

## ***Interactive comment on “Impacts of marine instability across the East Antarctic Ice Sheet on Southern Ocean dynamics” by S. J. Phipps et al.***

**Anonymous Referee #2**

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This paper explores the impact of freshwater input from the Wilkes Basin on the broader Antarctic ice sheet and Southern Ocean. In particular the potential for loss of ice in the Wilkes Basin to trigger warming and further ice loss in the Weddell Sea sector is discussed. It builds on the work of Fogwill et al., (2015), with this paper differing in that freshwater hosing is applied to the East Antarctic as opposed to the West Antarctic. The paper is important given recent publications highlighting the sensitivity of the East Antarctic ice sheet to future anthropogenic climate change, but which lack potential ocean feedback effects. The paper is well written and the discussion and conclusions are justified based on the results presented. I recommend publication once minor comments below are addressed.

Specific Comments:

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1. The WEST/EAST/WILKES experiments are useful in highlighting the sensitivity of the model to the area that freshwater hosing occurs. In the discussion you could also touch on the assumption made that all ice lost from the Wilkes Basin would lead to localized meltwater delivery to the immediate George V Coast. As discussed there are various proposed mechanisms for collapse of the Wilkes Basin, which may affect the validity of this assumption.

2. I agree that using fixed pre-industrial CO<sub>2</sub> makes sense for the purposes of a sensitivity test in order to isolate other effects. However around lines 30 on page 3 could you expand on the impact that elevated CO<sub>2</sub> may have on these results, given that elevated CO<sub>2</sub> is likely required to trigger a collapse of the Wilkes Basin. Ideally additional experiments would have been performed at elevated CO<sub>2</sub> with and without freshwater hosing.

3. The a) and b) panels of Figures 5, 7 and 8 suggest that there would be surface cooling in the Weddell Sea sector and potentially at depths of 200-400m. This switches to warming at depth, as discussed in the paper. Although a possible mechanism that could explain this surface cooling is discussed, the surface cooling in the Weddell Sea sector is not currently mentioned in the manuscript. Could you also include some discussion about how warming/cooling at different ocean depths may affect ice sheet stability in the Weddell Sea sector.

Technical Corrections:

Page 4, line 5, could also include reference to Bintanja et al., 2013.

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