

Interactive comment on “UK Global Ocean GO6 and GO7: a traceable hierarchy of model resolutions” by David Storkey et al.

Anonymous Referee #1

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This is a generally well constructed and well written paper that describes newer versions of an important ocean climate model. Explanations of principal differences in state under forced integration are for the most part clear, along with the consideration of which changes in configuration are responsible. I have a number of mostly minor questions and points (some located by page and line number), below:

1. p. 4 l. 1: “This is to avoid instabilities associated with artificial cliffs in the bathymetry at the edge of the ice shelves where the ice cavities have been closed.”

As suggested by this comment, have you verified that GO7 is stable without partial-slip?

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2. p. 4 l. 15: “with increased friction in the Indonesian Throughflow, Denmark Strait and Bab el Mandeb regions.”
Is this discussed in another paper? If so please include the citation. If not, can you make some brief comment on the basis for this change and the degree of impact?
3. p. 4 l. 16: Again, is there a reference to the impact of this scheme in Nemo? Based on the prominence of Overflows in Future Plans, one may infer that the scheme is not producing the desired result; a few words on this would be useful.
4. p. 3 l. 29:
with the cube of the grid size ->
with the cube of grid length
5. p. 7 l. 28: “in the winter”
Perhaps this is fussy, but here and elsewhere it might be helpful to clarify as “austral winter” (and similarly for summer).
6. Section 4.4: With the factor of 2 reduction in isopycnal mixing coefficient, what happens with the Drake Passage transport?
7. Section 4.5: I would expect that Merino et al 2016 may be relevant (<https://www.sciencedirect.com/science/article/pii/S1463500316300300>), since it is on the NEMO-iceberg model and discusses impacts on sea ice?
8. p. 8 l. 28: “With less sea ice formation there was less sea ice overall and a widespread salinification of the surface waters in the Southern Ocean due to reduced melting offshore.”
This result is sufficiently counter-intuitive, given the tendency of drifting icebergs to deliver freshwater well offshore, that I would suggest including an explicit comment to the extent that reduced sea ice export dominates over iceberg export of freshwater, resulting in a net freshening of offshore waters.

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And I admit, this is one place I'm asking myself: Really, are they sure that this is so generally true? Aren't there some places (iceberg-alleys) where the freshwater delivery of icebergs dominates over the reduced export of sea ice?

9. Section 4.6: Are you using the delta-Eddington shortwave scheme, which computes the albedos, or a simpler scheme in which 'base' albedos are parameters which are then adjusted based on temperature and thickness?
10. Section 5.2: is it not likely that the elimination of the Weddell Polynya is primarily due to the change in sea surface salinity (fresher in GO6, eliminating the salinity bias relative to EN4)?
11. p. 12 l. 8:
to indirectly salinify the surface layers ->
to indirectly make the surface layers more saline
12. p. 14 l. 16:
from Ronne Ice Shelf cavity, but are fresher... However, the overall the Filchner shelf ->
from the Ronne Ice Shelf cavity, but are fresher... However, overall the Filchner shelf
13. Fig. 3: could you include a few words here to indicate what this length scale $n_{h,tavis}$?
14. Fig. 7: this set of plots would be easier to assess if presented in units of m/yr (as in Marsh 2015).
15. Fig. 8:
fields are meaned over ->
means are taken over

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16. Fig. 9 (and other similar opportunities): please use the figure caption to explain more than what one can already get from the annotations that are already embedded in the figure.
17. Fig. 17: what are the contour intervals? Does the interval change after 10?
18. Perhaps this would be addressed in final inspection before publication, but I will also make the point that it would be helpful to follow a policy of introducing acronyms.

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