

Pan-Arctic September 2014 Sea Ice Outlook July report (based on June data)

1. James Morison
2. Methods/Techniques
Heuristic
3. Extent Projection
4.4 million km²
4. Method

Short explanation: Estimate is based on prior year's ice and AO index plus observations of ice in April and June.

My July projection of average September, 2014 Arctic sea ice extent is 4.4 million square kilometers. My estimate this year, as in past years working with Norbert Untersteiner, is an impression based on comparison of a few variables over the last few years.

A) Our observations during the 2014 North Pole Environmental Observatory (NPEO) deployment were similar to 2013 and suggest that the snow cover is low in the central Arctic Ocean. This is a factor that helps increase September ice extent by allowing for more sea ice growth in winter and reducing melt pond formation and associated melt in summer. The NPEO web cameras as long as they lasted before being consumed by ice deformation suggest that as of the end of June there was no early formation of melt ponds and much of the snow seemed gone. This is on the positive side.

B) Also, although most of the snow was gone over the Beaufort Sea ice observed during our June Seasonal Ice Zone Reconnaissance Survey Flight, there didn't appear to be a lot of surface melting of the ice itself. Ice concentration on 150°W out to about 74°N was reasonably high (95%) with reduced concentration at 75°N and 76°N. This is similar to 2012 (record minimum) at this time of year, a negative indication depending on this summer's atmospheric circulation.

C) A slightly different wrinkle in my thinking this year is the high AO last winter (NDJFMA). High winter AO should negatively correlate with AO [*Rigor et al.*, 2002]. I notice that for recent peak AO winters, the ice extent the following September is between 0.8 and 1.7 million square km less than the previous winter, making me think the atmospheric forcing associated with a peak AO will knock on the order of one million square kilometers off the previous years accumulation.

In 2013 the Sept average was 5.4 million. One million off of that is 4.4 million, similar to my intuitive guess from (1) and (2) and slightly below the long term trend, which looks like it would give ~ 4.8 million. I'll go with the 4.4 number.

5) Uncertainty

1 million square kilometers

6) Uncertainty Method

Experience

7) Summary

My estimate is based on prior year's ice and Arctic Oscillation index plus in situ observations of ice in April and June.

Reference

Rigor, I. G., J. M. Wallace, and R. L. Colony (2002), Response of sea ice to the Arctic oscillation, *Journal of Climate*, 15(18), 2648-2663.