

Interactive comment on “Modelling Ross Ice Shelf melting effect on the Southern Ocean in quasi-equilibrium” by Xiying Liu

R. Walker (Referee)

ryan.t.walker@nasa.gov

Received and published: 6 January 2018

Inclusion of ice shelves in global circulation models is a significant issue for the accuracy of climate projections. This study considers the impact of basal melting under the Ross Ice Shelf on the Southern Ocean by contrasting global ocean model experiments with and without melting in the sub-Ross cavity. The choice of a no-melt scenario that includes sub-ice-shelf bathymetry seems a little odd to me, as most ocean modeling that I'm aware of either includes ice shelves plus melting or excludes ice shelves from the domain. It should still be possible to get value from this experimental setup. However, I would have liked this manuscript to spend much more time on detailed discussion of the different experiments, particularly the relations between water properties and dynamics.

C1

General comment on figures) All units should be in axis labels, not only in the captions. Also, axes should be labeled with variable names. Figures 1, 2, 6, 7, 9, 10 should have a larger font size to be readable.

Page 2: Line 9) “The equivalent freshwater flux...” This is unclear. Do you mean that the freshwater flux is equivalent to a particular melt rate over the ice shelves?

Figure 1b) On my printout, this looks like green, not yellow.

Section 3.1) Is the first paragraph about both experiments or only EI?

5:5) “The difference in the feature...” This calls for more explanation.

5:10) When listing the earlier results, it would be good to provide the actual numbers for comparison.

5:14) “The difference in seasonality...” Also could use more explanation.

Figure 3) Write out the full names of the variables in the axis labels.

7:6) What latitudes are you considering to be the Southern Ocean?

7:15) This could use a description of the complex mechanisms.

7:17) What happens in the Southern Atlantic?

7:19) Why aren't you showing the figure? I don't think there's a limit on number of figures here.

Figure 4) This would be easier to read with the y-axis flipped so the surface is at the top of the graph.

Figure 5) The color scale here doesn't show detail over most of the domain because of a few outliers under the Ross. Probably would be better to plot Ross separately or just discuss the values there in the text.

9:7) Describe the specific bathymetry feature.

C2

9:16) It would be better to compare your output with Hellmer's for the case of ice-shelf melt being included. The difference you're describing here is more or less a matter of how you define the no-melt experiment setup.

Figures 6 and 7) The color scales for the subplots should be equal for (a) and (b). Also, the arrows in Figure 6 are very small and hard to read.

11:2) Again, why not show the figure?

Figure 8) You may want to zoom in to show the gyres better.

11:15) Could use a reference for the recommendation.

Figure 9) The contours of the difference overlying the EI shaded contours are hard to follow, at least for me. The difference could use its own subplot.

12:18) It would be useful to compare the heat transport anomalies to the magnitude of the full heat transport.

Figure 10) Cut "stream function" in caption.

13:7) For consistency with the rest of the paper, this should be Southern Ocean.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-228>, 2017.