<p style="text-align:center">**SEA ICE OUTLOOK**
2016 Report</p>

1. ***Name of Contributor**:
Nico Sun

2. *** Contributions submitted by a person or group not affiliated with a research organization:**
Mainly solo effort. Documentation and some discussions about the model are posted on the Arctic Sea Ice Forum: http://forum.arctic-sea-ice.net/index.php/topic,1575.0.html

3. * **Do you want your contribution to be included in subsequent reports in the 2016 season?**
No, I plan to submit separate contributions for subsequent reports.

4. *"**Executive summary**":
The forecast model is based on my own global surface radiation model and uses arctic sea ice albedo and land albedo to calculate daily sea ice area and volume losses. The albedo values are obtained from extent/area ratios and northern hemisphere snow cover. The average error for the 2007-2015 period is 4.9% or 0.154 million km^2 for daily minimum sea ice area. The final average September extent value is calculated by average ratios of past years.

5. ***Type of Outlook method**:
Mixed: The feedback system between sea ice area, extent, volume and energy absorption are a dynamic model. The prediction of extent to area ratios for the remaining 2016 melting season is purely statistical.

6. ***Dataset of initial Sea Ice Concentration (SIC):**
NSIDC extent and area values were calculated by Wipneus
Wipneus data: https://sites.google.com/site/arctischepinguin/home/sea-ice-extent-area/data

NSIDC extent: 20. March – 3. July
NSIDC area: 20. March – 3. July

Rutgers Snow Lab: 20. March – 3. July, weekly snow cover was linear interpolated for daily calculations

7. **Dataset of initial Sea Ice Thickness (SIT) used**:
Thickness is calculated by my model based on PIOMAS sea ice volume (20th march 2016) and NSIDC sea ice area.

8. **If you use a dynamical model, please specify:**

a) Model name:
ASIFM v 1.5 (Arctic Sea Ice Forecast Model, self-developed)

d) Forcing:
Atmospheric forcing for heat from land cover is averaged for the 2007-2015 period to better fit June/July sea ice volume losses.

8. ***Prediction of September pan-Arctic extent as monthly average in million square kilometers.**

On average 4.482 million km^2. 1SD range is 4.064 to 4.899.

10. **Prediction of the week that the minimum daily extent will occur:**
 17. September or 3rd week

11. ***Short explanation of Outlook method (using 300 words or less). In addition, we encourage you to submit a more detailed Outlook, including discussions of uncertainties/probabilities, including any relevant figures, imagery, and references.**

My global surface radiation model calculated the incoming solar energy per day per m^2 for a given latitude. For this sea ice forecast model every day for the astronomical summer is pre calculated for all latitudes between 60N and 90N. If a grid cell has 50% ice concentration, then it is treated as a water area 50% the size of the grid cell. 80% of the absorbed energy is then counted as ice melting energy. At the moment the model doesn't support gridded calculations so the whole arctic is considered as one cell. The daily extent value is used as the cell size and the daily area is used to calculate sea ice concentration.

For a better volume calculation, a sub model based on average DMI 80N temperatures is used to calculate ice thickening. The daily area loss is obtained by dividing the daily melt volume by the daily average thickness.

The actual prediction part is statistical featuring an average extent to area ratio compared to the 2007-2015 period and +-1 Standard Deviations.

12. **If available from your method for pan-Arctic extent prediction, please provide:**

a) **Uncertainty/probability estimate such as median, ranges, and/or standard deviations (specify what you are providing).**

Statistical variability of the remaining season in million km^2. The Standard Deviations give the range of outcomes for high and low extent to area ratios (2007-2015 period)

Daily minimum Area
+1SD: 3.2
avg: 2.93
-1SD: 2.657

Average September extent
+1SD: 4.899
avg: 4.482
-1SD: 4.064

b) **Brief explanation/assessment of basis for the uncertainty estimate (1-2 sentences).**

For the 2007-2015 period the average error is 4.9%. No year has an error above 10%.

c) **Brief description of any post processing you have done (1-2 sentences).**
None.

d) **d) Raw (and/or post processed) forecasts for this year and retrospective forecasts in an excel spreadsheet with one year on each row and ensemble member number on columns (specifying whether raw or post processed).**
At the moment I can only provide sea ice area for previous years.
All previous years have historic extent to area ratios.

September daily minimum area

Model — Actual

2016 area forecast

"-SD" — average — "+SD" — actual
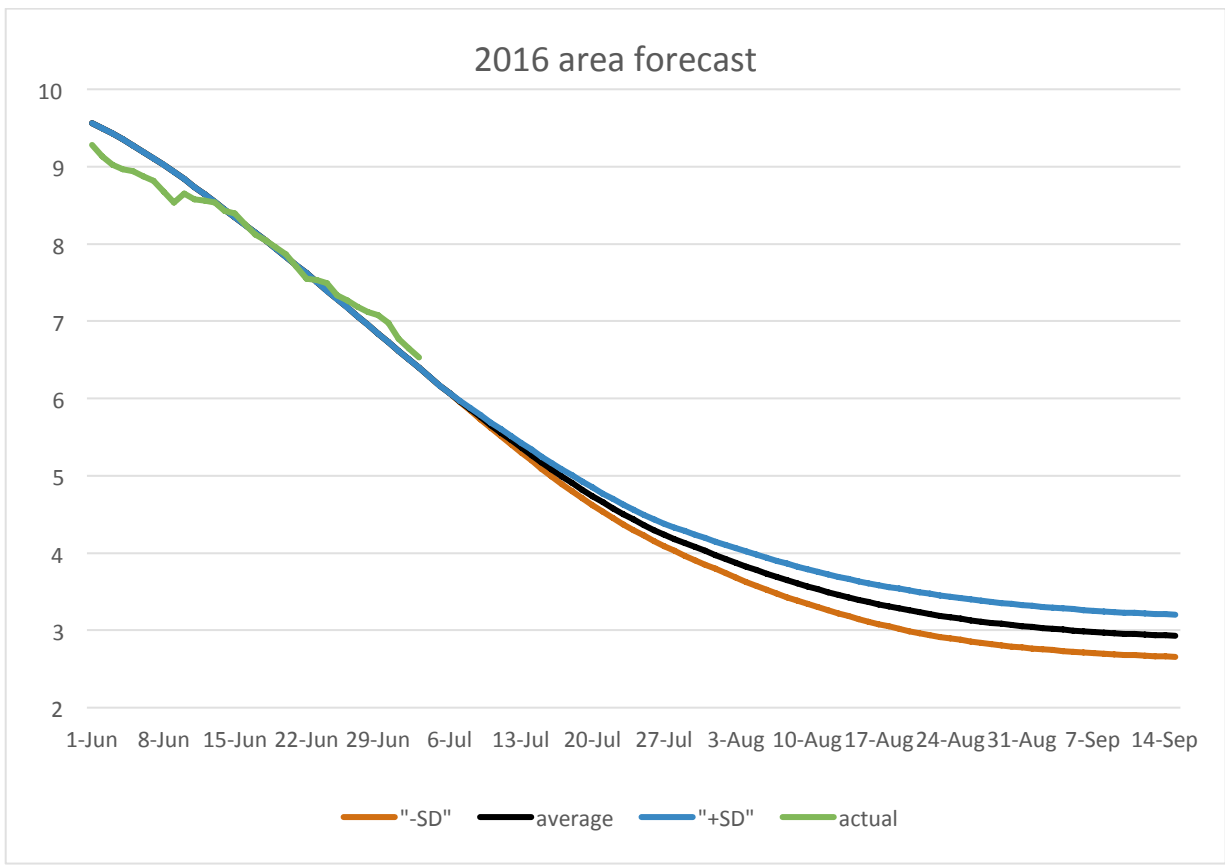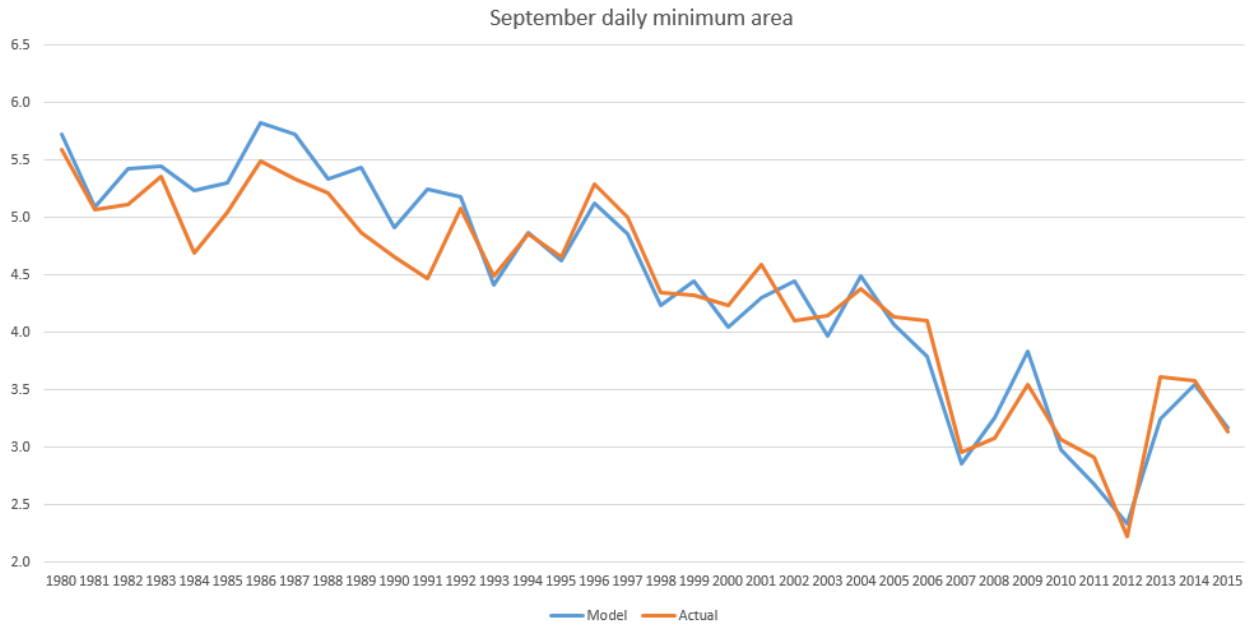
Submitting an Alaskan Regional Outlook (Optional, yet encouraged):

No forecast, because the model doesn't predict ice drift. Based on current condition the Northwest Passage should be ice free in September maybe already by mid-August.

Additional figures:

Block Diagram for area losses