Dear editor,

Thanks for the constructive comments from you and two reviewers. Minor text issues pointed out by reviewer 1 have been corrected in lines 147, 472 and 475 of the revised manuscript. We have revised our manuscript following the comments from reviewer 2 and our response is as follows.

Reviewer 2:

Thank you for the accurate revision of this paper and the answers to my comments. Although a full investigation of the issues I mentioned in my review is in part still missing (impact of model setup and tuning), I am happy to see that these aspects are now discussed in the concluding paragraphs of the paper, which should help the readers to contextualize the message. I still have some minor additional comments that I suggest considering before publishing the paper.

Figure 6: When you calculate the difference between JRA-55 and CORE2 we can see that there are some interpolation issues. I am not sure what is going on there, but I suggest checking your analyses to fix the issue. If this is a true feature of the reanalyses, you should describe it.

Thanks for pointing this out. We have checked the interpolation and updated the Fig. 6 in the manuscript. This is because the resolution of COREII data is 2^{o} and we interpolated them to the 1/4° before. Now, we interpolate them to the COREII grid to avoid this issue.

Figures 7 and 8: I am very confused by the behavior of the sea ice thickness in summer for both hemispheres. I would expect a decline in the thickness, which we do not observe. Is this a consequence of the averaging conditioned to the NSIDC sea ice concentration? I think an explanation should be given, or possibly choose a different way of comparing the model with the observations.

Answer: Thanks for this constructive comment. A peak ice thickness in August is noticed in NorESM2-LM, CMCC-CM2-SR5, EC-Earth3 and MIROC6 except in MRI-ESM2-0. The regions selected to do the spatial average are different in each month and this can affect the monthly mean ice thickness. Meanwhile, we have compared the monthly mean ice thickness, concentration and vectors between NorESM2-LM/C and MRI-ESM2-0/C (Figs. 1 to 3). The much increased ice thickness in August is related to the much decreased ice concentration and increased dynamic convergence in NorESM2-LM.

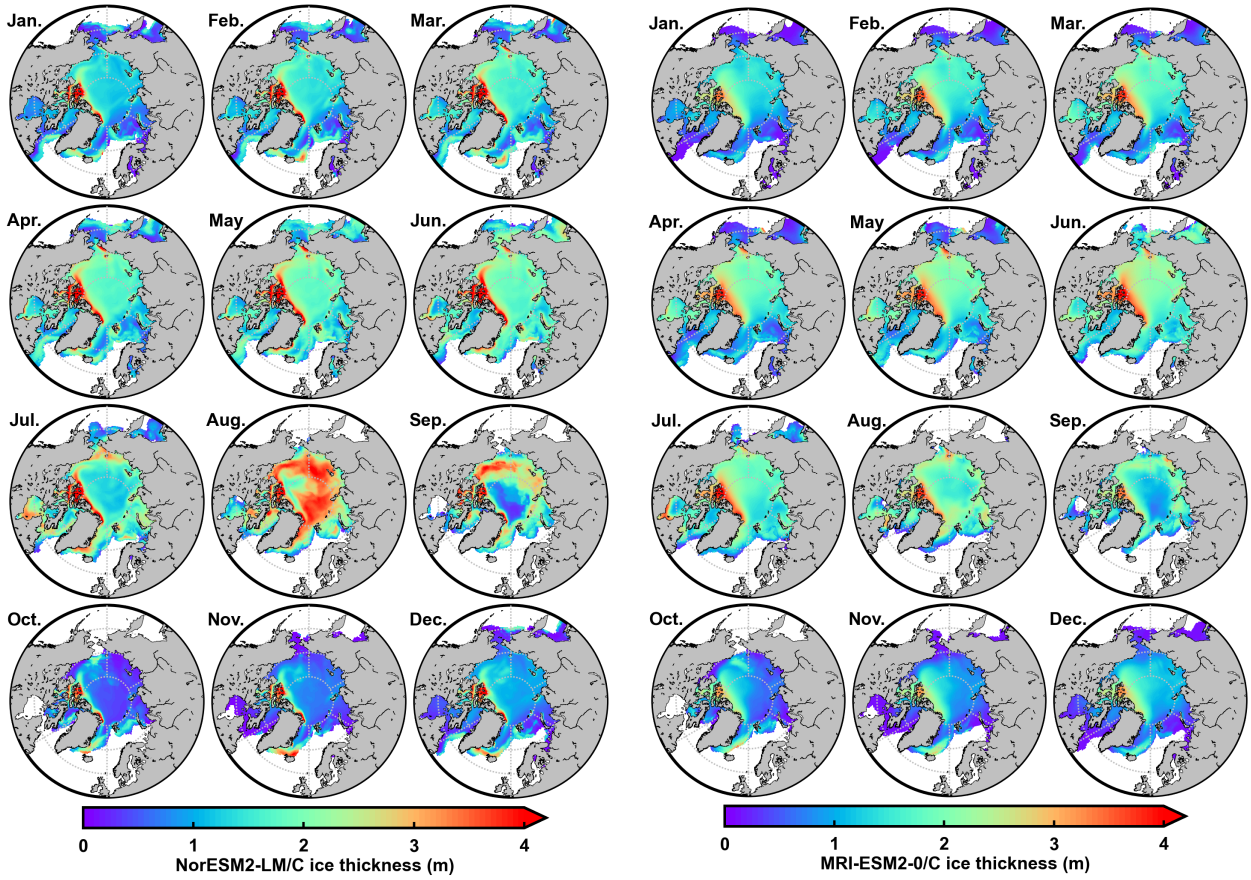

Fig. 1 The 2003-2007 monthly mean ice thickness of NorESM2-LM/C and MRI-ESM2-0/C.

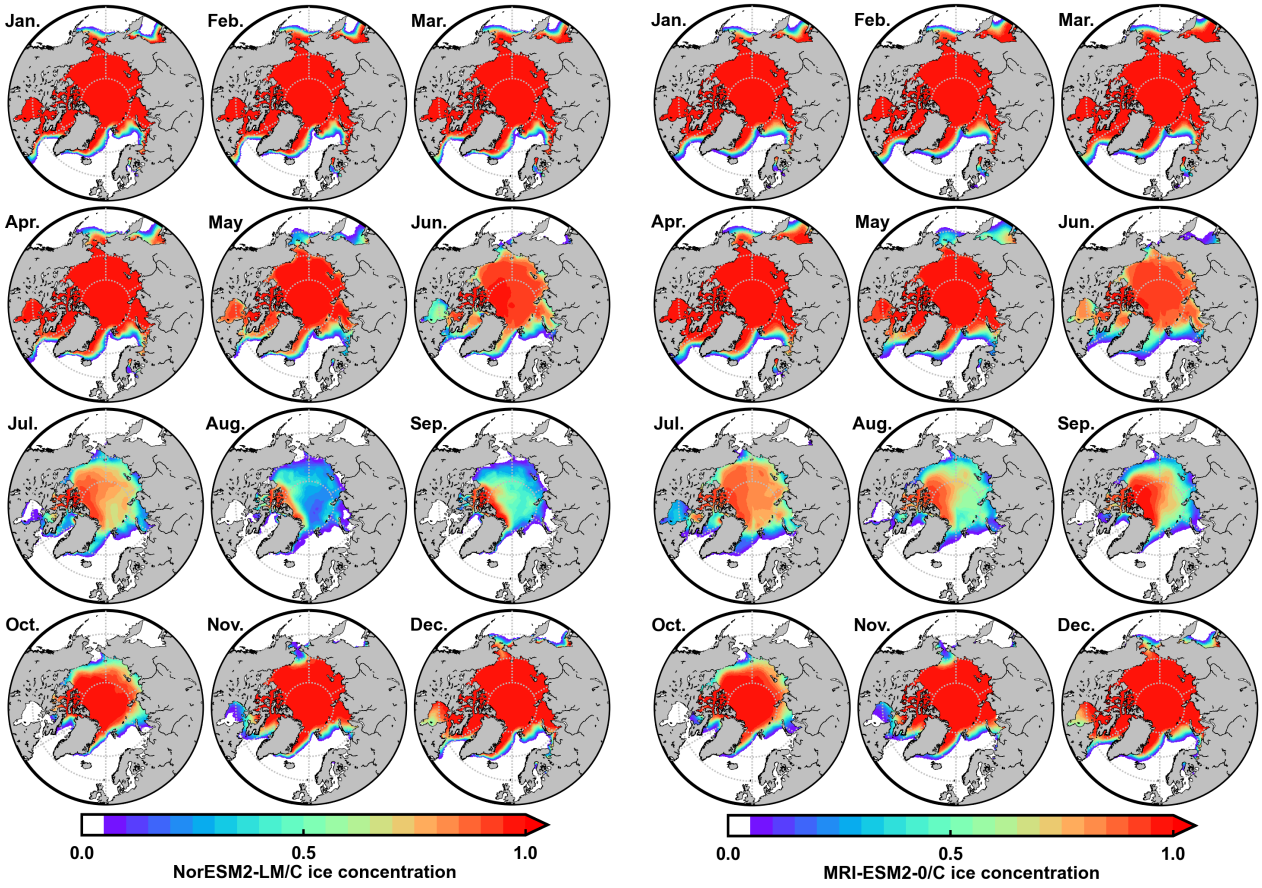

Fig. 2 The 2003-2007 monthly mean ice concentration of NorESM2-LM/C and MRI-ESM2-0/C.

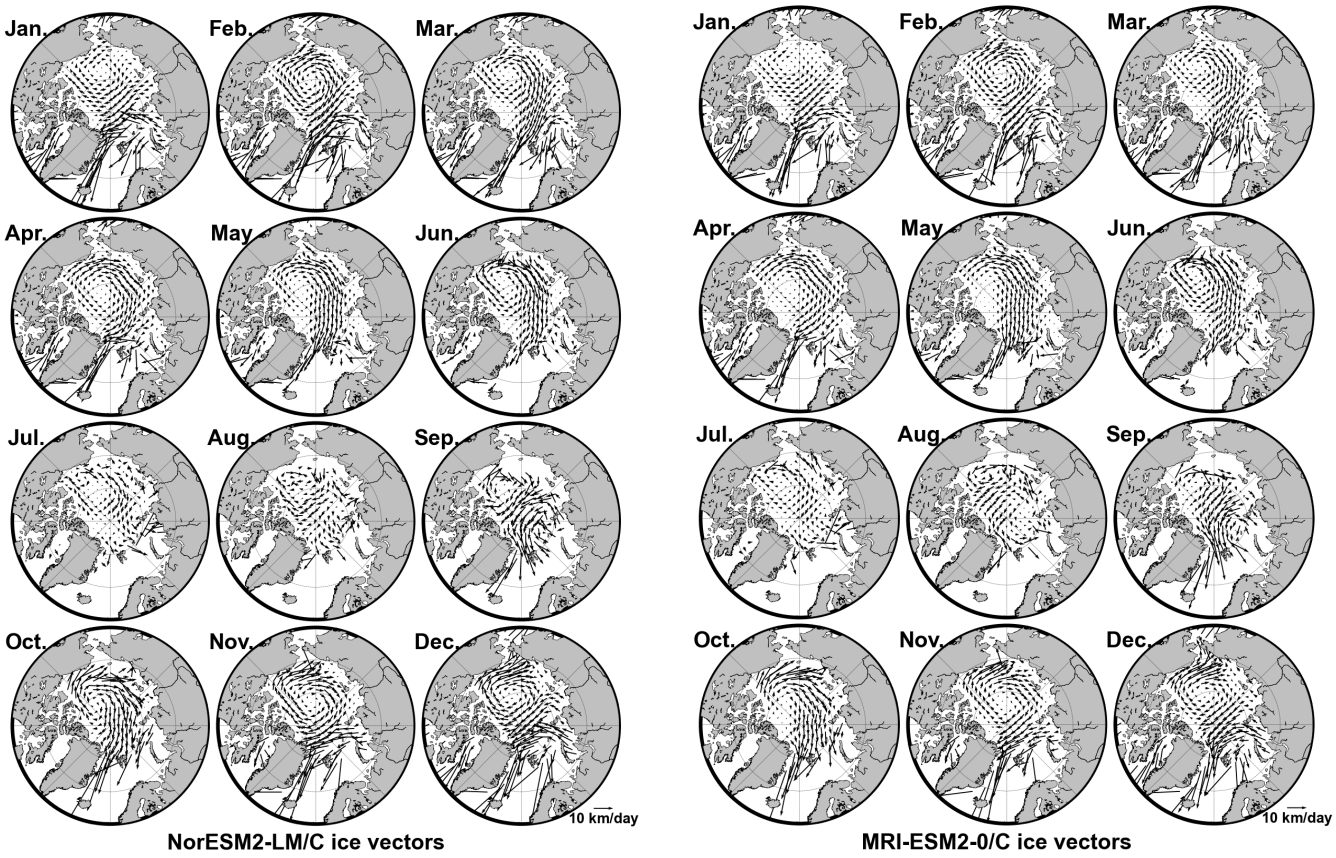

Fig. 3 The 2003-2007 monthly mean ice vectors of NorESM2-LM/C and MRI-ESM2-0/C.

Action: These discussions are added in lines 521-526 of the revised manuscript. This is not due to our methods of comparison, but we do check the calculation. As introduced in Lin et al. (2021), the ice vectors from observations and models are removed when ice concentrations are below 50 %, or the data are closer than 75 km to the coast, or with a spurious value to reduce the spatial and temporal noise in the calculation. To be consistent, we apply these selections to other variables in the revised Figs. 7, 8 A8 and A9. These are detailed in lines 479-482. We revised the corresponding text in section 3.2.1 and this update did not change the conclusion.

Yours sincerely,

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