L. Hamilton August 16, 2010

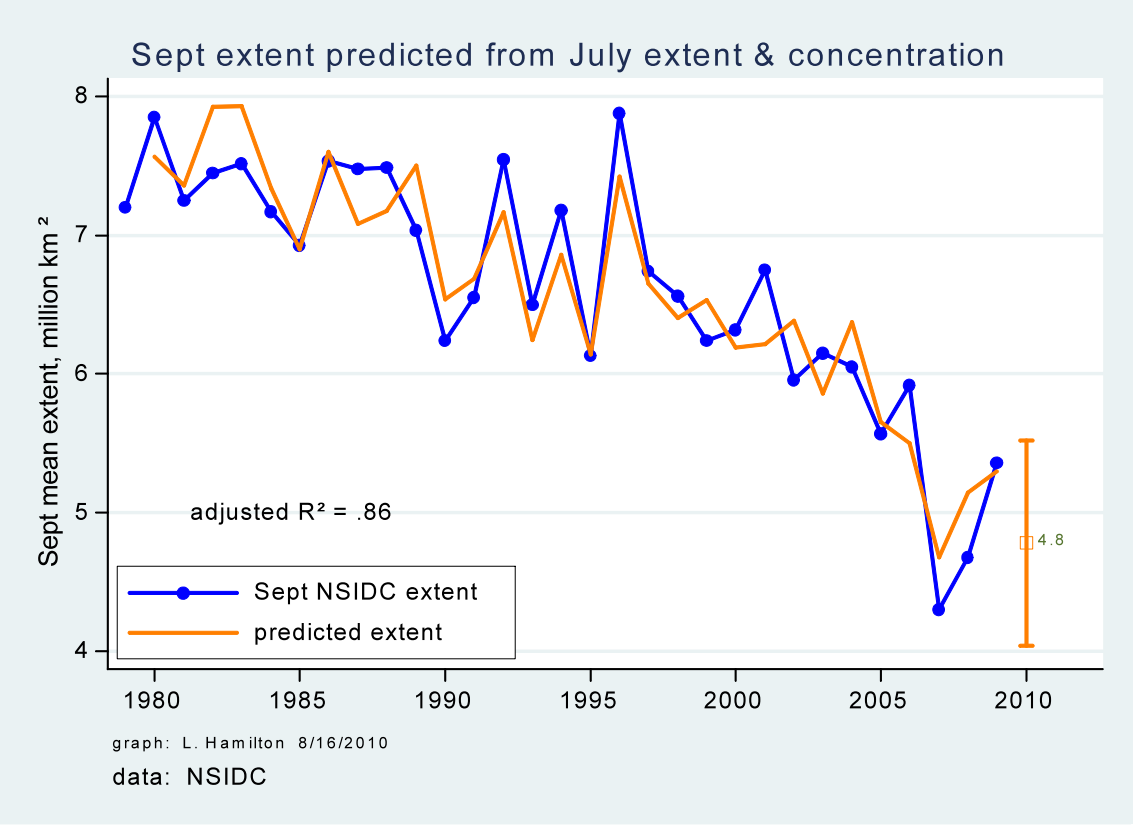
PAN-ARCTIC OUTLOOK — Hamilton

1. Extent Projection

Multiple regression analysis suggests a mean September 2010 ice extent of 4.8 million km^2 (NSIDC). The confidence interval for this forecast is 4.0 to 5.5 million km^2.

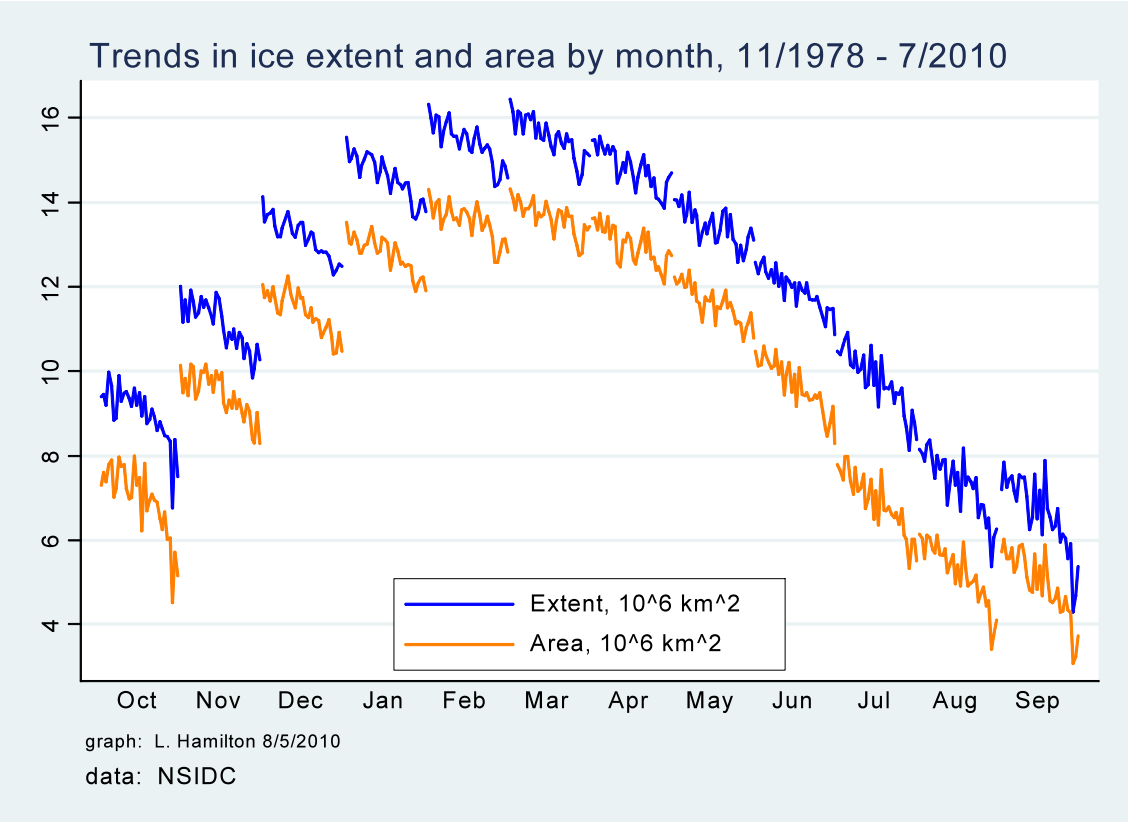
2. Methods / Techniques

The naive model used here is purely statistical. It predicts September mean extent from July extent, July concentration, and the previous year's September extent. Estimation data are the NSIDC monthly mean extent and area reports from November 1979 through July 2010.

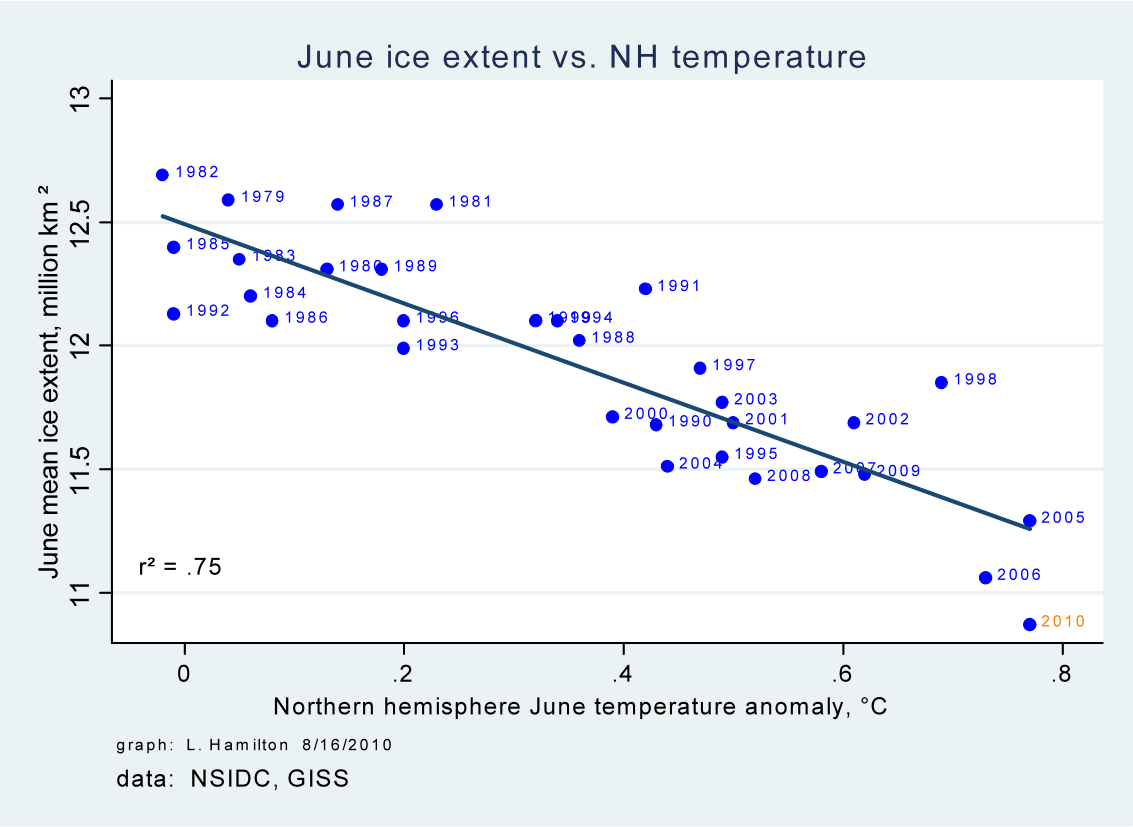


3. Rationale

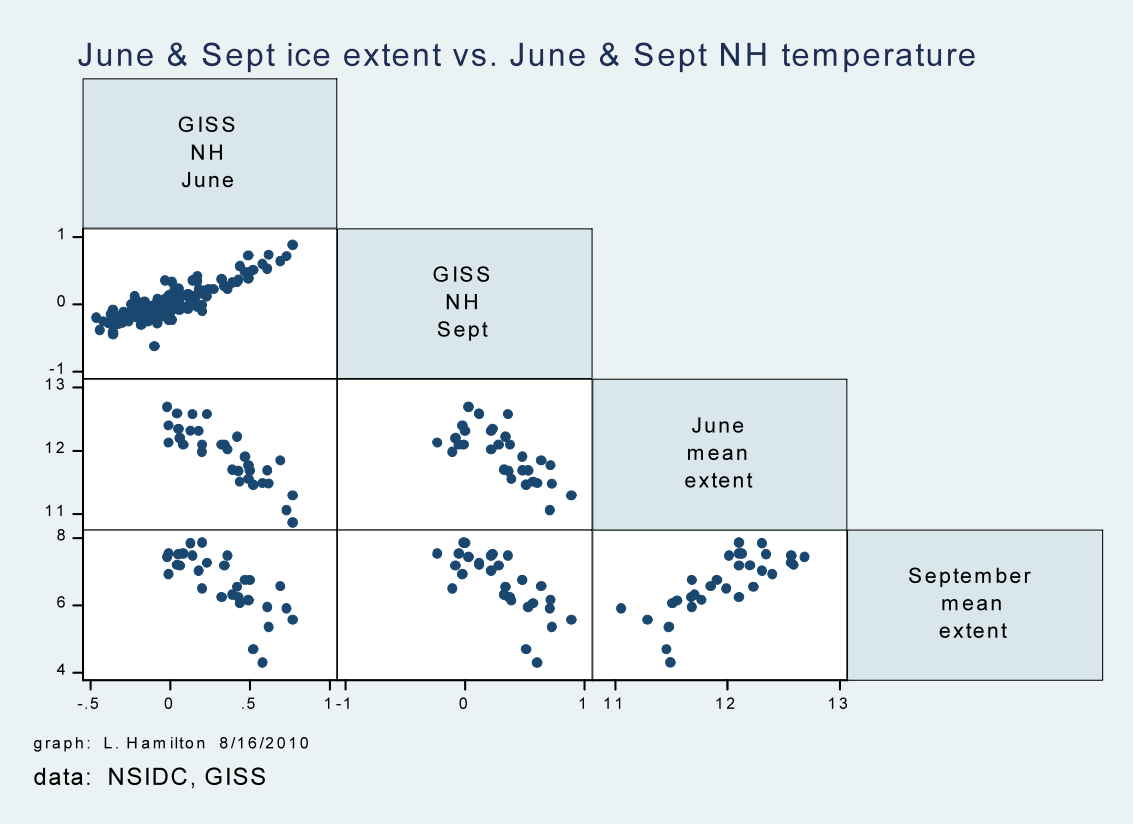
A cycle plot of monthly ice area and extent data, 1979–2010, highlights the strong pattern of decline in both area and extent, within each month of the year.



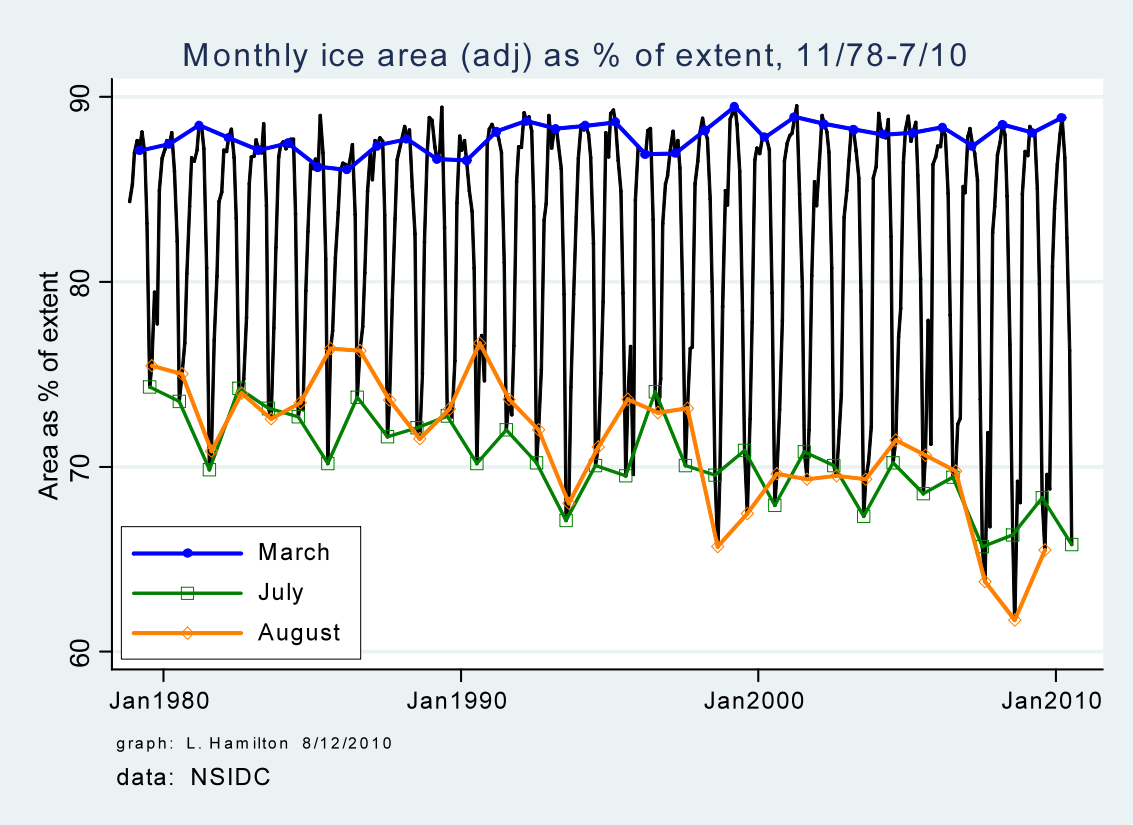
The cycle plot's monthly trends appear most uniform for June, which also turns out to be the month in which Arctic ice extent and area are most predictable from general Northern Hemisphere temperature.



September ice extent and area show more erratic variations than June, perhaps reflecting a relatively larger contribution from winds.



Concentration, here defined as mean area/mean extent, follows annual cycles with peaks just under 90% each March. Although maximum concentration has no apparent trend, the minimum concentration has been decreasing. The minimums occur in July or, more often in the last few years, in August. July 2010 concentration was the lowest ever for July, and this measure (along with July area, and previous September area) proves to be a significant predictor in our regression model.

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. regress ext9 ext7  conc7 L1.ext9

      Source |       SS       df       MS              Number of obs =      30
-------------+------------------------------           F(  3,    26) =   58.88
       Model |  20.1110446     3  6.70368154            Prob > F      =  0.0000
    Residual |   2.9601701    26  .113852696           R-squared     =  0.8717
-------------+------------------------------           Adj R-squared =  0.8569
       Total |  23.0712147    29  .795559128           Root MSE      =  .33742

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        ext9 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        ext7 |    .715886   .1529556     4.68   0.000     .4014813    1.030291
       conc7 |    .133224   .0407675     3.27   0.003     .0494251    .2170228
     L1.ext9 |   .1763631   .0919588     1.92   0.066    -.0126609     .365387
       _cons |  -10.93657   2.090988    -5.23   0.000    -15.23465   -6.638481
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4. Executive Summary

September ice extent 1980–2009 has been reasonably well predicted (86% of variance explained) by July ice extent, July ice concentration, and September extent from the previous year. Additional predictors such as other months or temperature measures do not significantly improve the fit. There is no residual autocorrelation.

This naive statistical model yields a predicted mean September extent of 4.8 (or 4.0 to 5.5) million km^2.

June ice extent appears more predictable than September, a pattern that deserves further study.