

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

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1. “Why does the analysis start in 1980? The passive microwave record goes back to 1979 for continuous data. I don’t think it will affect the analysis, but it seems odd to not use all of the data unless there is a specific reason.”

We chose to start in 1980 for two reasons: (1) starting in 1980 conveniently allows decadal partitioning, and (2) the lead-lag analysis required that some of the analyzed information came from prior to 1980.

2. “It is a reasonable proposition to use quadrants, especially since they’ve been employed previously in ACIA. However, they are somewhat arbitrary. Another approach
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would be to split the Arctic into more geographically coherent regions, as was done in Parkinson et al. (2008, JGR) and Meier et al., (2007, Ann. Glaciol.). Such regions are smaller and may be more difficult to analyze, particularly for models. Perhaps a sentence on the rationale/advantage of using quadrants would be useful?”

We added the following sentences to 3967, Line 1: “Rather than use divisions seen in previous sea ice research (e.g. Parkinson et al., 1999), we chose larger regions that cover segments of sea ice relevant to the routes we investigate in section 3. For example, the Canadian quadrant covers most of the Northwest Passage, while the Russian quadrant covers most of the Northeast Passage.” Further, the limitations of model resolutions, typically 1-2 degrees latitude-longitude or coarser in CMIP3 models argued for coarser regions than the individual seas used by Parkinson et al, since errors in regional area introduced by grid cell resolution become smaller as a percentage of the size of the regions’ increase.

3. “The correlation between SST and sea ice extent is interesting, particularly the fact that SST lags extent. It would seem more intuitive that it would be the reverse. This would seem to deserve a paper all its own, investigating potential explanations. As it is, while it’s interesting, it seems a bit out of place. I understand that it is used to explain why the Atlantic sector has a different winter trend than the other three quadrants. The analysis sort of provides an answer, but really it just leads to more questions – i.e., why/how is the extent leading SST? I won’t suggest that this should be cut, though I think it could be without detriment to the paper.”

When we noticed the anomalous loss of ice in the Atlantic sector, we investigated winds and SSTs as potential drivers. We found very high correlations between pan-Arctic sea ice and winds, as well as Pacific quadrant sea ice and winds. We removed those sections as the correlations have been discussed in greater depths in other research, e.g. Ogi et al. 2010. By comparison, the SST comparison is new and deserves further investigation.

4. "I wonder why the cross-pole route isn't mentioned? I've heard much talk of the route over the pole recently and my understanding is that this route is likely to become more feasible sooner than the Northwest Passage. Even the Northeast Passage can get blocked by wind-driven ice along the coast."

The challenge for the cross-pole route is that it will likely be fully or partially ice-covered year round in the near future. Later this century, the route could be open for a very short period of the year, but for at least 10 months of the year for the rest of this century, it will most likely require an expensive polar class ship. With the loss of speed caused by breaking ice, it would still be more efficient to travel the Northwest Passage during those months where it is mostly ice-free but the cross-pole route is not. For these reasons, we chose to investigate the Northwest Passage, the Northeast Passage, and the Arctic bridge.

P3964, L8: Typo corrected

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