

The comments are in blue, and our responses are in black.

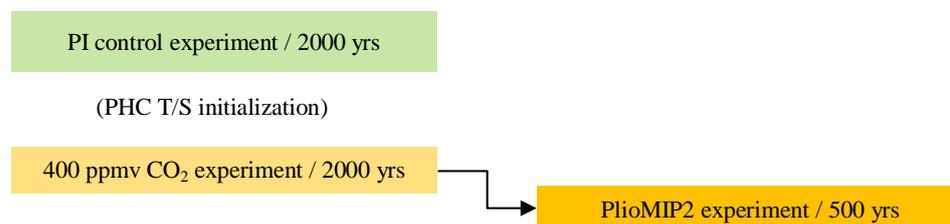
Response to Editor:

Comments from the editor

It would be interesting to know what exactly in the two models is causing them to show such contrasting salinities. The difference in the signs of the sea surface salinity change really stood out.

In our experimental flow (Figure Sketch), there are divergent responses in global mean sea surface salinity (SSS) in PlioMIP2 experiment with NorESM1-F and NorESM-L. There is a slight positive shift in global mean SSS in the NorESM-L simulation, and a negative shift in global mean SSS in the NorESM1-F simulation (Note the mean value in Fig. 4). The divergent responses are likely associated with the different vertical redistribution of salt in the two models, due to differences in e.g. surface layer mixing, ocean ventilation, convection and circulation. The two models have different vertical resolutions and horizontal/vertical mixing schemes, which makes it difficult to disentangle the factors causing the contrasting salinity responses.

NorESM1-F



NorESM-L

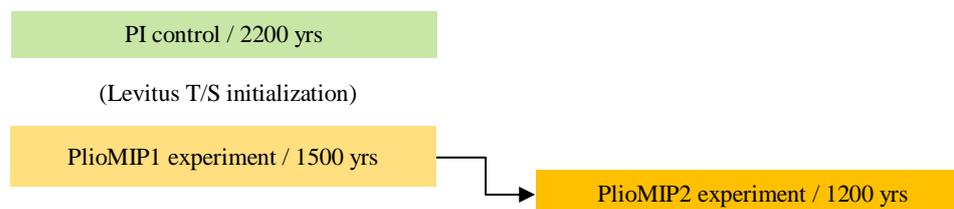


Figure Sketch for NorESM1-F and NorESM-L experiments flow.

However, when the shift in global mean SSS is removed, NorESM-L and NorESM1-F show similar regional anomalies. Both versions show that the SSS contrast among the Indian Ocean, the Arctic and the rest of the oceans is intensified in the Pliocene experiment (Fig. S2). We added those in Section 4.4 in the manuscript with the revisions marked.

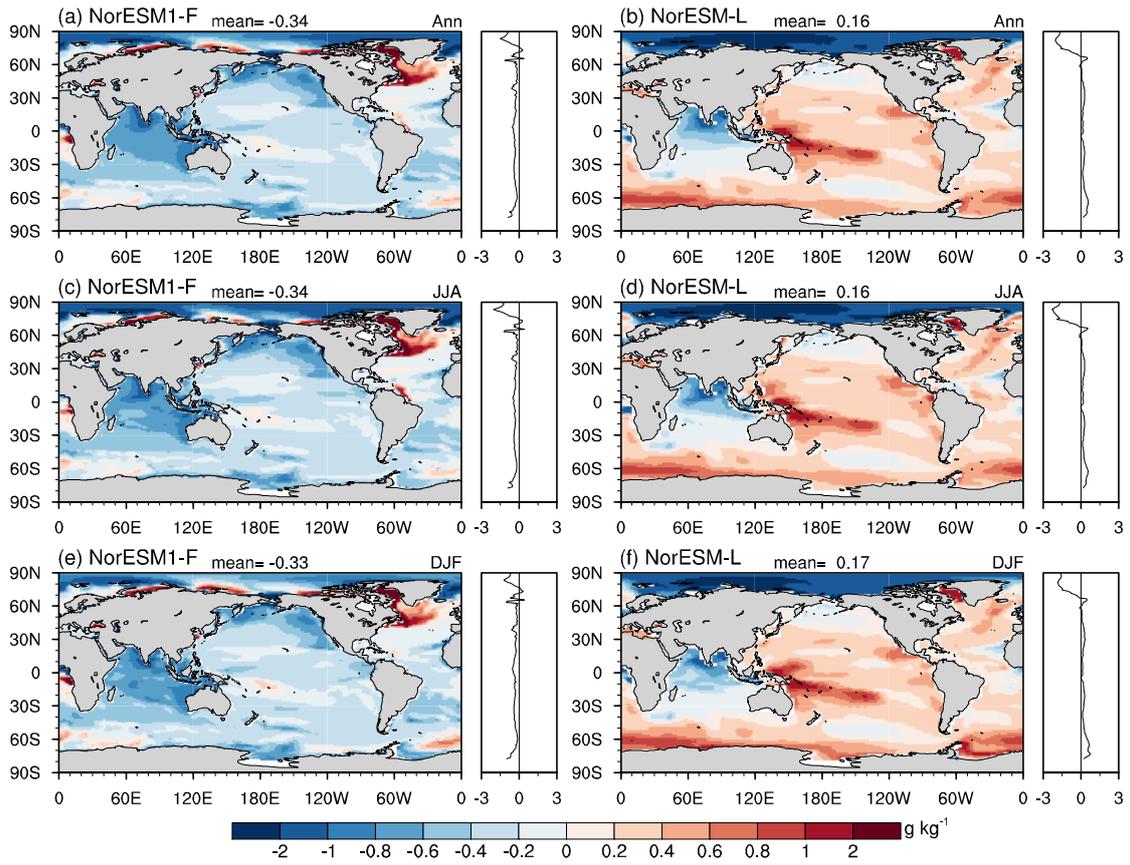


Fig. 4. The difference in climatological sea surface salinity (units: g kg^{-1}) between Pliocene and pre-industrial experiments according to NorESM1-F (left panel) and NorESM-L (right panel) for the annual mean (a and b), boreal summer (c and d), and boreal winter (e and f). The zonal mean is shown to the right of each plot.

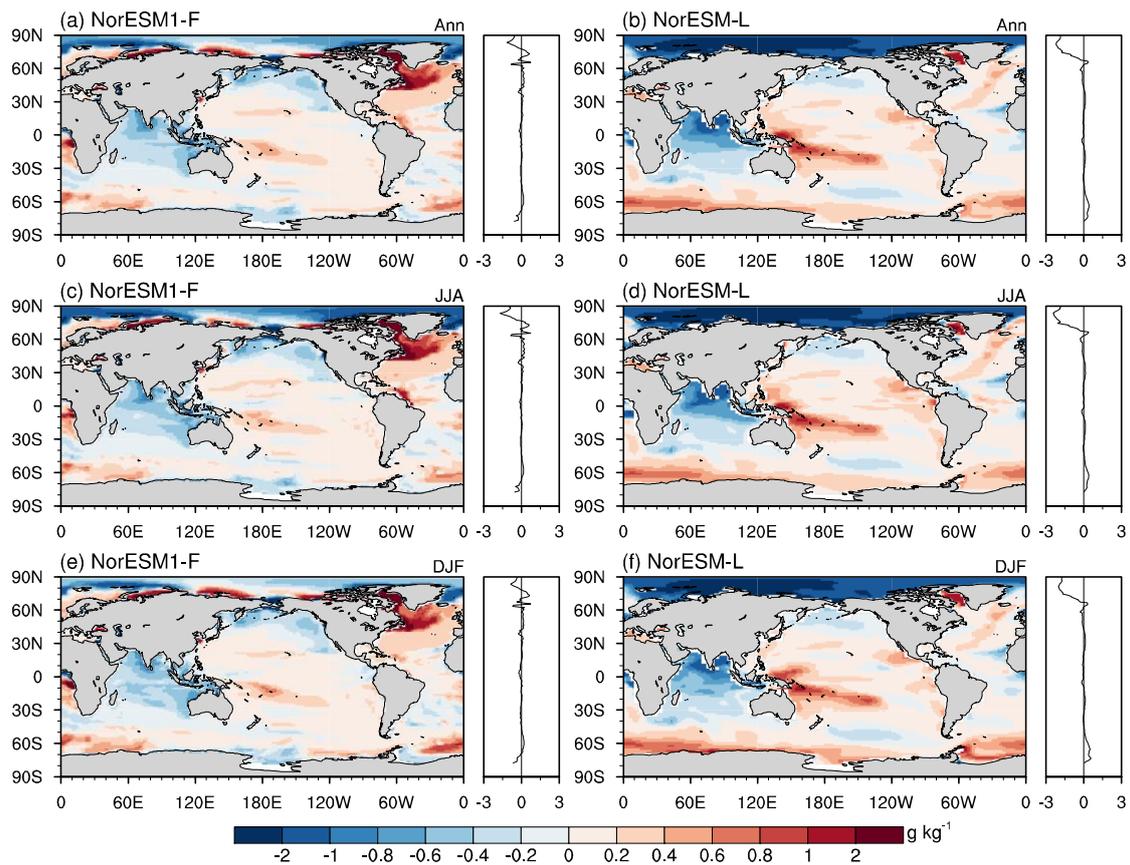


Fig. S2. Same as Figure 1, but for each grid, the global mean shift is excluded to emphasize the response of the sea surface salinity contrast between ocean basins in the Pliocene experiment.

Below, I list a (non-exhaustive) list of non-technical corrections the authors should consider:

Page 1, line 23: become → becomes

Page 2, line 7: The global mean sea level was higher than that of today, with a peak of 22 ± 10 meters (Miller et al., 2012)

Page 5, line 20: ... similar pattern to those...

Page 5, line 21: ...in Circum-Arctic regions...

Page 5, line 27: no comma after 'of'

Page 6, line 18: ...except for Baffin Bay...

Page 7, line 21: -21.6 for the Pliocene experiment...

Page 7, line 28: ...versions is likely to be associated...

Page 8, line 3: Add 'Therefore' to be beginning of the sentence so that it links with the previous statement.

Page 8, line 6: The presence of less sea ice leads to a reduction in albedo and to a more active ocean-atmosphere interaction, contributing to...

Page 8, line 8: ...ventilation in the Southern Ocean...

Page 8, line 22: appears → appear

Page 10, line 4: ...testing the impacts of the differences between the boundary

conditions of PlioMIP1 and those of PlioMIP2, ie...

Page 10, line 10: requests →request

Tables 3 and 5: The numbers are written in groups of 3 (ANN, JJA and DJF). It may be easier to visualise and to compare if the authors inserted a gap on either side of the slashes, or put each number on a separate line.

Revised. Thanks for the improvement to our manuscript.