

Interactive comment on “Influence of the Southern Annular Mode on the sea ice-ocean system: the role of the thermal and mechanical forcing” by W. Lefebvre and H. Goosse

Anonymous Referee #3

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General

The paper is OK, and interesting, and for the most part well done. The idea of separating into thermal and mechanical forcing appears valuable and the (somewhat surprising) linearity a useful result. Having to end up with only 7 years is a bit of a problem though.

Specific

Fig 2: pretty sure this is obs T vs obs SAM from NNR. Could that be explicitly stated.

Fig 3: not sure why $S+ + S-$ (and ditto M and T) is shown. Why not $S+ vs M+ + T+$. Or indeed $S+ - S-$. $S+ + S-$ would tend to cancel out. Also, 15 points per year? Odd. Why?

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Fig 4: a and b are supposed to be v similar (note to the journal editor: can we please have a, b, ... captions to figures rather than the clumsy "top left" etc). But there is a major difference: in b the -ve response is almost all in the ABS; in a, entirely in the Weddell. Errr... and in fact there is a major problem with that figure: a is for 1980-7; b is for 1980-99. They aren't comparable.

Fig 5: caption trouble? It says "(S+ CTRL)" and "(CTRL S-)". Should be S+ - CTRL and CTRL - S- I think.

Sec 3 line 11 ish: "will work with the first 7 years from now on". On a textural note, most of the figs up to now have been first 7 years, but now I understand why! A solution might be to run on-off forcing rather than constant. However, the finding that constant SAM leads to larger changes is perhaps interesting but isn't explored at all. The only-7-years bit should be mentioned higher up in the expt, where the fact that the runs are 1980-1999 is said.

Sec 4: "The effect is [the] strongest in the seasons with the biggest changes in temperature: autumn and winter. The opposite can be seen in the Weddell and Bellingshausen sectors, where an increase in air temperature results in a decrease in ice concentration." Hmmm yes, but in fact there are large T increases in the ABS sector but almost no sea ice changes there: why? The ice decreases are small and confined to very near the peninsula. They don't match the imposed (+ve) T pattern at all well. This "failure" of the model to do the obvious thing might explain why the -ve part in the ABS seen in fig 4 b (obs) isn't in fig 4 a (model).

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