Authors’ comments on the reviews of “Response to Filchner-Ronne Ice Shelf cavity warming in a coupled ocean—ice sheet model. Part I: The ocean perspective”

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August 10, 2017

First of all, we would like to thank both reviewers for their careful reading of the manuscript and their helpful and constructive comments. Your input is really appreciated.

In the following, we quote the reviewers’ comments in *italic* typesetting, followed by our replies. New text added to the manuscript or modified from the original manuscript appears in **bold**.

Anonymous Referee #1

Major comments

p. 5, l. 2: "This ice model spin-up is forced by present-day surface temperatures (Comiso, 2000), accumulation rates (Arthern et al., 2006) and geothermal heat flux (Shapiro and Ritzwoller, 2004)." All these forcing datasets are somewhat outdated; please motivate your choice and discuss the impact it has on the simulated ice sheet.

It is true that these are not the most recent data sets, but to our know knowledge they are still the ones used by the most ice modelers. Like with any boundary condition and any parameterization, the choice of data sets and the choice of parameters are not independent steps - in fact they are so closely connected that parameter values and data sets can righteously be treated as married pairs. Given that RIMBAY has been comprehensively tuned to today's observations with the abovementioned data sets (Sutter et al., GRL 2016) and gives quite acceptable results in terms of ice shelf thickness and grounding line locations in the configuration used for RAnGO, we are confident that we are not introducing critical errors here.

p. 9, l. 4: It is not convenient to refer to figures that appear later in the paper; rather, include a map with all relevant names as Fig. 1 (or simply rename Fig. 9 to Fig. 1).

Given that the names actually occur in the dicsussion of Fig. 7, we will add acronyms **SF (Support Force Glacier), FI (Foundation Ice Stream), EI (Evans Ice Stream), RI (Rutford Ice Stream), H (Henry Ice Rise), K (Korff Ice Rise), RT (Ronne Trough) and FT (Filchner Trough)** to all panels of Fig. 7. The caption will be adjusted accordingly. The long list of acronyms is clearly not ideal, but we found that the panels are too small to allow for full-text labels. At least all the information is available to the reader without having to refer to some other figure now.

Fig. 6: Would it not be more logical if you comment on the slight drift that occurs in the RAnGO 20C control run (blue line) here, rather than later on page 14?

The discussion on page 14 is on ice shelf thickness, area and mass (Section 3.2), while the first appearance and discussion of Fig. 6 is in the Basal melt rates and hydrography section (3.1). Section 3.1.3 actually addresses melt rates in the FESOM and RAnGO 20C control experiments, but we agree that the structure is not perfectly clear here. So, we changed the relevant section title to **3.1.3 FESOM and RAnGO 20C control experiments** to have naming consistent with the scenario section 3.1.2. Furthermore, section 3.1.1 has been renamed to **3.1.1 Present-day climate in FESOM and RAnGO** to make the distinction between 'hindcast' and projection more visible.

p. 11, l. 18: "In contrast to the former experiments, a water column thickness of only 120 m (90 m) southwest of Henry Ice Rise prevents the warm water from flushing even larger parts of the Ronne cavity in the RAnGO 20 (FESOM) simulations discussed here." Is the water column thickness so different from these former experiments, and if so, what causes this? What does this imply for the conclusions drawn in these studies when it comes to stability of the ice shelf?

We added further detail to the statement. The sentence now reads: **In contrast to the former FESOM experiments, which adopted a water column thickness of about 200 m southwest of Henry Ice Rise from RTopo-1 (Timmermann et al., 2010), slightly thicker ice in RIMBAY and a better representation of bottom topography in the RAnGO (FESOM) simulations discussed here lead to a water column thickness of only 120 m (90 m) in the channel and thus prevent a rapid spreading of warm water into the Ronne cavity.**

With increasing melt rates, the ice southwest of Henry Ice Rise gradually becomes thinner in RAnGO, so that warm water can pass the channel slightly more easily. The difference in bottom temperatures in the Ronne cavity between the two simulations is not very big though and the melt rate difference in Fig. 10 (left panel) does not show any signature of this process, so we decided to not discuss it in the paper.

Minor (textual) comments

p. 1, l. 15: Mass flux $->$ The mass flux

Done.

p. 1, l. 17: any other process $->$ the other processes

We decided to go with **all other proceses**.

p. 1, l. 19: grounding location $->$ *grounding line location*

Done

grounded ice $->$ *grounded ice above floatation*

Good point. We rephrased the sentence into **Changes in ice-shelf thickness and grounding line location may therefore alter the discharge of ice grounded above floatation and thus contribute to global sea level rise.**

p. 3, l. 7: in a ramp-like shape $->$ *by a ramp-like shape*

Done.

p. 6, l. 9: as good as possible $->$ *as well as possible*

Done.

p. 8, l. 10: time are spent $->$ *time is spent*

Done.

p. 11, l. 8: With the beginning of the 21st century, but most notably after 2050, $->$ *Most notably after 2050,*

Done.

p. 11, l. 12: which corresponds to a factor of six $->$ *a factor of six increase*

Done.

p. 18, l. 22: indentical $->$ *identical*

Done.