

## Response to the report from Anonymous Referee #1

-Section 3.1: In the discussion of EOFs/PCs, please make clear when you refer to spatial or temporal variability, to avoid confusing the reader.

I have already made revisions to this section, clarifying in the description that it refers to spatial variability.

-Section 3.1: Referring to positive/negative variability is misleading: the positive/negative anomalies in the EOF plots refer to positive phases of the PCs, therefore those same anomalies turn negative/positive when PCs are in a negative phase. I'd just refer to high/low/no spatial variability.

I have removed all expressions of positive/negative in the revised manuscript and described the variability in some regions as opposite variability in the east and west.

-Section 3.1: Please make sure that all the relevant figure panels are referred when discussing the plots.

I have added some annotations in the revision to ensure that all figures are mentioned in the discussion.

-L174: Not clear to what season you are referring. All of them? Please clarify.

In response to line 174, all seasons are significant, and I have added this statement in the revised manuscript.

-L178: Are you referring to high/low variability or positive/negative anomalies? Please clarify. And please add a reference to the panel in fig. 3 relevant for spring.

I apologize for the inaccuracies in my previous expressions. In the revised manuscript, I have changed them to terms such as high variability or opposite high variability. The citation for Figure 2 has also been added.

-Figure 2: adding labels in the EOF plot indicating the position of the regions mentioned in the text would be helpful to the reader to locate them when reading the text.

Thank you very much for your suggestions on revising Figure 2. I have divided the four left panels of the EOF spatial mode images in Figure 2 into regions and labeled them with abbreviated names. I have also declared the full names corresponding to these abbreviations in the figure caption and added the abbreviated labels in the description of the spatial modes. The same modifications have been made to Figure 3.

-Section 3.2: In this section you regress atmospheric and oceanic (AO) fields onto PC1s, relating the anomalies in the AO fields to the anomalies in the corresponding EOFs (Fig. 2, left panels). When discussing the impact of the AO anomalies on fast ice, please refer to the relevant panels in Fig. 2 to help the reader to identify where AO anomalies are impacting.

Thank you very much for your suggestion. I have added a reference to Fig. 2 in the description of Section 3.2 in the revised manuscript.

-L207-209: These sentences are rather vague: where do we see an increase in the number of cyclones in the vicinity of Amundsen Sea Low? What is the cyclone system you are mentioning here? Please clarify and rephrase.

In response to lines 207–209: I apologize for the mistake in my expression. In fact, the view that the number and central pressure of cyclones near the ASL are related to the climatic intensity of the ASL was pointed out in the study by Fogt et al. (2012). I have revised the manuscript to a more precise statement: "In addition, a study by Fogt et al. (2012) confirmed that the number and central pressure of cyclones are related to the climatic intensity of the ASL. Therefore, more cyclones due to the high climatic intensity of the ASL can promote the disintegration of fast ice, leading to a reduction in fast ice extent."

-L308: "complex ... complex", please correct.

I apologize for the low-level error in line 308 and have corrected it in the revised manuscript.