Sea Ice Outlook for September 2014
June Report - NASA Global Modeling and Assimilation Office

Richard I. Cullather, Christian L. Keppenne, Jelena Marshak, Steven Pawson,
Siegfried D. Schubert, Max J. Suarez, Guillaume Vernieres, Bin Zhao

*Please note that these predictions are experimental and are produced for research purposes
only. Use of these forecasts for purposes other than research is not recommended.*

1. Contributor Name
   NASA Global Modeling and Assimilation Office

2. Type of Outlook projection
   Model

3. September monthly average projection (in million square kilometers)
   5.34 million km^2

4. Short explanation of Outlook method. If this is a model contribution, please include method of
initialization and variable used.
   The GMAO seasonal forecast is produced from coupled model integrations that are
   initialized every five days, with ten ensemble members generated by coupled model breeding
   and initialized on the date closest to the beginning of the month. The main components of the
   AOGCM are the GEOS-5 atmospheric model, the MOM4 ocean model, and CICE sea ice
   model. Seasonal forecasts are initialized with GEOS-iODAS, MERRA-Land, and MERRA
   atmospheric fields.

5. Projection uncertainty/probability estimate.
   0.44 million km^2

6. Short explanation/assessment of basis for uncertainty estimate.
   An uncertainty of 0.44 million km^2 denotes the ensemble standard deviation, which is
   larger than for the corresponding forecast for 2013. This does not account for other sources
   of uncertainty inherent in the forecasting system. September hindcasts initialized from this
   time explain 47 percent of the variance using this system, which indicates marginal skill.

To further assess uncertainty, a beta-version of the assimilation system and model has been integrated for comparison with the 11-April ensemble member. This system has performed a sensitivity experiment by assimilating ice thickness data from CryoSat-2 (http://nsidc.org/data/docs/daac/icebridge/evaluation_products/cryosat-2-sea-ice-frebrd-thick-snowdepth-quicklook-index.html). While notable changes in ice volume are apparent, the changes in ice extent are negligible for the September forecast period.

Forecast Sensitivity to Assimilation of CryoSat2 Ice Thickness
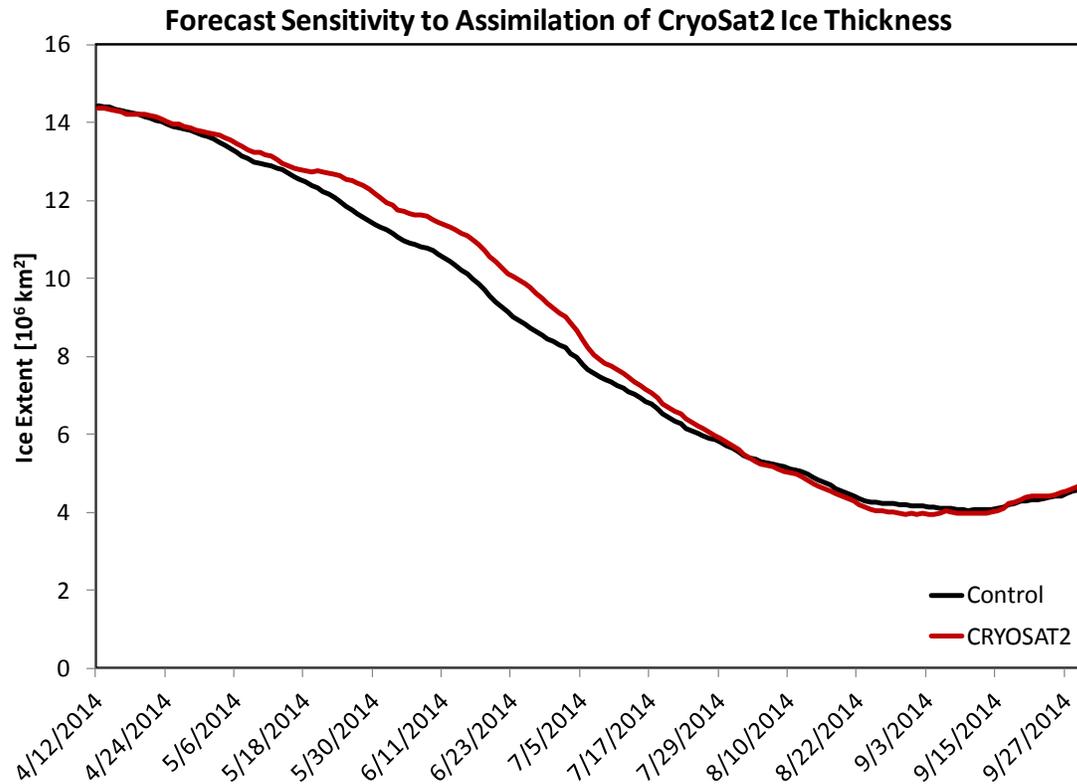
7. "Executive summary" about Outlook contribution

A projection of 5.34 ± 0.44 million km^2 is made from forecasts initialized from 11 April until 1 May. The forecast has been bias corrected to NSIDC Sea Ice Index values over the previous 15-year period. This projection is made in order to understand the relative skill of the forecasting system and to determine the effects of future improvements to the system.

Additional Items for Pan-Arctic Contributions

1. Spatial forecast/map for September mean ice extent.

The attached figure shows the uncorrected ensemble-mean forecast ice concentration for September 2014.
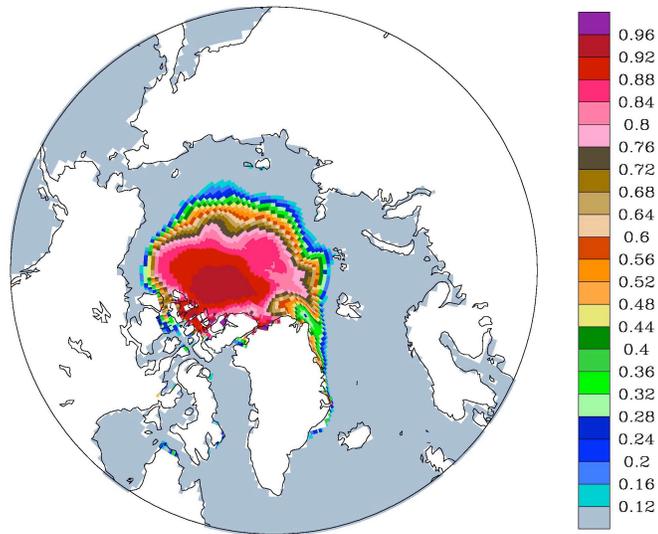
The projection suggests similar conditions to those of the previous year. The ensemble forecast (http://gmao.gsfc.nasa.gov/cgi-bin/products/climateforecasts/GEOS5/fore_anom.cgi?var1=may&var2=2014&var3=glb&var4=h500&var5=sea&var6=May) indicates an absence of significant atmospheric circulation anomalies for the Beaufort Sea and the Canadian Archipelago for the summer period.
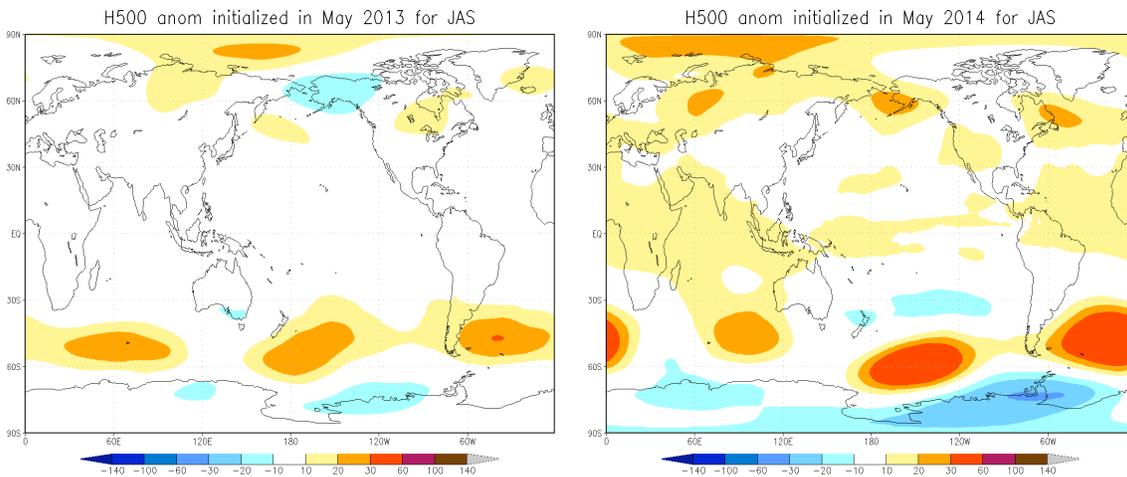
2. Hindcast validation statistics for a set period.

Hindcasts have been run for the previous 30 years, but issues with earlier integrations indicate degraded skill prior to 1999. Forecasts for the period 1999-2013 are correlated with NSIDC values at a value of $r = 0.69$.

3. Estimate for the week that the minimum daily extent will occur.

Nine of the 14 ensemble members indicate the week of 7-September.

0.96
0.92
0.88
0.84
0.8
0.76
0.72
0.68
0.64
0.6
0.56
0.52
0.48
0.44
0.4
0.36
0.32
0.28
0.24
0.2
0.16
0.12