Review, round 2. Evaluation of sea ice variability in three ocean reanalyses and two regional models in the Barents and Kara Seas in 1991-2020.

General comment

The revised manuscript has been much improved compared to the original version. I think the authors have addressed my main concerns, which were that the original manuscript was too vague in its aim, that the discussion was too descriptive and there was no interpretation of the data, nor any implications for the results. The revised manuscript is more focused in the introduction now with clearer objectives, and the authors also provide much more interpretation in the discussion through discussing the relationship between sea ice and mixed layer temperature, as well as the new analysis with climate indices. Importantly, the authors also provide specific suggestions on the choice of data products depending on the region and the intended application of the user.

I also want to mention that I do not consider the specific additional analyses suggested in my previous review to be requirements in themselves, but rather that they were possible discussion points for a more interpretative analysis. I would say that the revised manuscript has now generally addressed my previous comments.

However, I have some remaining issues that I recommend addressing before publication. They are mostly related to some restructuring of the introduction, removing the remaining references to the storyline concept, and including the motivation for the selection of datasets. I do not think these changes will take long to implement, and therefore recommend minor revisions, after which the manuscript should be suitable for publication.

As a final general comment, I want to mention that the responses to several of the major comments in the response letter are very brief and do not indicate where the corresponding changes have been made, nor exactly how they have been addressed. I understand that the authors have restructured the manuscript, which can make it difficult to point to specific changes. However, given the length of the manuscript and the number of points raised in the original review, the limited detail in many of the responses made the revision more difficult and time consuming for me than necessary. While I do not think it is necessary to provide detailed responses for minor comments, I expect substantially more specific responses to major comments. For any future papers, I would strongly recommend that the authors provide specific responses on which relevant changes have been made, and their exact location in the revised manuscript.

Main comments:

The introduction is overall improved, and the study objectives are clearer. However, I recommend some restructuring of the introduction. Right now the current introduction ends with a general discussion of regional modelling rather than with a clear statement of the research questions and the study structure. The study objectives (L. 36-40), appears already as the second paragraph, before discussing the relevant physical processes, any existing literature, or the motivation for comparing these products. I recommend moving it to the end of the introduction after establishing the general background and the motivation for the study.

I previously recommended removing the concept of storylines unless it was developed and explicitly connected to the analysis. The authors state in their response letter that the concept of storylines has been removed, and while it has been removed from the methodology and the discussion, it remains in two places in the revised introduction (L. 33-35, 73). Again, since the study does not appear to use the storyline framework in its analysis or interpretation, I recommend removing these two remaining references as well.

I do not think that the issue raised in my original comment on the selection of the datasets has been sufficiently addressed by the authors in the revised manuscript. The response letter provides an explanation for the selection of the regional models and the renanalyses, but it is still missing in the manuscript itself. The only justification I see in the manuscript are for OSI-SAF and ORAS5 as the observational reference and a global benchmark, respectively. However, there is still no clear explanation of why HIRHAM-NAOSIM and RASM were selected as the two regional coupled models, or why TOPAZ and RARE were selected as the two regional reanalyses. In the manuscript, the authors describe the configurations of these products but describing a dataset is not the same as explaining why it was selected for the study. This is especially important because the study now relies on fewer datasets. It is therefore important to understand what this comparison is intended to represent. In the response letter, the authors give very reasonable explanations, e.g. data availability, wanting to include different model components, and different sea ice assimilation approaches. I recommend including this information in a concise way into Section 2 of the manuscript.

Minor comments:

L 41. Perhaps a bit redundant with “on the Siberian Shelf”, I recommend removing.

L 42. “Greenland Sea” is typically considered to be west of the deep Mid-Atlantic Ridge. Change to the “connected to the Nordic Seas” perhaps.

L. 57. “E.g.,” appears after the cited references. Change citation to “(e.g., Arthun et al [...])”

L 61. The colon reads a bit strange in that sentence. Maybe change to “[...] parts of the region. Dorr et al., 2024, for example, found that [...]”

Figure 1. Change “Topography” and “Topographic” to “bathymetry” and “Bathymetric”, respectively in the figure text.
Then you write “(darker lines)” vs “(lighter colours)”, I’d be consistent and write lines in both, i.e. “darker lines” and “lighter lines”.
Finally, I would not write a number part in numbers and part in text, i.e. “1255 thousand”. And additionally, is it important to know the exact area of the two seas? In my view it doesn’t add anything to the paper, and can be safely removed.

L. 114. The reference should come at the end of the sentence. I.e., “50° N (Xie et al., 2017)”.

L. 114. Change the sentence starting at L. 114 to have the reference come at the end of the first clause. The result should be “[...] Hybrid Coordinate Ocean Model version 2.2 (HYCOM; Chassignet et al., 2003), and [...]”.

L 115. Reference should be at the end of the sentence to not interrupt the flow of the sentence so much. Change to “ERA5 data is used as atmospheric forcing (Hersbach et al., 2020).”

L 124. Reference Carton and Chepurin should appear as a parenthetical citation and not a text citation here.

L. 126. Change the sentence to have the reference come at the end of the first clause. The result should be “[...] and Assimilation System 2.1 (PIOMAS; Zhang and Rothrock, 2003) are used to [...]”.

L. 132. Can merge both parentheses and separate by comma. “(ORAS5, hereafter ORAS)”.

L 135. Add comma after the reference to Gouretski and Reseghetti.

L. 141. Add appropriate reference at the end of the sentence.

L. 142. Change “cover” to “covers”

L. 167. Remove “and the depth of the ML is where the density differs from the density at 5 m by σ” since you already mention it at L. 164.

L. 172. Write “Indices” with lower case letters.

L. 172-176. This part reads a bit strange. The authors first describe NAO as b), then AMO and PDO with no letter attached to it, then EA/WR as a), then NH OHC with no letter attached to it. Attach letters correctly going from a-e chronologically, or remove the letters.

Table 2. The last sentence in the table text has “(least-squares regression)” outside of the sentence. Move the period after the parentheses.

Figure 2. Since both panels share the same colorbar, I recommend moving the colorbar to the center of the figure rather than keeping it under the left panel only. This makes it clearer that both panels use the same colorbar.

L. 242. Any appropriate references to add for where initial states lead to different results in the Arctic? Or perhaps more generally?

L. 260. The line “[...] even though some change can be seen [...]” is a bit too vague. Please clarify exactly what change is being referred to (e.g., changes in SIA departures? In which direction? By how much?).

L. 297. Avoid relative terms such as “is discussed below”. I recommend specifying “S. 4.3.1 and 4.3.2”.

L. 356. Change “indicating” to “indicates”.

L. 370. Change “(Fig. 5h)” to “(Fig. 5h).

L. 370. Change “but he maximum [...]” to “but the maximum [...]”.

L 445. Change “(Sec. 2.2)Carton and Chepurin (2023)” to “(Sec. 2.2; Carton and Chepurin, 2023)”

L. 471, 475, 477, 479, 481, 483, 491, 494. Separate the letters in the references to the appended figures by a space. E.g., change “(Fig. A7a,b,c)” to “(Fig. A7a, b, c)”.

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