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Interactive comment on “Future Arctic marine access: analysis and evaluation of observations, models, and projections of sea ice” by T. S. Rogers et al.

Anonymous Referee #2

Received and published: 2 November 2012

This study demonstrates an excellent approach to address user needs for information about Arctic sea ice evolution and predictions based on available observations and model projections. Sea ice in different regions of the Arctic and during the four seasons will respond differently to changing forcing, and this study is a good first step toward understanding those differences and how they will affect stakeholders. I recommend that the paper be published after a few comments are addressed.

1. During winter, sea ice in the Russian and Canadian quadrants grows until it hits the coast. Very little change can be expected to occur in sea-ice extents in winter and spring until so much warming occurs that ice doesn't reach the coast anymore.

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I'm surprised to see statistically significant trends (Table 2) in these quadrants during months when ice has filled the basin. How is this ice loss occurring? I looked at maps of ice extent using NSIDC's Sea Ice Index, and during March for each year of this study, the ice was solidly packed up against the coast in the Canadian quadrant. There might be some variability around Novaya Zemlya that accounts for changes in the Russian quadrant, but I don't see how a negative trend emerged during winter in the Canadian quadrant.

2. The correlation found between winter ice and SSTs in the North Atlantic quadrant was previously found by Francis and Hunter (2007), which should be cited. The lead-lag relationship, however, is opposite to their conclusion. It is difficult to imagine a mechanism by which ice would lead SSTs, thus I agree with Walt Meier's suggestion that perhaps this aspect should be downplayed in the paper until the relationship can be confirmed and understood.

3. P. 3970, line 2: I suggest changing "ice-free summer sea" to "ice-free summer Arctic Ocean". Lines 23-24: The use of "catch" and "catching" in this paragraph seems too colloquial – perhaps "simulate" or "realistically represent" would be better.

4. P. 3971, lines 15-25: I've read the explanation for how the composite rankings were calculated, but I just don't get it. Can you please take another shot at describing the methodology? Perhaps include an example for how one of the values in Table 4 was determined?

5. Following comment #1, it seems that the months and quadrants in which ice is confined largely by coastlines should not be used in the model ranking. These trends are small and probably not reliable, so models should not be overly judged by these values.

6. Table 3: Why is the annual cycle for observed sea ice not included? Should the March trend for the CNRM model have a negative sign?

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7. Table 5: it's very difficult to distinguish bold from non-bold Xs. I suggest using some other symbol, such as +, to denote the best 5 models.
8. Fig. 2: Please make plot lines thicker – they're hard to see in printed copy.
9. Fig. 4: plots should have the same scale on the x-axis to enable comparison. The lag is not discernible.
10. Fig. 6: The different plot lines would be much easier to see if they were in color or included symbols. The HadGem line doesn't show up at all in my copy.
11. Fig. 10: Again, it is very difficult to discern the different dashed lines. Please use color instead or add symbols.

Interactive comment on The Cryosphere Discuss., 6, 3963, 2012.

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