July Outlook for 2010 September Arctic Sea Ice Extent Minimum

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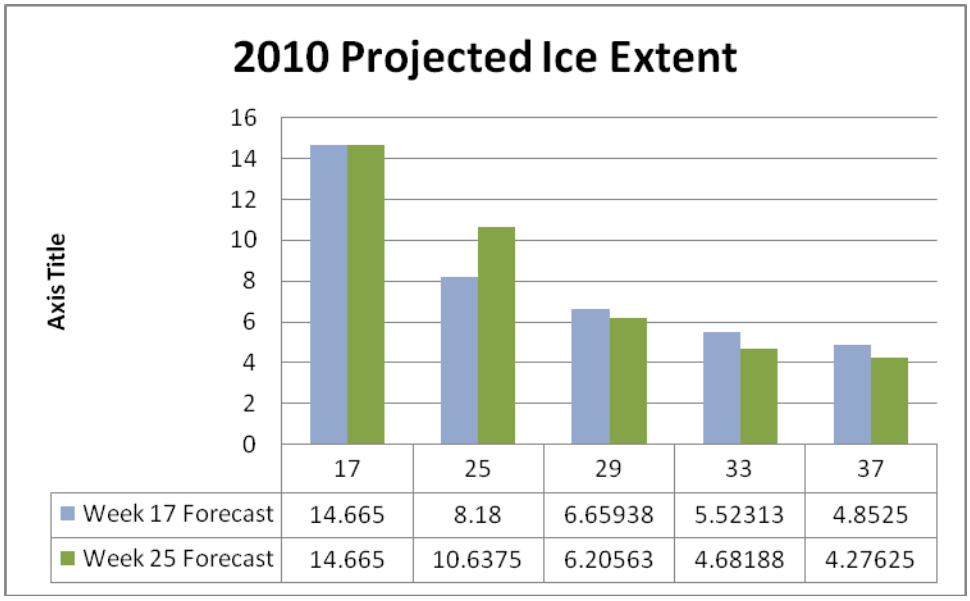
As in the June 1 Outlook, we used the most recent data available to produce a full forecast for the remainder of the summer. In this case we use week 25 data, 8 weeks later than previous forecast. As in previous forecasts, we use NASA Team sea ice concentration, NCEP 2-meter air temperature, and NCEP Sea Level Pressure as predictors, and ice extent/concentration as the predictand. We find that the new projected summer minimum ice extent is significantly lower, at 4.27 million km2 (compared to 4.85 million km2), and lower values are predicted for weeks 29 and 33 as well (figure 1). Curiously, the week 17 ARIFS run predicted a lower value for both ice extent and ice area for week 25 than was actually observed, but the week 25 run predicts lower values for all further weeks in the summer than the week 17 values. The low predicted value in week 25 could be due in part to the lack of prediction capability for the Canadian Arctic Archipelago (CAA): we held the model capabilities constant to be able to directly compare its predictive ability, but there will be a low bias for prediction versus actual because the missing area in the CAA is not accounted for.



	17	25	29	33	37
Week 17 Forecast	14.665	8.18	6.65938	5.52313	4.8525
Week 25 Forecast	14.665	10.6375	6.20563	4.68188	4.27625

Figure 1: Projected Arctic Sea Ice Extent over summer 2010, based on Week 17 conditions (blue) and week 25 conditions (green). While the observed value for week 25 is higher than predicted in week 17, future summer conditions are projected to be lower using week 25 conditions than they are with week 17 conditions.

Figure 2 compares predicted and observed conditions for week 25 and shows that there are noticeable differences in the ice conditions beyond the missing CAA forecast; in reality, there is a larger open water area is evident in the Laptev Sea. Meanwhile, some ice is beginning to retreat from the eastern Beaufort Sea while the forecast shows light ice (1-3/10) all the way to the shore. Differences in mid-September conditions are provided in Figure 4.

While we have the benefit of hindsight to assist with evaluating ARIFS for the summer season, it is our goal to implement this system operationally for the use of the Navy, Coast Guard, and our partners in the North American Ice Service (Canadian Ice Services, USCG International Ice Patrol).

The simple linear regression model (Helfrich and Arbetter Regression Model, or HARM) performed in the first outlook was not updated in time for this outlook, but will be done in time for the next update.

(CAVEAT: This is not an official National Ice Center forecast and should not be interpreted as advice for navigation. Only ice-capable ships with experienced ice pilots should attempt navigation in the Arctic, and should consult with local authorities for current ice conditions and navigational restrictions.)

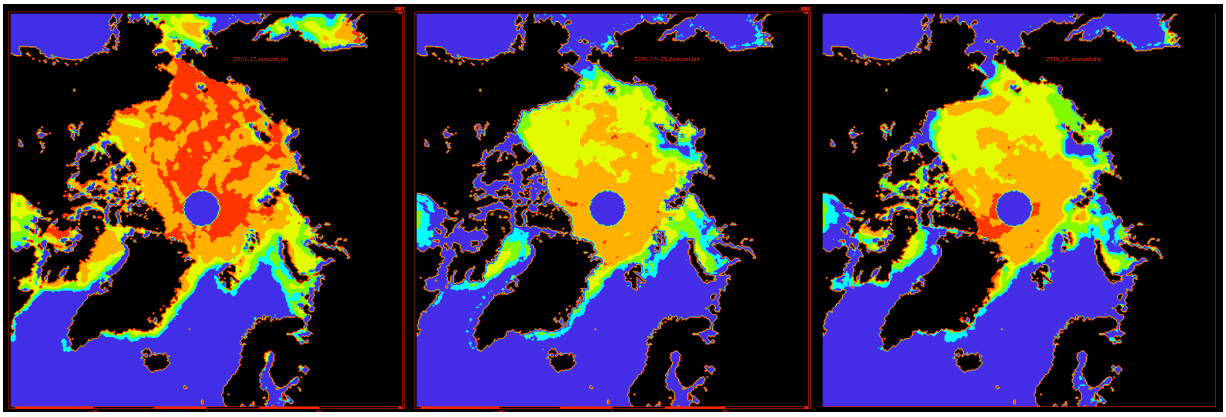


Figure 2: Sea ice extent and concentration for 2010, end of April conditions (left), projected conditions for 2010, mid-July conditions (right), and actual mid-July conditions (right). The blue area in the center (surrounding the North Pole) is the SSM/I blind spot; no projections are done for this region. WMO color codes are given in Figure 3.

Figure 3: WMO Sea Ice Color codes for Ice Concentration.

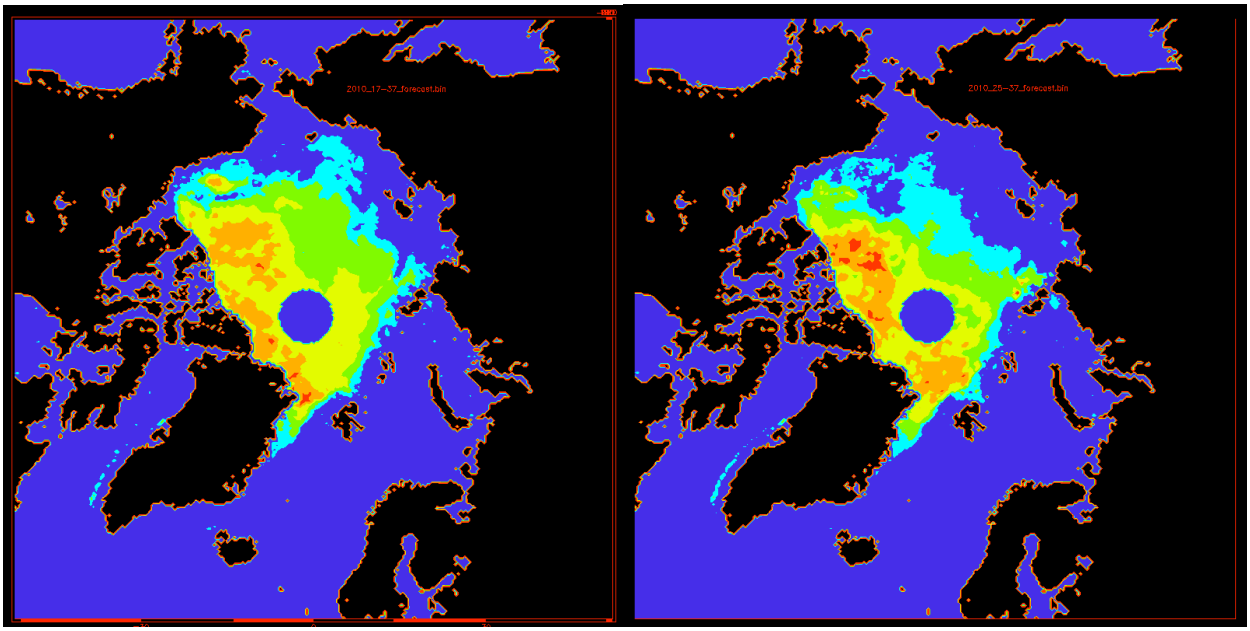


Figure 4: Mid-September Arctic ice extent, as projected from mid-April conditions (left) and mid-July conditions (right). While both projections show large retreat in the Siberian and Laptev Seas, the mid-July projections suggest the 15% ice edge will be further back and ice retreat in the Beaufort Sea will be more severe. The Nothern Sea Route is likely to be navigable, but the model does not predict sea ice conditions in the Canadian Archipelago, so no direct conclusions can be drawn about the Northwest passage.

References

Drobot, S. D., J. A. Maslanik, and M. R. Anderson, 2008: Interannual variations in the opening date of the Prudhoe Bay shipping season: links to atmospheric and surface conditions. *International Journal of Climatology*, **29** (2), 197-203.