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Extent Projection: 4.2 +/- 0.2

Methods/Techniques

Estimates are based on multiple regression of a wide variety of publicly available monthly arctic data. The data includes:

- sea ice extent and area (from NSIDC)
- various arctic climate data (NCEP/NCAR Reanalysis)
- various climate indices (NAO, AO, AMO, PDO)
- PIOMAS volume (from Polar Science Center @ University of Washington)

For this August Report, predictions are based solely on past area, extent and volume. Other data sets were skipped this month - partly because these three are the best individual predictors and due to lack of time to explore the other data sets.

Simple quadratic fits for the September extent, E_0 , based on July data (E_{-2} , A_{-2} and V_{-2}) give

$$E_0 = -19.76 + 4.279 (E_{-2}) - 0.161 (E_{-2})^2 = 4.03$$

$$E_0 = -12.405 + 4.643 (A_{-2}) - 0.2639 (A_{-2})^2 = 4.19$$

$$E_0 = 1.823 + 0.2612 (V_{-2}) - 0.000162 (V_{-2})^2 = 4.13$$

The regression fits based on extent and area are considerably smaller than last month, while the prediction based on volume is quite similar.

Instead of the quadratic fit, we can select best subsets of data up to 18 months prior to September. The predictions based on extent, area, and volume are, respectively, 4.09, 4.70, and 4.29.

Details are presented at <https://sites.google.com/site/sciencstatsandstuff/sea-ice>

Rationale

It is only logical that there would be a strong statistical correlation between past conditions and future conditions. Several individual predictors from June or earlier provide correlations from $r^2 = 0.4$ up to $r^2 = 0.7$. Various multiple regression fits can push the correlations up over $r^2 = 0.85$. (Of course, care must be taken not to over-fit the data, since there are well over 100 potential sets of data that are analyzed).

Executive Summary

Various single and multiple regression results with $r^2 > 0.6$ suggest that the September extent will be close to, or perhaps below, the minimum value set in 2007.

Estimate of Forecast Skill (if available)

Each regression analysis will, naturally provide a different prediction. By taking an aggregate of the various estimates for September Extent, a general range can be determined. The best fits tended to

predict values from 4.1 to 4.3, with one data point at 4.7, so 4.2 ± 0.2 was chosen. This is the same as my prediction from last month.