I want to thank R. Walker for his constructive review and good suggestions. I am answering his comments in the following. For clarity, I repeat the original comment ([C]) at first and then the answer ([A]) and author's changes in manuscript [R] afterwards:

General Comments

[C]: 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.

[A]: Initially I set up two experiments, one included ice shelves plus melting and the other excluded ice shelves from the domain. After preliminary analysis of simulation results, I realized that the sub-ice-shelf bathymetry gave significant contribution to the differences between the results from the two simulations. This difference in geometry changes local circulation and mixing and leads to changes of overall results compared to or even greater than that in basal melting under the Ross Ice Shelf. Under such conditions, it would be difficult to discuss the effect of basal melting under the Ross Ice Shelf. Hence a third experiment with no-melt scenario that includes sub-ice-shelf bathymetry was added and its results were used in the discussion instead of that from the experiment that excluded ice shelves from the domain. More discussions on the modelling results have been added.

[R] See [R] parts for specific comments.

[C]: 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.

[A&R] These figures have been redrawn:

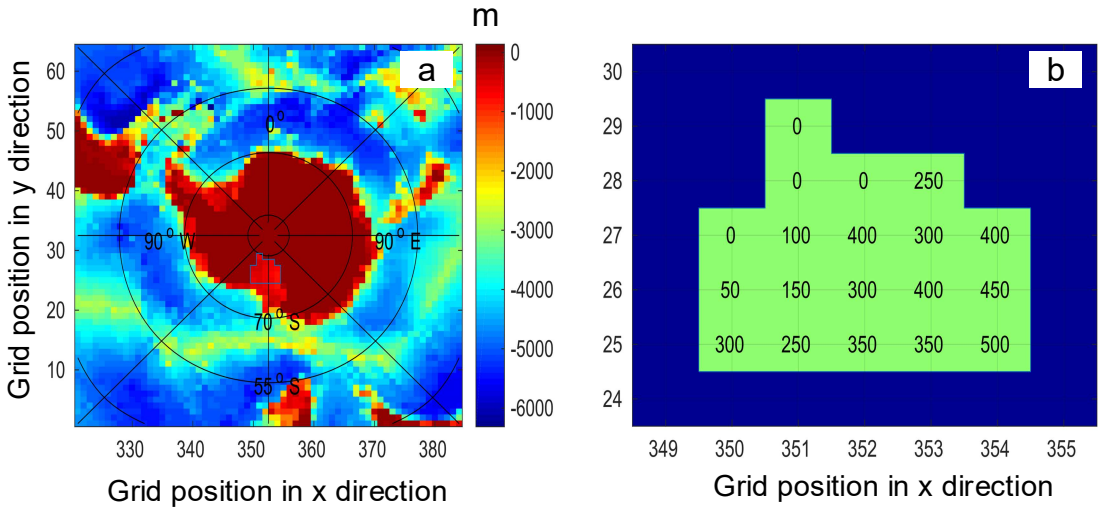

Fig. 1

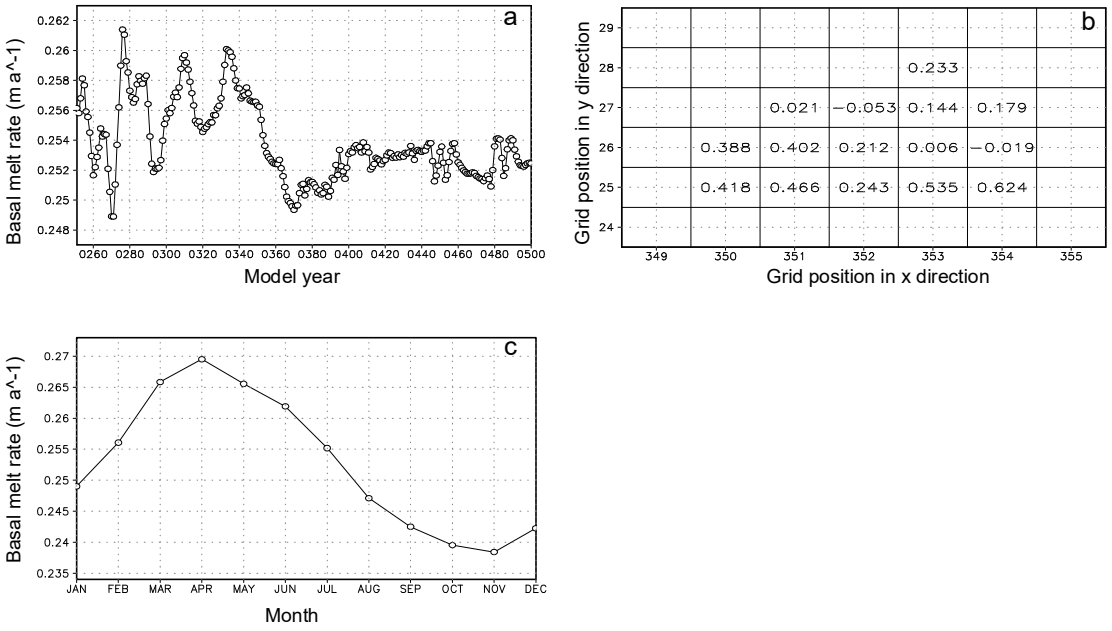
a
Basal melt rate (m a^-1)
Model year
b
Grid position in y direction
Grid position in x direction
0.233
0.021
−0.053
0.144
0.179
0.388
0.402
0.212
0.006
−0.019
0.418
0.466
0.243
0.535
0.624
c
Basal melt rate (m a^-1)
Month
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Fig. 2

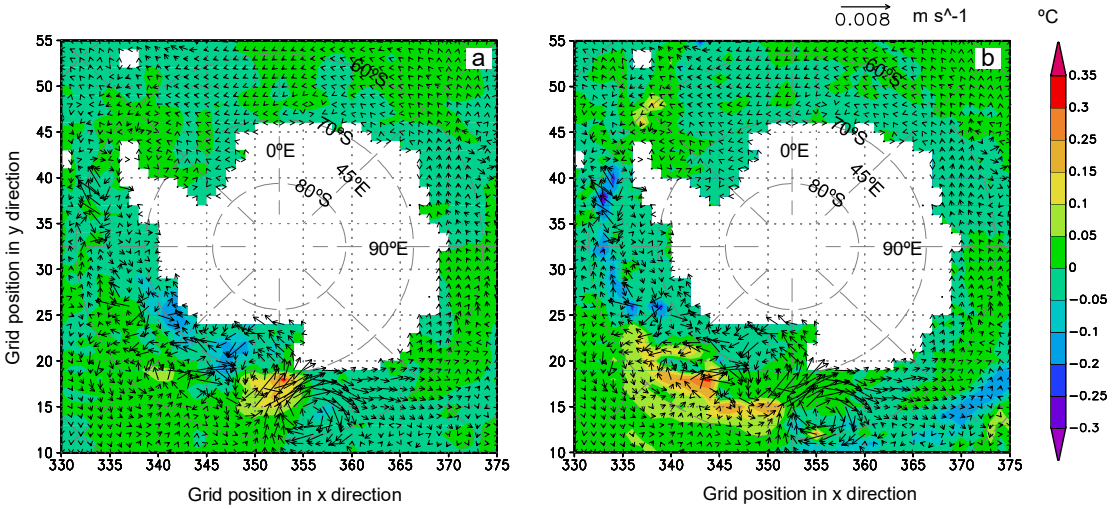
0.008 m s^-1
°C
a
b
60°S
70°S
80°S
0°E
45°E
90°E
Grid position in y direction
Grid position in x direction

Fig. 6

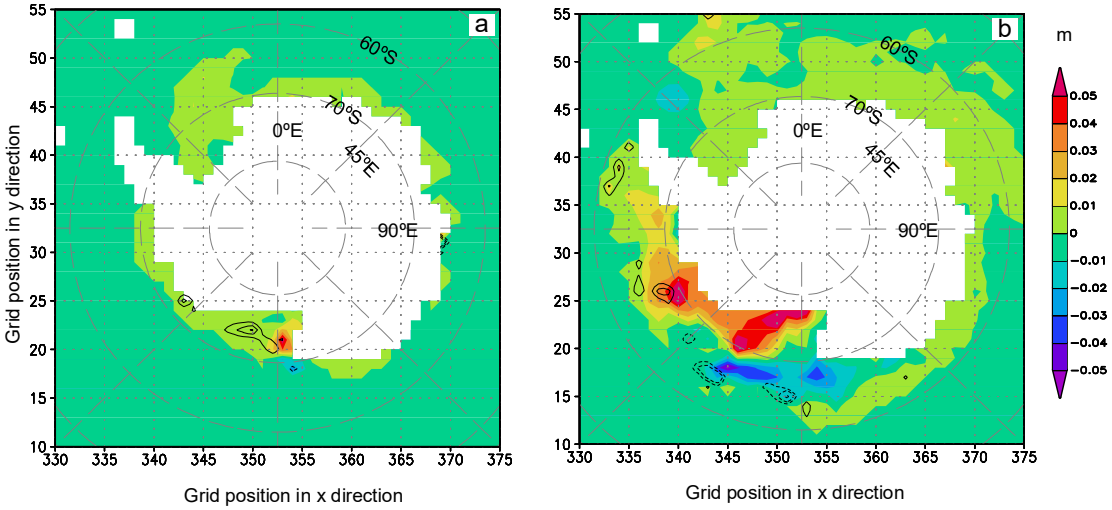
a
b
m
60°S
70°S
0°E
45°E
90°E
Grid position in y direction
Grid position in x direction

Fig.7

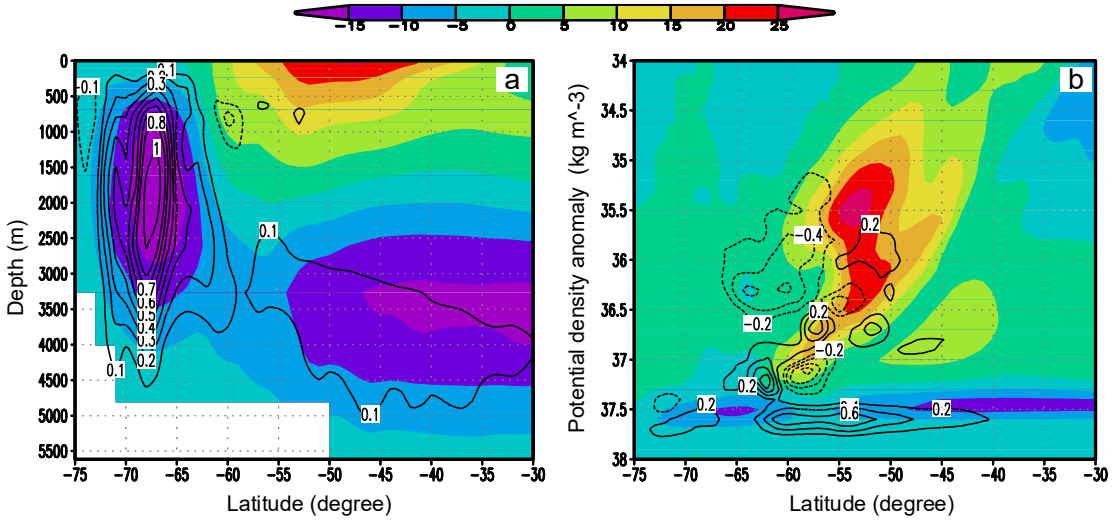

Fig.9

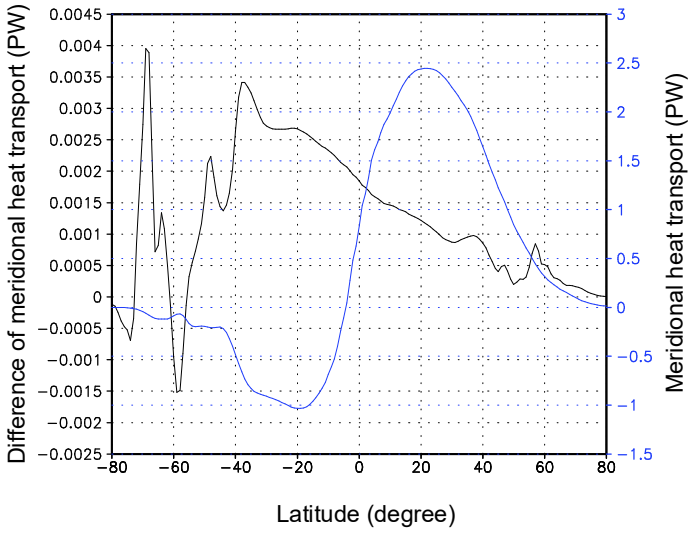

Fig.10

Specific Comments

[C] 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?

[A&R] Yes, I do. The sentence has been revised.

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

[A&R] Sorry, I used a wrong word. It has been revised.

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

[A&R] It’s only about EI.

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

[A&R] More explanation has been added: “Before longer time scale reaction of ocean has been

set up, variation of local basal melting is large.

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

[A&R] The suggestion is accepted. A table listing the earlier results has been added:

Table 2. Basal melt rates averaged over the entire RIS in the work and other studies

Basal melt rates (m/a)	Source	Brief description
0.12 ± 0.03	Shabtaie and Bentley (1987)	Calculated from the measured ice flux into the Ross Ice Shelf and previous measurements
0.18-0.27	Hellmer and Jacobs (1995)	Calculated from a two-dimensional (y/z plane) channel flow model forced by density differences between the open boundaries and the interior cavity
0.25	Assmann et al. (2003)	Calculated from a circumpolar numerical model
0.082	Holland et al. (2003)	Calculated from a regional numerical model (MICOM)
0.13-0.15	Dinniman et al. (2007)	Calculated from a regional numerical model (ROMS)
0.15	Dinniman et al. (2011)	Calculated from the ROMS model
0.6	Timmermann et al. (2012)	Calculated from a global finite element ocean model (FESOM)
0.0± 0.1 for Ross West 0.3 ± 0.1 for Ross East	Rignot et al. (2013)	Calculated from radar measurements and output products from the Regional Atmospheric and Climate Model RACMO2
0.14 ± 0.05	Depoorter et al. (2013)	Calculated from radar measurements and a regional climate model (for firn air content and compaction)
0.25 (without tidal forcing) 0.32 (with tidal forcing)	Arzeno et al. (2014)	Calculated from the ROMS model
0.11 ± 0.14 (converted from basal melt budget of RIS dM/dt in Table 3 with ice density 918 kg/m^3)	Moholdt et al. (2014)	derived from Lagrangian analysis of ICESat (NASA's Ice, Cloud and land Elevation Satellite) altimetry
0.24 (converted from basal melt in Gt/yr for the last year of simulation in R_MLT in Table 3 with RIS area 500 000 km^2 and ice density 918 kg/m^3)	Mathiot et al. (2017)	Calculated from a regional numerical model (NEMO)
0.25	This study	Calculated from quasi-equilibrium state of a global numerical modelling

[C] 5:14) “The difference in seasonality ...” Also could use more explanation.
[A&R] The suggestion is accepted. More explanation has been added: “The modelling system used by Holland et al. (2003) did not incorporate wind and sea ice and restoration of surface temperature and salinity was used.”

[C] Figure 3) Write out the full names of the variables in the axis labels.
[A&R] Figure 3 has been redrawn:

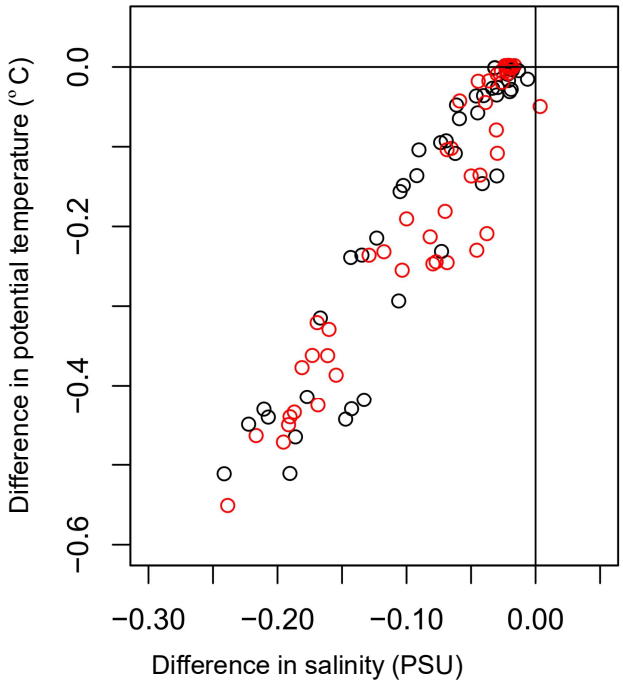

Fig. 3

[C] 7:6) What latitudes are you considering to be the Southern Ocean?
[A&R] Ocean south of 35 ^{o}S is considered to be Southern Ocean. Explanation on it has been added in the text.

[C] 7:15) This could use a description of the complex mechanisms.
[A&R] The sentence has been removed.

[C] 7:17) What happens in the Southern Atlantic?
[A&R] In deep ocean, the signal of the basal melting effect of RIS is weak in the Southern Atlantic Ocean compared to those in the Southern Pacific Ocean and the Southern Indian Ocean. The analysis has been added in the text.

[C] 7:19) Why aren’t you showing the figure? I don’t think there’s a limit on number of figures here.
[A&R] I rechecked the figure and realized that my previous analysis is not correct. The sentence related with the figure has been removed.

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

[A&R] Figure 4 has been redrawn.

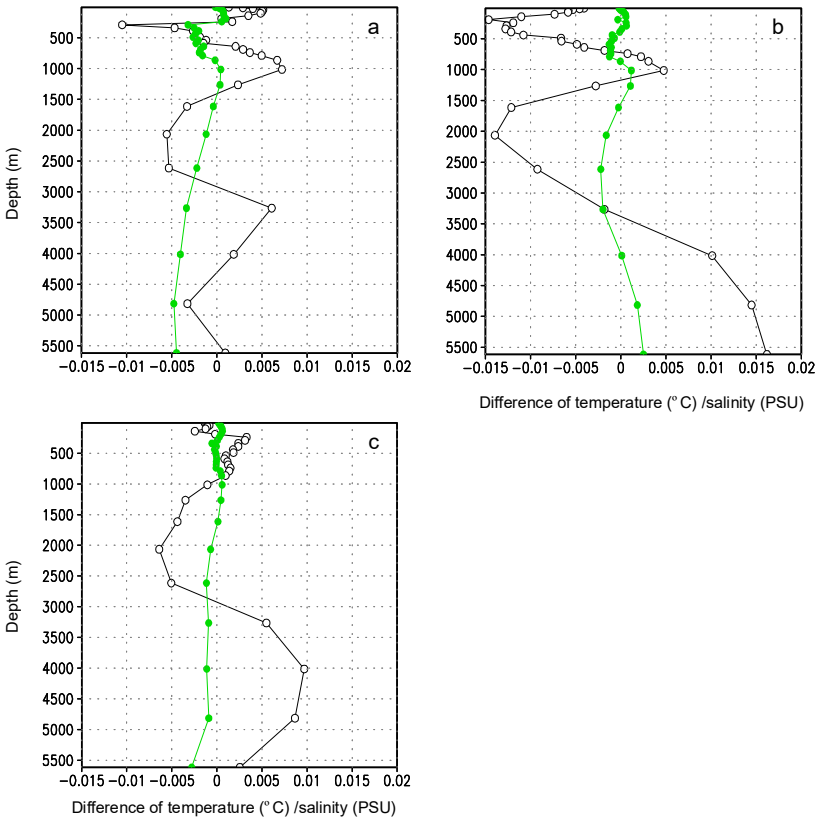

Fig. 4

[C] 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.

[A&R] The figure has been redrawn with new color scale.

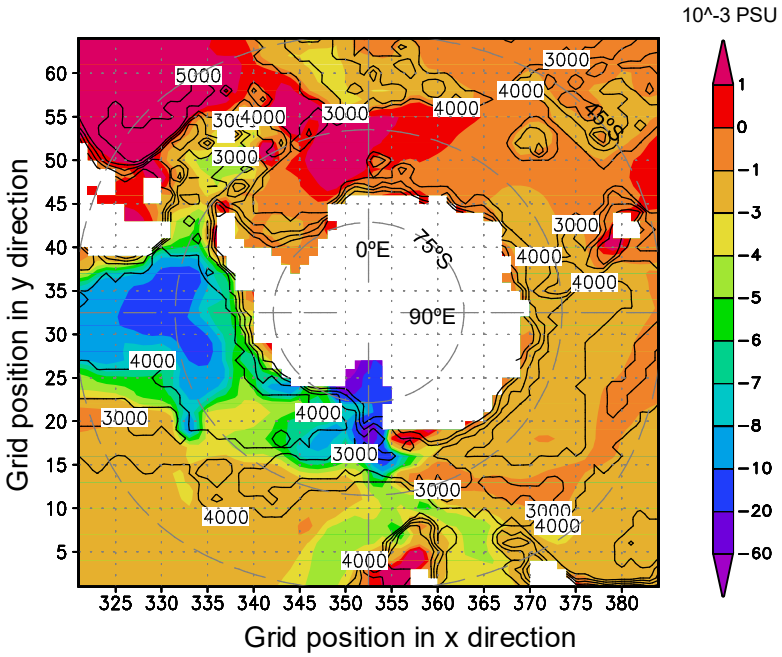

Fig. 5

[C] 9:7) Describe the specific bathymetry feature.
[A&R] There is a local low center in bathymetry. The detail has been added in the text.

[C] 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.
[A] That is a good idea. Unfortunately, the result of Hellmer's for the case of ice-shelf melt being included could not be found in the article. I guess the cavity geometry contributes to the difference to a large part.

[C] 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.
[A] The two figures have been redrawn. See my previous [R] parts.

[C] 11:2) Again, why not show the figure?
[A&R] The figure has been added (Fig. S4)

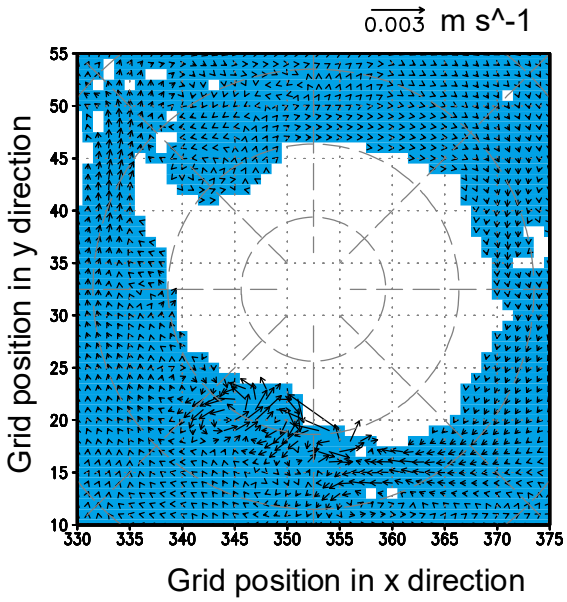

Fig. S4 Differences of annual mean ocean currents (EI minus EN) at 2065 m. The unit of velocity is m/s

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

[A&R] The figure has been redrawn.

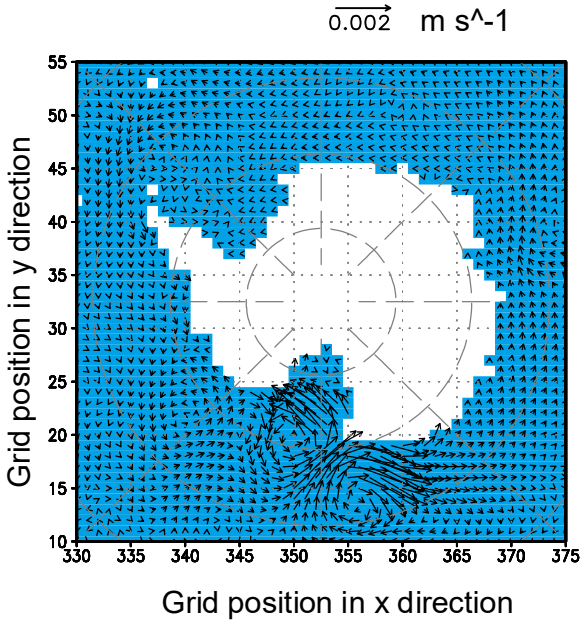

Fig. 8

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

[A&R] A reference has been added.

Ballarotta, M., Drijfhout, S., Kuhlbrodt, T., and Döös, K.: The residual circulation of the Southern Ocean: which spatio-temporal scales are needed? Ocean Modell., 64, 46–55, doi: 10.1016/j.ocemod.2013.01.005, 2013

[C] 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.
[A&R] The figure has been redrawn. See my previous [R] part.

[C] 12:18) It would be useful to compare the heat transport anomalies to the magnitude of the full heat transport.
[A] The suggestion is accepted.
[R] More analysis is added: Compared to the magnitude of the full heat transport, the maximum reduction of southward heat transport occurs around 71 ^{o}S with a value about 6% whereas at most other latitudes the relative reduction is less than 1%.

[C]Figure 10) Cut “stream function” in caption.
[A&R] Corrected.

[C] 13:7) For consistency with the rest of the paper, this should be Southern Ocean.
[A&R] Corrected.