SEA ICE OUTLOOK
2016 Report

By UTokyo (Kimura et al.)

1. *Name of Contributor

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2. * Contributions submitted by a person or group not affiliated with a research organization, please self-identify here:
   No

3. * Do you want your contribution to be included in subsequent reports in the 2016 season?
   Yes, use this contribution for all of the 2016 SIO reports

4. *"Executive summary" of your Outlook contribution: in a few sentences (using 300 words or less) describe how and why your contribution was formulated. To the extent possible, use non-technical language.

   Monthly mean ice extent in September will be about 4.86 million square kilometers. Our estimate is based on a statistical way using data from satellite microwave sensor. We used the ice thickness in December and ice movement from December to April. Predicted ice concentration map from July to September is available in our website: http://ccsr.aori.u-tokyo.ac.jp/~kimura_n/arctic/1st_e.html
   On the Russian side, sea ice in the Laptev Sea is expected to retreat quickly. On the other hand, sea ice in the East Siberian Sea is likely to retreat slowly. The ice retreat in the East Siberian Sea will be late compared with the last year because the area is covered by thicker ice piled up by the winter convergence of sea ice. On the Canadian side, sea ice in summer is expected to be thin and retreat more quickly than the last year.

5. *Type of Outlook method:
   statistical

6. *Dataset of initial Sea Ice Concentration (SIC) used (include name and date; e.g., "NASA Team, May 2016"):
   Initial SIC is not used.

7. Dataset of initial Sea Ice Thickness (SIT) used (include name and date):

SIT dataset distributed by distributed by Arctic Data archive System (ADS, https://ads.nipr.ac.jp/index.html), December 1 of all AMSR-E/AMSR2 years. SIT is calculated by an algorithm of Krishfield et al. (2014)

8. Dataset of Sea Ice Velocity

Kimura Dataset (Kimura et al., 2013), during December 1 and April 30 for all AMSR-E/AMSR2 years.

9. *Prediction of September pan-Arctic extent as monthly average in million square kilometers. (To be consistent with the validating sea ice extent index from NSIDC, if possible, please first compute the average sea ice concentration for the month and then compute the extent as the sum of cell areas > 15%.)

4.86 million square kilometer

10. Prediction of the week that the minimum daily extent will occur (expressed in date format for the first day of week, taking Sunday as the start of the week (e.g., week of 4 September).

Week of 3 September

11. *Short explanation of Outlook method (using 300 words or less).

We predicted the Arctic sea-ice cover from coming July 1 to November 1, using the data from satellite microwave sensors, AMSR-E (2002/03-2010/11) and AMSR2 (2012/13-2015/16). The analysis method is based on our recent research (Kimura et al., 2013). First, we expect the ice thickness distribution in April 30 from redistribution (divergence/convergence) of sea ice during December and April, based on the daily ice velocity data. Then, we predict the summer ice area depending on the assumption that thick ice remains later and thin ice melts sooner than the average.

For this analysis, we distributed particles homogeneously over the Arctic sea ice on December 1. We traced the trajectories of the particles to the end of April by using the satellite derived daily ice velocity (Kimura Dataset). Based on the relationship between particle density on April 30 and ice concentration in summer, we predicted the summer sea ice cover of this year. We also take it into account that thickness of sea ice on December 1 calculated by an algorithm of Krishfield et al. (2014) .

Reference

Kimura, N., A. Nishimura, Y. Tanaka and H. Yamaguchi, Influence of winter sea ice motion on summer ice cover in the Arctic, Polar Research, 32, 20193, 2013.

Krishfield, R. A., Proshutinsky, A., Tateyama, K., Williams, W. J., Carmack, E. C., McLaughlin, F. A., and Timmermans, M. L., Deterioration of perennial sea ice in the

Beaufort Gyre from 2003 to 2012 and its impact on the oceanic freshwater cycle, J. Geophys. Res., 119, 1271-1305, doi:10.1002/2013JC008999, 2014.

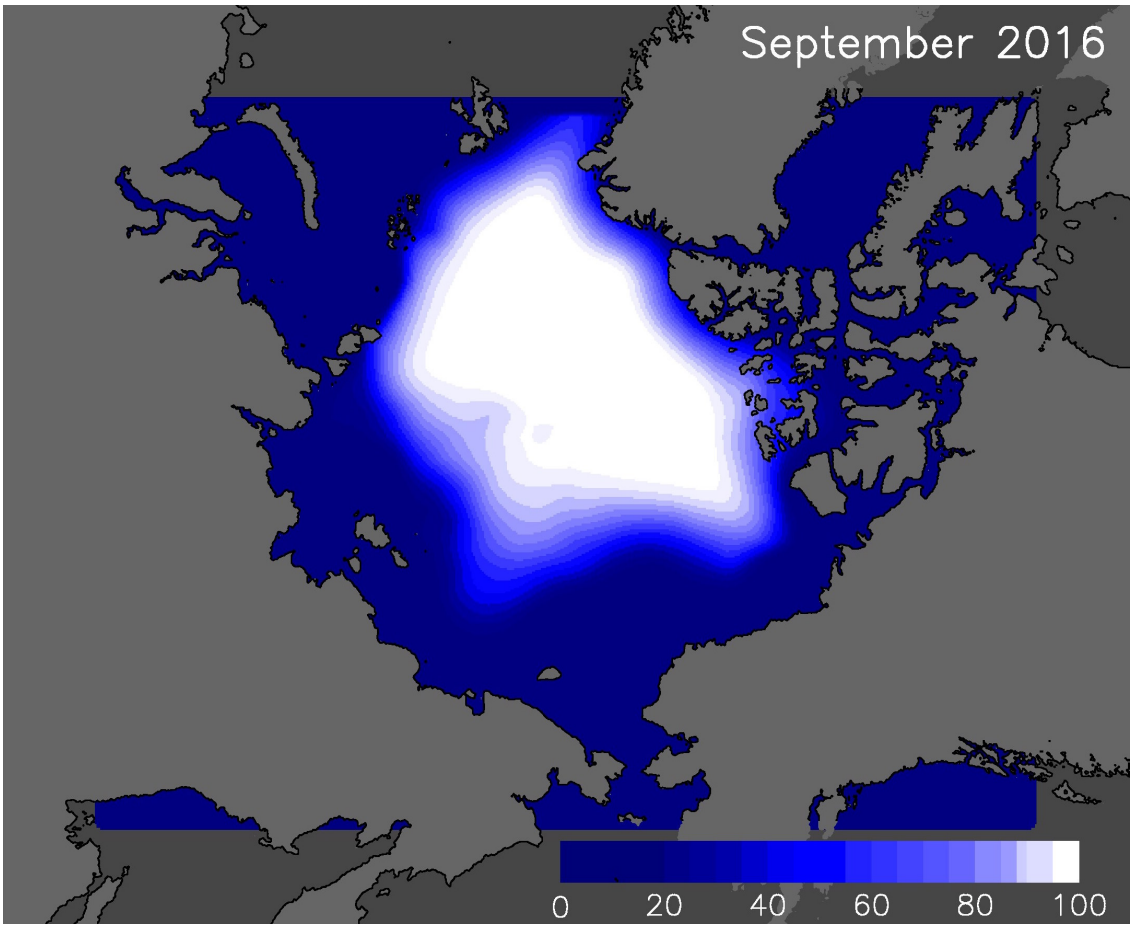

Fig: Predicted monthly mean ice concentration in September 2016.