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Interactive comment on "The recent amplifying seasonal cycle of the Arctic sea ice extent related to the subsurface cooling in the Bering Sea" *by* Xiao-Yi Yang and Guihua Wang

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General comment Overall, this is well-written paper and the analysis is competent. However, I have a few notable issues, listed below. The second issue in particular is critical and is the major reason for the decision of Major Revision.

1. The authors generally treat the Bering and the Chukchi Seas as one system, but I'm not sure if this really appropriate. ..... In the body of the paper, the authors seem to be clearer and focus more on the Bering Sea and then interaction with the Arctic Ocean in general. So maybe some changes in phrasing in places would help here.

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Reply: We highly agree that the Chukchi Sea ice and Bering Sea ice vary in different seasons and under the different mechanisms. We apply the term of ChukBerSIE in order to stress that the abrupt change of total Arctic sea ice extent variance is originated from this Pacific sector, rather than other Arctic areas. We recognize that the summer Chukchi sea ice variability is closely connected to the inner Arctic Ocean processes, but the spring Bering Sea ice is more under the spell of local climate variability. While much attention is paid to the drastic summer Arctic ice cover reduction, few people care about the spring Bering sea ice variability. Our preliminary analysis reveals that the Bering sea ice has experienced a strengthening decadal oscillation, which at least partly accounts for the abrupt change of total Arctic sea ice variance in the recent decade. However, we did not know the detailed processes that trigger this decadal oscillation of Bering sea ice. This is the motivation of our study.

We greatly appreciate your suggestion about the phrasing change, and we do some revision to specify the difference between the Chukchi and Bering regions in Page 4 Line 19-20: though the sea ice variability in the Chukchi sea and the Bering sea is probably subject to different dynamical processes and thermal conditions. And we further show and compare the difference between the summer Chukchi sea ice and spring Bering sea ice in Page 4 Line 21-32 (Fig. 2).

2. The other main issue is, unfortunately, the timing of this paper. As the authors are probably aware, the situation in the Bering has completely reversed over the last two winter. . .. Because the change is so substantial, I feel the authors should really redo the analysis through at least 2018. . .

Reply: Thank you! We follow your suggestion to extend all the datasets to the latest time except for the ORA-S4. This dataset ends up in dec2017. The detailed information please refer to the reply to review 1. We then redo the analyses using the new datasets and make much more revisions on our conclusions and physical interpretation.

3. Overall, the analysis is rather cursory. The authors pull together the right datasets

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and the analysis that they do is reasonable. . . The paper is <6 pages long and while I enjoy short, concise papers, the analyses are not very deep and they don't dig into the data enough to definitively support their conclusions.

Reply: Thank you for your insightful comments! In the revised manuscript, we explore in detail the physical factors that trigger the recent Bering sea ice change. We finally conclude that the NPGO mode change and its synchronization with the PDO in the recent decade are the principle cause for the decadal oscillation of Bering sea ice. Detailed statistical and physical analyses can be found in the reply to review 1.

4. The final issue is several grammar errors not major, but occasionally throughout the manuscript. Some are note below in Minor Comments, but a thorough proofreading for English grammar would be helpful.

Reply: Thank you for your careful check-up! The revised manuscript is thoroughly proofread for English grammar.

Specific comments

5. 16-17: "significant" and "insignificant" are each used. Do these refer to statistical significance? If so, the significance level should be specified. If not, then I would suggest different wording, e. g., substantial, notable, etc. to avoid confusion over the use of "significant".

Reply: Thank you! Yes, these refer to statistical significance with the confidence level of 95%. Revised in the manuscript.

Figure 1b: I find this figure a bit confusing. The 120W-60W is not labeledâĂŤthat's the Canadian Archipelago. I recognize this isn't terribly relevant to the study, but odd to have just that longitude range unlabeled. More relevant though is: where is the Laptev? I think it's included in what is labeled "East Siberian" –if so, that should be noted. Maybe what would help is a map that has the seas labeled and the longitude boundaries outlined.

Reply: We make much revision on all the figures. In the new version, we emphasize the decadal differences of Arctic sea ice variance. And we outlined the Chukchi-Bering section as the key region of this decadal change. Details can be found in the reply to review 1.

Minor Comments

1. 9: “in recent decade”âĂŤa minor grammar issue, but it makes things ambiguous: is it “in the recent decade”, or is it “in recent decades”? This is repeated elsewhere in the manuscript as well.

Reply: It should be “in the recent decade”. Corrected. Thank youïijĄ

1, 27: “transit” should be “transition”

Reply: revised, thank you!

2, 10: “urgent” not “urgently”

Reply: revised.

5, 22: “decline” not “descent”

Reply: revised.

6, 15: as noted above, I don’t think you can any longer say “lengthening sea ice seasons” for the BeringâĂŤcertainly not for the last two years.

Reply: Thank you! Revised in Page 10 Line 25.

6, 29: In light of the last two years’ worth of data, I think the question of whether the “amplifying seasonal cycle of Arctic sea ice cover will be sustained” has been answered, at least in terms of the Bering Sea: no!

Reply: Thank you! We revised it. It is not “amplifying” but “decadal oscillation”.

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