

Sea Ice Outlook for September 2016  
June Report - NASA Global Modeling and Assimilation Office

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*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. Name of contributor.

NASA Global Modeling and Assimilation Office

2. Contributions submitted by a person or group not affiliated with a research organization, please self-identify here: N/A

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Yes, use this contribution for all of the 2016 SIO reports (this contribution will be superseded if you submit a later one).

4. Executive summary.

The GMAO seasonal forecasting system predicts a September average Arctic ice extent of  $5.23 \pm 0.30$  million  $\text{km}^2$ , about 13 percent greater than the 2015 value. While the initial ice cover is remarkably low in the Barents and Kara seas, the forecast suggests limited reductions in ice extent on the Pacific side of the Arctic as compared with recent years. This is the final year of sea ice forecasts with the current system, a new GMAO seasonal forecasting system will be in place next year.

5. Type of Outlook projection.

Dynamical model

6. Dataset of initial Sea Ice Concentration (SIC) used (include name and date; e.g., "NASA Team, May 2016"):

Assimilated NASA Team for May 2016.

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

N/A (model-derived)

8. If you use a dynamical model, please specify:

a) Model name:

Goddard Earth Observing System model 5 (GEOS-5)

b) Information about components:

Atmosphere: GEOS-5 AGCM initialized with MERRA-2 and GMAO forward processing NWP analysis

Ocean: MOM4 initialized with GMAO Ocean Data Assimilation System (EnOI)  
Ice: CICE4 (EnOI)

9. Prediction of September pan-Arctic extent as monthly average in million square kilometers.  
5.23±0.30 million km<sup>2</sup>

10. Prediction of the week that the minimum daily extent will occur  
week of 4 September

11. Short explanation of Outlook method.

The GMAO seasonal forecast is produced from coupled model integrations that are initialized every five days, with ten additional 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 and MERRA-2 atmospheric fields.

12. If available from your method for pan-Arctic extent prediction, please provide:

a) Uncertainty

0.30 million km<sup>2</sup>

b) Brief explanation/assessment of basis for the uncertainty estimate

The given uncertainty is the standard deviation of the 11 member ensemble.

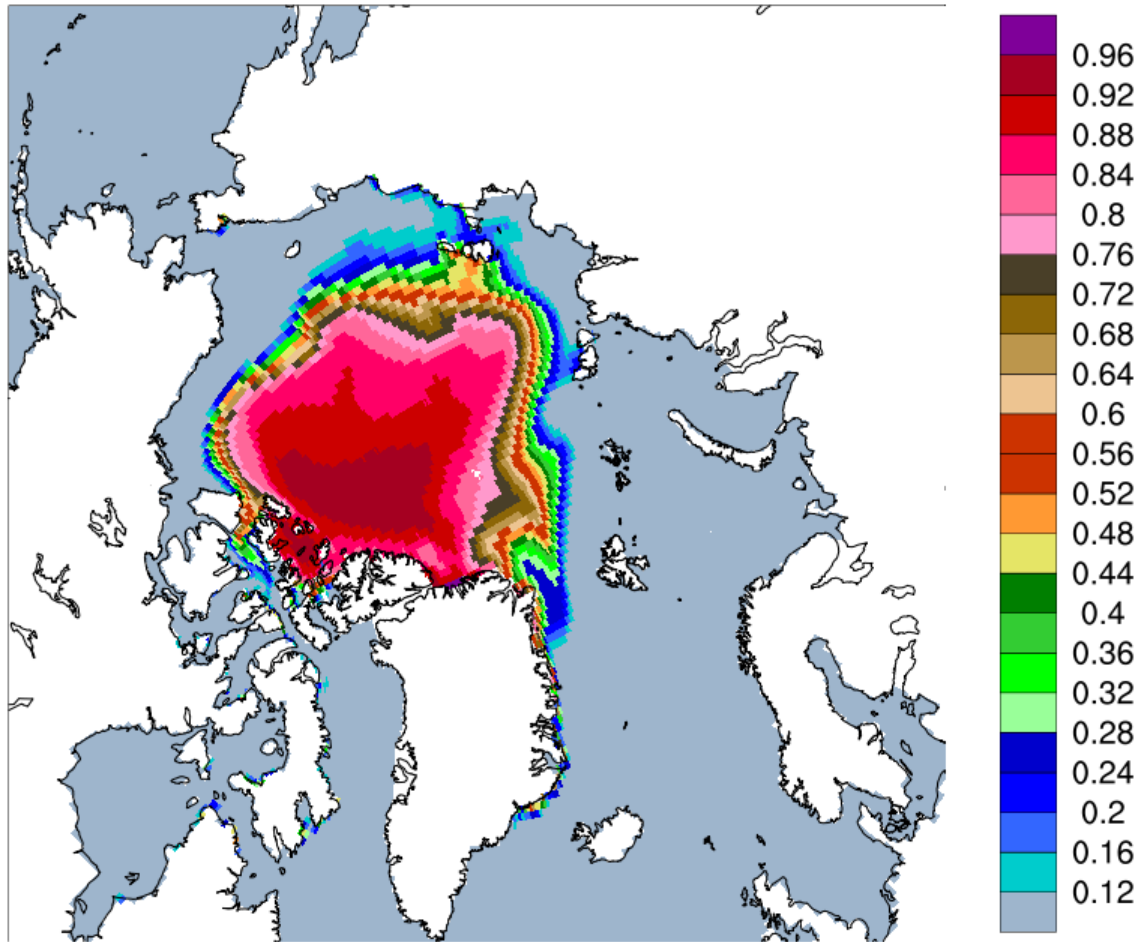


Figure 1. Ensemble-averaged sea ice concentration forecast for September 2016.

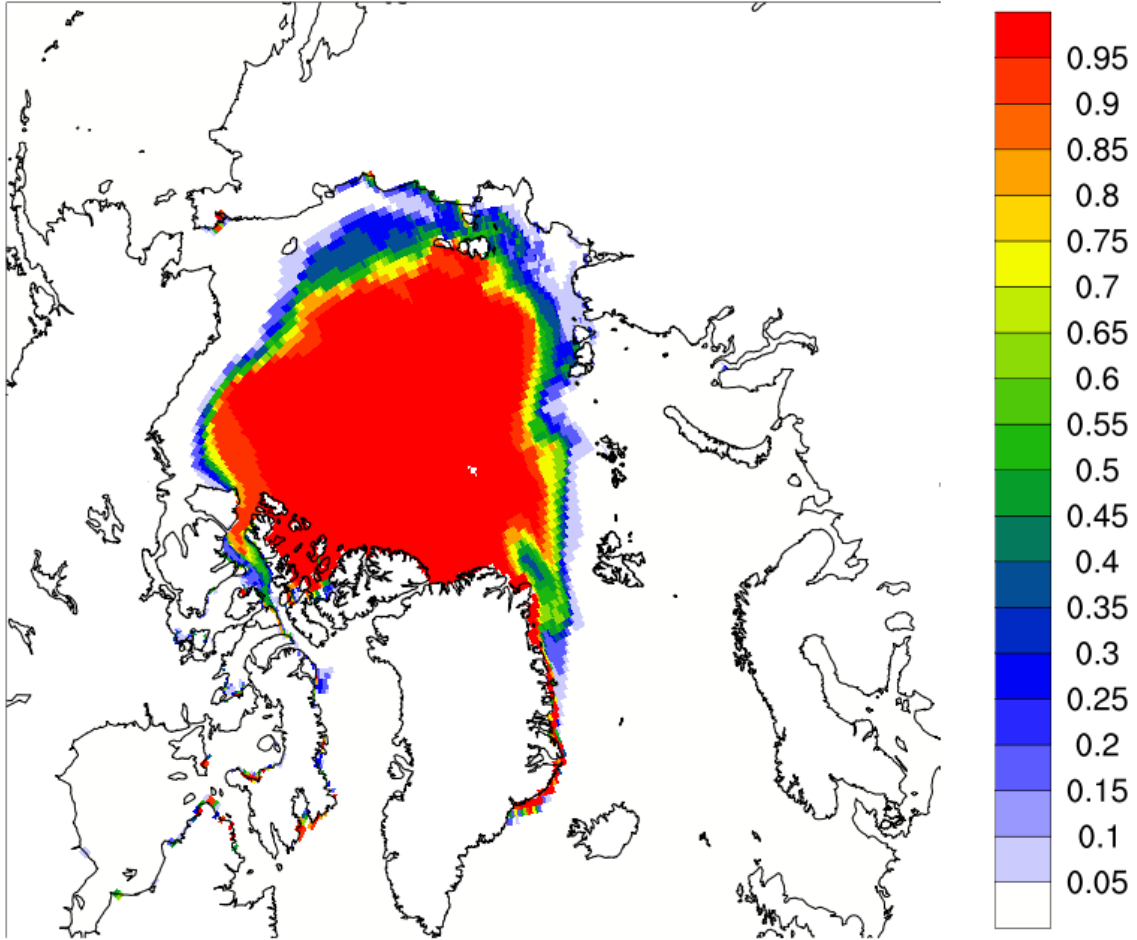


Figure 2. Ensemble probability of sea ice extent for September 2016.

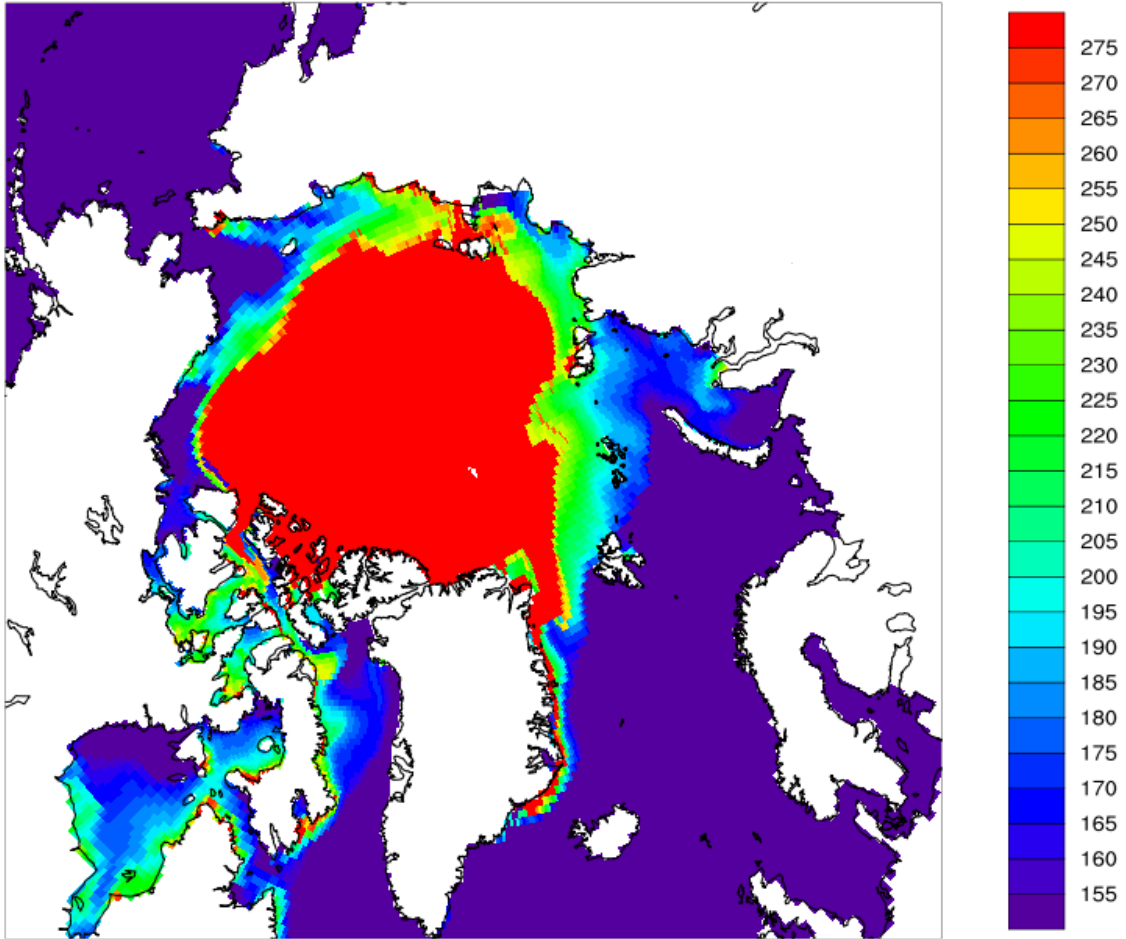


Figure 3. Ensemble-average ice-free day.