



EGUsphere, referee comment RC2  
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## **Comment on egusphere-2022-324**

Anonymous Referee #2

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Referee comment on "Rapid sea ice changes in the future Barents Sea" by Ole Rieke et al.,  
EGUsphere, <https://doi.org/10.5194/egusphere-2022-324-RC2>, 2022

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Review of « Rapid Sea Ice Changes in the Future Barents Sea »

by Rieke et al.

This study investigates the trends of sea ice decline and variability, in the Barents Sea, as represented by climate models. More specifically, the study tries to relate the sea ice variability in the Barents Sea to its drivers, such as ocean or atmospheric forcing.

The work is relevant, and deserves publication, but the manuscript needs to be clarified because it is difficult to follow the method or the conclusions. Basically, one gets the impression some important work has been done, but assembled in a messy way. If this manuscript is mostly the work of its first author, I would suggest the co-authors to review the manuscript as if they were reviewers, if it is a collective job then the manuscript could be reviewed by a colleague before submitting a revised version.

I really think the work is interesting, but I recommend major revision because the manuscript needs clarification.

Line 63 : F is not the advective heat flux per unit volume, but rather the advection of temperature per unit volume.

Line 57 : Can you rephrase this sentence, super heavy to read. You could reverse it. *Trends in ocean heat transport via the Barents Sea Opening (BSO), sea ice area transport between Franz Josef Land and Novaya Zemlya (eastern gateway) and between Svalbard and Franz Josef Land (northern gateway), net surface heat fluxes, sea level pressure....*

Section 2. Data and Methods :

This section is very confusing. Each bit does have a meaning, but all the bits together are really hard to follow because you switch from one to the other. Could you split in subsections, or at least make paragraphs : basically it starts with the model references, then explains how you define RICEs, then the fluxes etc.

It is difficult to understand the concept of « external » forcing, can you explicitate as this idea comes back several times in the manuscript, there are references but it would be good to have a substantial description within the manuscript. Especially, how do you arrive at the conclusion that within the number of members taken, the mean represents only the external forcing ?

In the middle of the section you already refer to Fig.2 in which the distribution of something obviously is plotted, but the reader does not even know what (although obvious for you). The beginning of the section describes models used, then you switch to methods to estimate events, and then at the end you switch back to model qualities... such a mess, please rewrite the entire section to split ideas so that the reader can follow.

Section 4:

Could you explain why the mean internal trend is not zero in Figure 2, this sounds strange as you mention these are only deviations from the ensemble mean, which suggests it is subtracted. This appears to be confusing even further later in Line 92.

*« The distribution of observed trends after 1920 is shown for comparison, and is similar to both, the historical simulations of CESM-LE (not shown) and the future simulations between 2007 and 2025 (Fig. 2a). »* I guess you refer to the « Observations » in Fig. 2a, make it clear by using similar words.

Line 115 : you switch here to the main interest of the paper, the underlying processes behind the RICEs. I would create another section, or a subsection.

Line 120 : heavy notation since you use twice semi-columns, I would suggest to switch to a bullet list or use sub-sub-sections. Add for each forcing its abbreviation so one identifies it when reading Figure 4 without reading the caption.

A general comment about the method, the relation with the underlying processes is presented is only presented here as a kind of correlation. I think it would give more added value to your work if you could show you can actually reconstruct the signal of RICEs through an empirical function, it is just a recommendation but i do not think it is a lot of work to do. This would permit to dis-entangle processes which are, as you suggest, « counted twice » as for example a strong temperature anomaly in the atmosphere can also be related with a stronger heat transport through the BSO. You could show that you can reconstruct the signal of RICEs with the same accuracy or almost by eliminating one of the processes.

Section 5 and Conclusions : Too many number to read in Section 5, it's difficult to follow. Can you sustain a bit further in terms of processes all the differences between models ?

I'll coment further on this part on the revised version.

Other or general comments :

7.7  $\square 10^4 \text{ km}^2\text{yr}^{-1}$  and such numbers : Do not use the \* sign, and put some spacing. Check in other articles of the same journal on how such number are written.

Add some dots in some places before beginning a new phrase: based on Walsh et al., 2017). Please check sentences in general, and avoid long sentences.

Check the case according to journal requirements, I suspect eastern gateway should be written « Eastern gateway » (this is just an example, directions in general should be written East, North, etc. I believe).