

Interactive comment on “Model resolution influence on simulated sea ice decline” by J. O. Sewall

Anonymous Referee #2

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This is an interesting paper, sometimes thought-provoking, but not always convincing. It should be published, but hopefully the following comments may help to improve the final version of the paper.

1. The author sometimes tend to overstate his conclusions. The paper doesn't need that. For instance: "Differences in sea ice response .. do not appear to be correlated to the ... formulation of the sea ice model (763). You do not really prove that, to do so one should run the same CCM with 2 different sea ice models; the results merely suggest that ocean resolution and ocean heat transport play an important role in the response. Here, and at other places a slightly more cautious way of formulating conclusions seems appropriate.

2. Please add confidence bars and mention statistical significance for your correlation estimates.
3. In Figs. 1 and 2 the model diagnostic is not well defined. Percentage of what exactly (Fig. 1; total Arctic area or ice covered area)? Thickness averaged over which points (Fig. 2; all ocean points, or only ice-covered ones?). I would prefer to see instead the change in total area of ice coverage in km^2 (Fig. 1) and change in total volume (Fig. 2).
4. What is the relation between the results presented in Figs. 1 and 2 and initial biases in simulating Arctic ice coverage and volume? Is a large ice loss related to initially too high values for ice coverage?
5. I am aware that hindcasts of the observed trend of summer ice loss have been presented elsewhere, but to put the results in perspective a comparison between the response to quadrupling of CO_2 and the hindcast of the last 30 years is warranted.
6. Figure 4. Please calculate ocean heat transport across a fixed latitude! Also, it is not clear why simulated ice loss and average heat transport should correlate at all. Please add 2 figure panels showing the correlation between ice loss and CHANGE in ocean heat transport (convergence). Is the relation with ocean model resolution still evident when change is considered? If so, comment on why this would be the case. If change in sea ice area/volume correlates less well with the change in ocean heat transport than ocean heat transport itself, at least some discussion on the possible reason for this is needed.
7. On the basis of these results the whole paper could be rewritten to make a point that ATMOSPHERIC model resolution influences simulated sea ice decline. Could you show the correlation between sea ice decline and atmospheric energy transport across the same latitude circle, and more interesting the correlation between sea ice loss and change in atmospheric energy transport as well? Please add a short discussion on the relative roles of changes in atmospheric and ocean heat transport.

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Interactive comment on The Cryosphere Discuss., 2, 759, 2008.

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