**2015 Sea Ice Outlook**
July Report

*** Contributor :

Rob Dekker, individual

*** Type of Outlook :

Statistical model, using mainly NH snow cover as input variable.

*** September 2015 monthly average projection :

Pan Arctic Ice EXTENT : 4.6 million km^2 (with 370 k km^2 standard deviation on the prediction)

*** Short explanation of outlook method :

The basic concept behind my method pertains to estimating albedo-based Arctic amplification during the melting season.

I use the "whiteness" of the Arctic in June as a predictor for how much ice will melt out between June and September.

Specifically, I set up a formula which reflects how "dark" areas near the Arctic in June would create heat that will melt out ice over the months until the September minimum.

As an educated guess, such a formula could take the following form :

Melt_formula = 0.25 * Snow - 1.0 * (Extent - Area) + 0.5 * Area

With factors explained like this :

For (Extent - Area): 1.0 (assuming that ALL solar radiation onto melting ice and into polynia will cause ice to melt later in the season.

For (Area): 0.5 (assuming that half of the heat absorbed in the ocean OUTSIDE of the main pack will cause ice melt (while the other half would cause the ocean to warm up.

For (snow cover): 0.25 (assuming that half the heat from lack of snow cover will be blown North, and half of that will go to ice melt.

Then I set up a regression equation for how much ice will melt out between June and September :

september_extent - june_area = alpha + beta * (Melt_Formula) ;

When I tweek the factors, to obtain the best fit over the 1995-2012 range, the 'Melt_Formula' that obtains the best correlation (R=0.93) is this one (centered to (extent - area):

Melt_Formula = 0.434*snowcover - 1.0*(extent - area) + 0.65*area

Which is remarkably close to the "educated guess" factors explained above. This suggests that this formula is realistic, and the effect is physically real.

Using this formula, for the period 1992 - 2013, I obtain R=0.93, beta = 0.5588, and a prediction for Sept 2015 ice extent of 4.61 million km^2 with a standard deviation of 370 k km^2.

The "beta" of 0.5588 means that for every km^2 of polynia/melting ponds in June, an extra 0.558 km^2 of sea ice will melt out between June and September.

And the 0.434 factor on snow cover with that beta means that for every 1 km^2 snow cover loss in June, some 0.242 km^2 of sea ice will melt out by September.

The interesting issue is that the standard deviation (at 370 k km^2) is significantly better than the 500 k km^2 or so that would be achieved for a simple linear trend. This means that the June "whiteness" signal is apparent in the September sea ice minimum, and serves well as a predictor.

As for past performance, here are the results for what this method would have predicted for the past couple of years :

.....

2006: predict 5.34, final 5.91, delta 0.57

2007:predict 4.79, final 4.29, delta -0.50

2008: predict 5.01, final 4.72, delta -0.29

2009: predict 5.66, final 5.38, delta -0.28

2010: predict 4.39, final 4.92, delta 0.53

2011: predict 4.60, final 4.61, delta 0.01

2012: predict 3.71, final 3.62, delta -0.09

# -2013: predict 4.89, final 5.35, delta 0.46

# -2014: predict 4.93, final 5.28, delta 0.35

# -2015: predict 4.61, final ????

Note that the years tagged with a # are NOT part of the 1992-2012 regression learning period.

This suggests that the "whiteness" of the Arctic in June, as expressed in the regression formula, using snow cover and (extent-area) as well as June "area" itself, explains a large part of the increase in September ice extent during the 2013 and 2014 season w.r.t. 2012 and other years.

*** Executive Summary :

The basic concept behind my method pertains to estimating albedo-based Arctic amplification during the melting season.

I use the "whiteness" of the Arctic in June as a predictor for how much ice will melt out between June and September.

Specifically, I use a formula based on physics of energy absorption, using snow cover, and June ice extent/area numbers. The interesting result is that not only the standard deviation (at 370 k km^2) is significantly better than the 500 k km^2 or so that would be achieved for a simple linear trend, but also this method explains a large part of the increase in September ice extent during the 2013 and 2014 season w.r.t. 2012 and other years.

For 2015, this method predicts that there will NOT be a repeat of the 2013 and 2014 5 million+ extent, but instead ice extent in September will be 4.6 million km^2 (+/- 370 k km^2).