

SEA ICE PREDICTION NETWORK (SIPN)

Template for Pan-Arctic Sea Ice Outlook Core Contributions June Report (Using May Data)

**Required*

1. *Contributor Name(s)/Group
Emma Suckling, University of Reading (APPOSITE project)

2. *Type of Outlook projection
___model ___statistical ___heuristic
Statistical

If you use a model, please specify:

Model Name _____

Dynamic Climatology

Components of the model: Atmosphere___, Ocean___, Ice___, Land___, Coupler___

For non-coupled model: Ice___, Ocean___, Forcing___

Observed sea ice extent

3. *September monthly average projection (in million square kilometers)
4.67

4. *Short explanation of Outlook method (1-3 sentences)

If this is a model contribution, please include method of method of initialization and variable used. In addition, we encourage you to submit a more detailed Outlook, including discussions of uncertainties/probabilities, including any relevant figures, imagery, and references.

The model uses observed changes in sea ice extent between consecutive Septembers in the historical record. An ensemble is generated for this year by initialising the forecast using the mean observed sea ice extent value of the previous five years and adding each of the past observed differences from one year to the next. These ensemble members are then used to make a probabilistic estimate. This method is described further in:

E. B. Suckling and L. A. Smith, An evaluation of probabilistic decadal probability forecasts from state-of-the-art climate models, Journal of Climate, 26:23 (2013)

5. Projection uncertainty/probability estimate (only required if available with the method you are using)

Forecast percentiles and summary statistics below:

Pecentile	Sea ice extent
0.050000	3.63940
0.100000	3.74487
0.150000	3.87507
0.200000	4.04727

0.250000	4.24747
0.300000	4.33940
0.350000	4.41687
0.400000	4.49107
0.450000	4.57367
0.500000	4.67353
0.550000	4.76920
0.600000	4.85693
0.650000	4.94933
0.700000	5.05340
0.750000	5.15327
0.800000	5.25547
0.850000	5.38940
0.900000	5.47013
0.950000	5.75900

50th Percentile = 4.67353

Likely range (33-66%) = (4.38560 4.96893)

5th-95th Percentile = (3.63940 5.75900)

Ensemble Mean = 4.67782

Ensemble Median = 4.68600

6. Short explanation/assessment of basis for the uncertainty estimate in #5 (1-2 sentences)

The ensemble generated by the model is transformed into a probabilistic forecast distribution via kernel dressing, in which Gaussian kernels are centred on each ensemble member and summed over to produce the percentiles of the distribution. The parameters (mean and width) of the kernels are determined as the ones that maximise skill over a set of hindcast data under cross-validation.

7. * "Executive summary" about your Outlook contribution

1-3 sentences, to be used in Outlook summary: say in a few sentences what your Outlook contribution is and why. To the extent possible, use non-technical language.

A statistical model, known as Dynamic Climatology, is used to make the prediction for September sea ice extent in 2014. The prediction is initialised with the mean of the observed sea ice extent for September 2009-2013 and an ensemble prediction is created simply by adding all of the observed changes in the sea ice extent record from one September to the next over the historical period 1979-2013.

The ensemble members are then transformed into a probabilistic forecast distribution using the kernel dressing approach, in which the parameters of the kernels are determined based on the statistical skill over a set of hindcasts, under cross-validation.

Using this approach the mean (50th percentile) of the forecast distribution suggests a value for sea ice extent of 4.67 Million square Kilometers, with a 5-95th percentile range (3.64, 5.76) and 'likely range' (33-66%) of (4.38, 4.97).

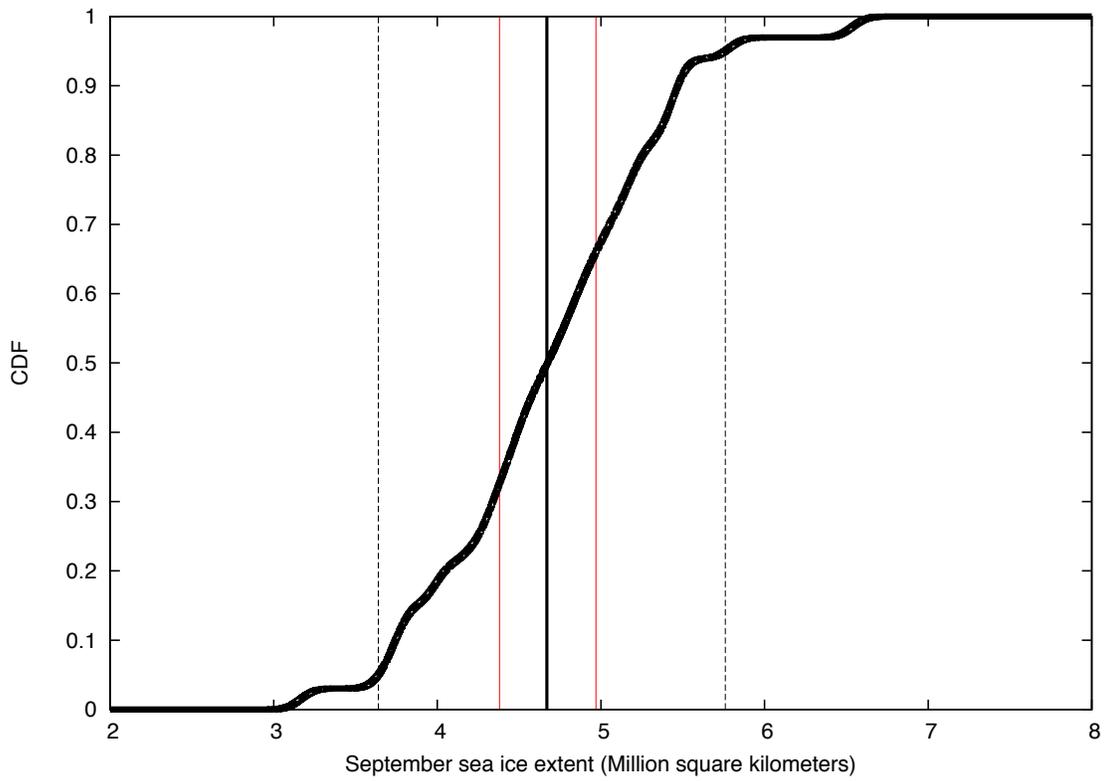


Figure 1: Probabilistic prediction CDF for September sea ice extent in 2014 using the Dynamic Climatology statistical model. The vertical bars show the 50th percentile of the distribution (black), 33-66% likely range (red) and 5-95th percentile (dashed lines).