

Review of Gutjahr, Putrasahan, Lohmann, Jungclaus, von Storch, Bruggeman, Haak and Stössel, Max Planck Institute Earth System Model MPI-ESM1.2 for High-resolution Model Intercomparison Project, revised for GMD.

The authors have addressed my comments very thoroughly. I think the paper can be accepted subject to the following minor comments:

Page 2, line 18. Start new paragraph here on increasing atmosphere resolution.

Page 4, lines 7-11. I have read the other Reviewers comments on this, and your response, and I think you should put more of your response text into the main text here.

Page 5 line 27. Typo on “configurations”

Page 6. Lines 8-9. “...the wind speed is too weak...” “but not as weak as in ...”?

Line 22. Delete “for biases” Also, did Drews et al partly, or totally, remove the bias?

Page 7, line 3. “due to resolved eddies and better mean flow”?

Page 11, line 7. “24km wide” – how does this compare with the lower resolution, and real bathymetry (approximately, no need to be too precise)

Line 11. “the cold bias at 740m”

Page 12, line 22. Reword “the relative differences among the simulations are similar” to something more easy to understand. (I think I know what you mean.)

Page 13, final sentence. This is a bit speculative – I suggest move to Discussion or delete.

Page 14 line 27 “in general much less sea ice volume”

Figs 10, 11, A9. There are modern estimates of observed MLD, e.g. Holte et al., MIMOC (PMEL) <https://www.pmel.noaa.gov/mimoc/> etc, using data from ARGO. Although data sparsity of ARGO is still an issue in some locations, can you add spatial maps of these products to the figures?

Page 16 line 31. According to the literature, ocean eddies act to restratify many areas of the Labrador Sea, leaving a small region of deep mixed layers possibly where eddies are not active. It might be interesting to add a plot of SSH variability to see if ERpp adds anything to the eddy-permitting regime.

Page 18, line 32. Low resolution MLD may only be 200-300m in the same regions in DuVivier et al etc.

Page 19, line 8. You could place Lee et al and Li and Lee references on this line: on the lines above I don't think Small et al 2014 discussed MLD, but you could put (R. J. Small, pers. Comm. 2019)

Line 26. “A possible explanation for this is that the volume transport...”?

Page 22, line 4-5. The reference to ERpp is out of place as this paragraph is on atmosphere resolution.

Justin Small