”

Corrected.

3.7 Line 430- in my opinion this line would work better as a list of three i.e. “sea ice decay, SAM and ZW3” instead of repeating the ands

What we meant was the relationship between sea ice decay and SAM, and the relationship between sea ice decay and ZW3. However, of course, SAM and ZW3 are related, too, (if not as straightforward as it may seem, though), so we follow this advice.

3.8 Line 445- again a matter of opinion but this could perhaps be broken into two sentences “. . . extremely zonal flow conditions. Whereas 2009 exhibited. . .”

We broke this sentence into two sentences, as suggested.

References

Stuecker M.F., Bitz C.M. and Armour K.C., 2017. Conditions leading to the unprecedented low Antarctic sea ice extent during the 2016 Austral spring season, *Geophysical Research Letters*, 44, 17, 9008-9019

We included this reference.