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PAN-ARCTIC OUTLOOK C ASI Blog

1. Extent Projection

In June through early July, participants in the Arctic Sea Ice blog posted 82 individual predictions for the mean NSIDC September Arctic sea ice extent. The median value of these 82 predictions was **3.2 million km^2**, with an interquartile range (approximately the middle 50% of predictions) from 2.7 to 3.9 million km^2.

2. Methods / Techniques

In June 2013, participants in the Arctic Sea Ice blog were invited to post their individual predictions of mean September Arctic sea ice extent, to be summarized as a single crowd-sourced contribution to the SEARCH Sea Ice Outlook (SIO) in July:

*The next SIO deadline is early July. You are all invited to submit, as comments to this post, your best guess for the mean September extent of Arctic sea ice (NSIDC). **Your numerical prediction should be in the first line of the comment**, followed by at least a sentence or two explaining the basis for your prediction — whether pure intuition, elaborate calculations, whatever you've got. Predictions are not bound by what you did or did not guess last month. As before, general discussion is welcome too.*

Results from this crowd-source experiment will be research data in their own right. Individuals can submit their own predictions directly to SEARCH, of course. The analysis here will focus on collective skill and uncertainty rather than individual. I will summarize the results after each cycle, possibly forming the basis for a research paper as well as future blog posts. The whole process should be completely transparent, because the raw data — predictions submitted here as comments — remain public and accessible to anyone.

By July 5 there had been more than 200 reader comments in response to this post. Among these comments we counted 82 individual predictions, posted along with diverse rationales, evidence and lively discussion. The format placed no restrictions on numerical values, and all comments are public for anyone to study.

The 82 predictions ranged from 0 to 5.6 million km^2, with a median of 3.2 and an interquartile range (approximately the middle 50%) from 2.7 to 3.9. Medians and quartiles are used as basic summaries here because they offer high resistance to outliers, are easy for anyone to replicate, and support more detailed analysis through graphics or quantile regression.

The distribution of July estimates is visualized below as a stem-and-leaf display (all analysis done using Stata):

```
 . stem asi_blog if cycle==7, lines(2) digits(1) round(.1)
```

```
Stem-and-leaf plot for asi_blog
(Predicted September mean sea ice extent, million km^2)

asi_blog rounded to nearest multiple of .1
plot in units of .1

   0* | 03
   0. | 89
   1* | 1
   1. | 7888
   2* | 0002233
   2. | 555678888888889999
   3* | 000001222333334
   3. | 5566888888889
   4* | 0011233333444
   4. | 55557
   5* | 0
   5. | 6
```

A complete set of summary statistics is below. The mild negative skew (−.57) is reflected in a mean (3.15) slightly lower than the median (3.2). Kurtosis of 3.52 indicates that this distribution has somewhat heavier-than-Gaussian (that is, more outlier-prone) tails. The observed outliers (values more than 1.5IQR beyond the first or third quartile) are all low values — three predictions less than 1 million km^2.

. **summarize** *asi_blog* **if** *cycle*==7, **detail**

```
         Predicted September mean sea ice extent, million
                            km^2
-------------------------------------------------------------
        Percentiles       Smallest
  1%           0               0
  5%          1.1             .3
 10%          1.8             .75        Obs                    82
 25%          2.7             .95        Sum of Wgt.            82

 50%          3.2                        Mean            3.154268
                            Largest      Std. Dev.       1.056696
 75%          3.9             4.5
 90%          4.4             4.69       Variance        1.116607
 95%          4.5             5          Skewness       -.5696431
 99%          5.6             5.6        Kurtosis        3.523403
```

3. Rationale

Participants in the Arctic Sea Ice blog are mainly non-scientists, or non-Arctic specialists, who nonetheless show a keen interest in scientific research on this topic. Their interest includes well-informed but diverse speculation about future sea ice extent. With many individual predictions some are bound to be near the final value of September ice extent, but interest here will focus on collective prediction and *change in the distributions* of estimates — how they compare with other predictions, and how different methods behave as they assimilate new information over the course of the melt season.

Our analysis will employ graphs and robust statistical methods that have good resistance to outliers, and do not assume Gaussian distributions. Data collection and analysis should be transparent and open to discussion at each step.

4. Estimate of Forecast Skill

The forecast skill of this crowd-sourcing approach is unknown. In October, we will examine how the distribution of ASI blog predictions shifted as new information became available over the course of the summer. The analysis will include comparison with other SEARCH SIO predictions, and with the observed September ice extent.