

SIO 2011: June Outlook for September Arctic Sea Ice Extent Minimum

Todd Arbetter¹, Sean Helfrich, Pablo Clemente-Colón, Chris Szorc
North American Ice Service/National Ice Center
Suitland, Maryland

¹UCAR Visiting Scientist

Projected Minimum Extent: 4.372 million km² on September 20, 2011

Method: Statistical Forecast Model (NIC Arctic Regional Ice Forecast System)

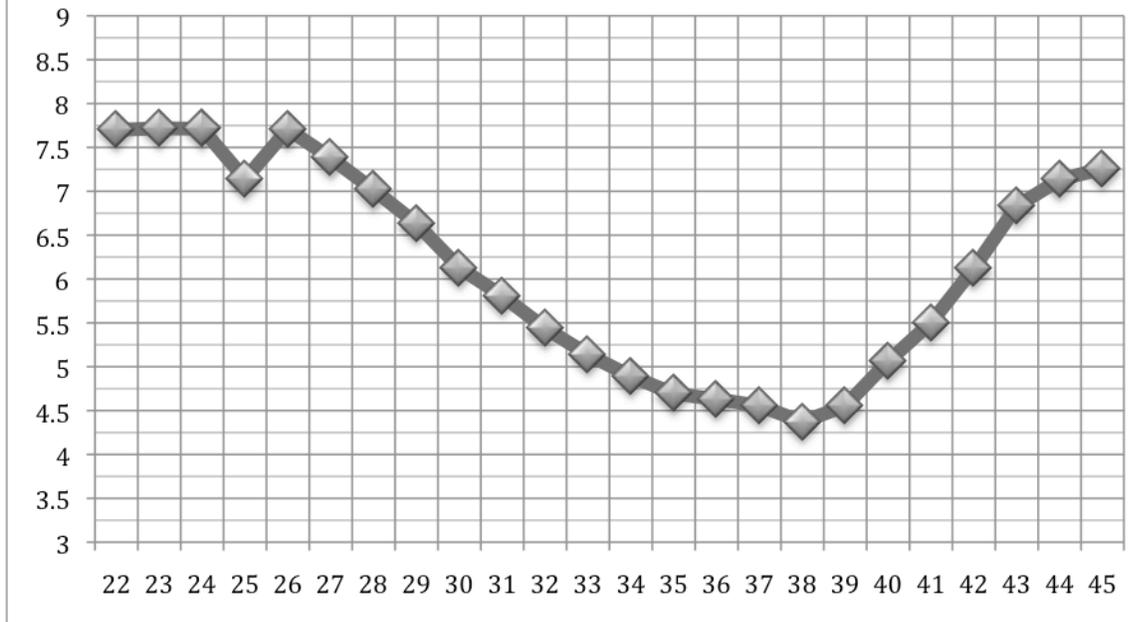
Rationale: There are no model physics, but the system determines the relationships between sea ice and atmospheric conditions over the past ten years to determine the likelihood of ice being present this year. The model uses SSM/I sea ice concentration, NCEP 2m Air Temperature, and NCEP Sea Level Pressure, and correlates each point with every other point in the domain, in a brute force multiple linear regression. Because of this, each point is constrained to be somewhere between the maximum and minimum observed value at that location in the past 10 years. Because of constraints in the resolution of the model, the Canadian Archipelago is not modeled. The model projects weekly conditions, consistent with NIC's production of weekly ice charts.

Executive Summary: The pattern of near-record low sea ice extent seen in recent years will continue, based on statistical correlations of sea ice and atmospheric conditions. Ice extent will decrease from 7.7 million km² at the beginning of June to 4.7 million km² at the end of August, with most of the loss happening in July and August. An additional 300 thousand km² will be lost in September before the autumnal refreezing process begins and the ice extent begins to increase.

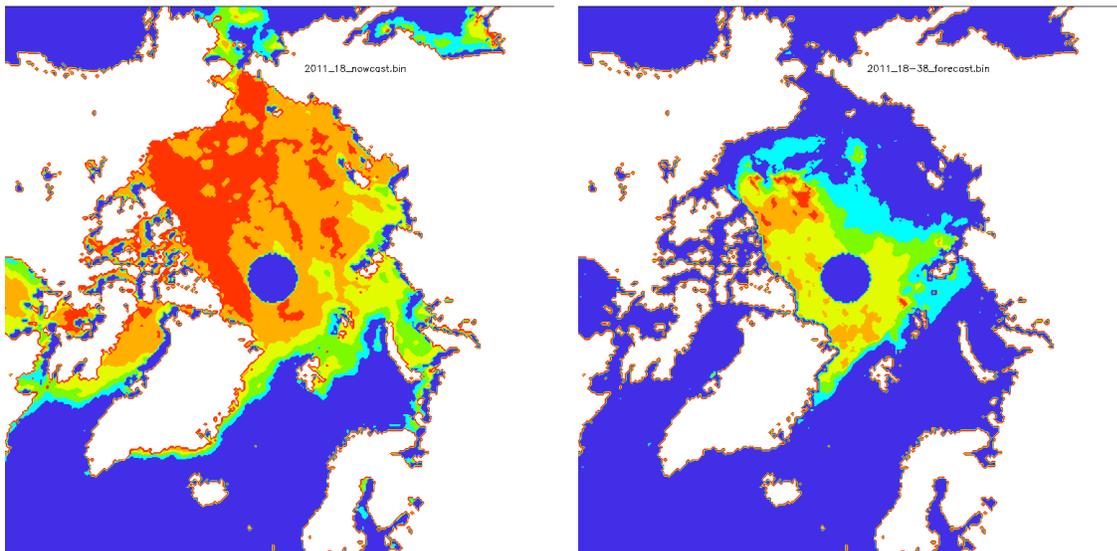
Estimate of Forecast Skill: The model has been in use for one year. It performed well in 2010, with monthly forecasts converging to 4.53 million km² (actual value: 4.60 million km²) and a spatial pattern that was consistent over the three outlooks and resembled the actual ice extent, except the NIC version was rotated clockwise. One key impact was that while NIC projected M'Clure Strait to be iced in, it was in fact open. Hence the north channel of the Northwest Passage was projected to be closed by NIC, but in fact was navigable.

While ice age is not included in the projections, it is contained in the egg code used in the ice charts. We do not yet believe the ice concentration will be as low as indicated here, but believe that the ice extent, as defined by the 1/10 contour, is reasonable. This year's Arctic ice contains more second-year and third-year ice than 2008. Aged ice is less prone to melt as firstyear ice. However, the overall thinness of the pack makes it prone to melt if the temperatures are unusually warm. Also, should the pack become diffuse, lateral melting will increase and low ice area values could become prevalent in the marginal ice zone.

Projected 2011 Arctic Ice Extent By Week



Projected sea ice extent by week, in millions of square kilometers.



Sea ice extent and concentration for 4/30/2011 – 5/6/2011 (left) and projected conditions for 9/17/2011 – 9/23/2011 (right). The blue area in the center (surrounding the North Pole) is the SSM/I blind spot; no projections are done for this region.



WMO Sea Ice Color codes for Ice Concentration.

(CAVEAT: This is not a forecast and should not be interpreted as rules for navigation. Only ice-capable ships with experienced ice pilots should attempt navigation in the Arctic.)