ARCTIC SEA ICE OUTLOOK
2016 Report

August report (using July Data)

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2. Research organization – NASA-GSFC/UMD.

3. Yes, use this contribution for all of the 2016 SIO reports (this contribution will be superseded if you submit a later one).

4. "Executive summary"

Based on an analysis of July sea ice concentration data provided by the NSIDC (NASA Team), I forecast a 2016 September Arctic sea ice extent of 4.37 +/- 0.33 M km^2. This is lower than the observed ice extent in 2015 (4.63 M km^2) and is lower than the extent expected from persistence of the long-term linear trend (4.66 M km^2). The forecast does not suggest a new record low September extent will be reached in 2016 (lower than the 3.62 M km^2 observed in 2012). This forecast is slightly higher than the June forecast submitted to the SIO (4.12 M km^2)

For the 2016 July forecast, the anomalous declines in the Beaufort and Barents seas are countered by a stronger (than June) positive anomaly in the Laptev Sea.

5. Type of Outlook method: Statistical

6. Dataset of initial SIC used: NA (statistical forecast)

7. Dataset of initial SIT used: NA (statistical forecast)

8. September Arctic sea ice extent forecast: 4.37 M km^2

9. NA (I do not predict the minimum sea ice week.)

10. Short explanation of Outlook method:

In this forecast we use sea ice concentration (SIC) data (1979-present day), derived from passive microwave brightness temperature (Tb) using the NASA Team algorithm [*Cavalieri et al.*, 1996, updated 2015]. The SIC data are detrended spatially using linear trend persistence (from the given forecast year) then averaged, to generate a detrended SIC dataset. A least-squares linear regression model is fit from the mean detrended SIC/SIE data. To produce the SIE forecast, the relevant monthly mean/detrended SIC data are applied to the linear regression model. Note that for the June forecast (and earlier) we weight the detrended data, however we find that using all data for forecasts made after June are more skillful, likely due to the equal importance of all detrended anomalies at this later stage of sea ice melt. Figure 1 shows the July forecast of September sea ice extent using the unweighted forecast model.

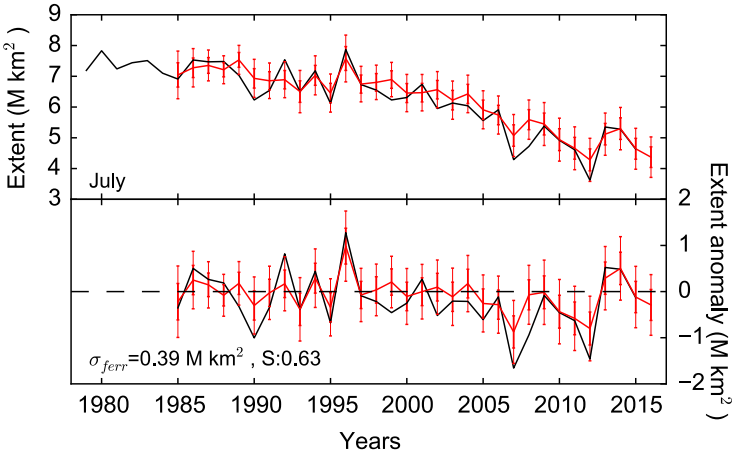

Figure 1: September sea ice extent observed (black) and forecast (red) using NASA Team sea ice concentration data. σ_{ferr} is the forecast error standard deviation and S is the forecast skill. The vertical red lines show the 1 SD (bold) and 2 SD/95% prediction intervals generated from each annual forecast.

12.

a) Uncertainty/probability estimate: +/- 0.33 M km^2 (one standard deviation of the prediction interval)

b) The uncertainty represents one standard deviation of the 2016 prediction interval. This uncertainty changes every year a forecast is made (based on regression with previous years). It is expressed by the thicker red line in Figure 1 (the thinner/longer line is the 95%/2 S.D. interval)

c) Brief description of any post processing you have done (1-2 sentences): NA

d) Raw/bias corrected?: NA

Alaskan Regional Outlook:

1. September Alaskan region sea ice extent forecast: 0.31 M km^2

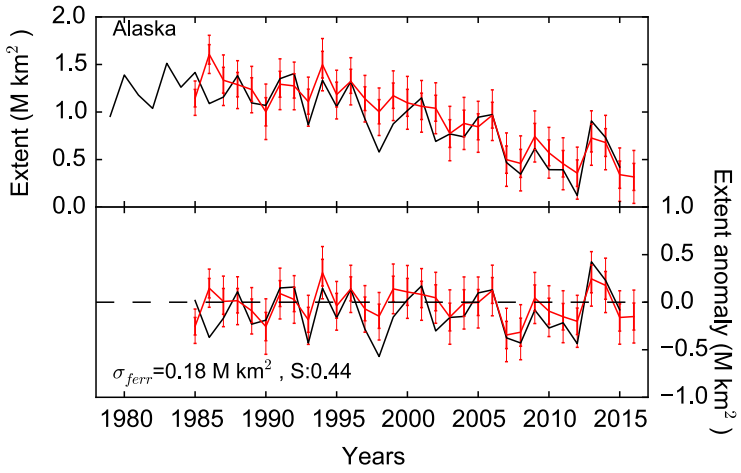

Figure 2: As in Figure 1, but for the forecast of Alaskan sea ice extent defined by the NSIDC region mask.

The July forecast suggests the 2016 Alaskan sea ice extent could be close to the record low extent observed in 2012 (0.12 M km^2). This July forecast was slightly higher than the June forecast submitted to the SIO (0.25 M km^2)

2. NA (I do not predict the minimum sea ice week.)

3. Short explanation of Outlook method:

Same as the Arctic forecast model, but the sea ice concentration is instead regressed against the Alaskan sea ice extent (defined by the Beaufort/Chukchi/Barents seas NSIDC mask). We use the spatial weighting scheme for this regional forecast as the skill is a lot higher than the unweighted regional forecast (see June SIO report for more information).

4.
a) Uncertainty/probability estimate: +/- 0.15 M km^2 (one standard deviation of the prediction interval).

b) The uncertainty represents one standard deviation of the 2016 prediction interval. This uncertainty changes every year a forecast is made (based on regression with previous years). It is expressed by the thicker red line in Figure 1 (the thinner/longer line is the 95%/2 S.D. interval)

c) Brief description of any post processing you have done: NA

d) Raw/bias corrected?: NA

5. Tell us how you defined the region:

Use the NSIDC definition (the three areas). I calculate extent using ice concentration and the ice flag data, following the NSIDC Arctic Sea Ice Index extent calculation.

References:

Cavalieri, D., C. Parkinson, P. Gloersen, and H. J. Zwally (1996, updated 2015), Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, Version 1, Boulder, Colorado USA: NASA DAAC at the National Snow and Ice Data Center, doi:10.5067/8GQ8LZQVL0VL.

Drobot, S. D., J. A. Maslanik, and C. F. Fowler (2006), A long-range forecast of Arctic summer sea-ice minimum extent*, Geophys. Res. Lett.*, 33, L10501, doi:10.1029/2006GL026216.