# September 2011 Regional Outlook
# June Report (based on May data)
## Adrienne Tivy

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### SHIPPING ROUTE: Arctic Bridge & Hudson Bay

<u>Sea Ice Parameter</u>: July ice concentration anomalies

<u>Methods/Techniques</u>**:** Canonical correlation analysis with three predictors: 1. North Atlantic Fall SST, 2. Northern hemisphere Fall z500 and 3. Regional (Hudson Bay) Fall SAT. For more information please see: *Tivy, A., S. E.L. Howell, B. Alt, J. Yackel and T. Carrieres (2011). Origins and levels of seasonal forecast skill for sea ice in Hudson Bay using Canonical Correlation Analysis. Journal of Climate. doi:10.1175/2010JCLI3527.1*

<u>Estimate of Forecast Skill:</u> The hind-cast skill of the model is used as an estimate of forecast skill. It is evaluated as the number of times the model correctly categorized ice concentration anomalies at each grid point as above normal, near normal or above normal.
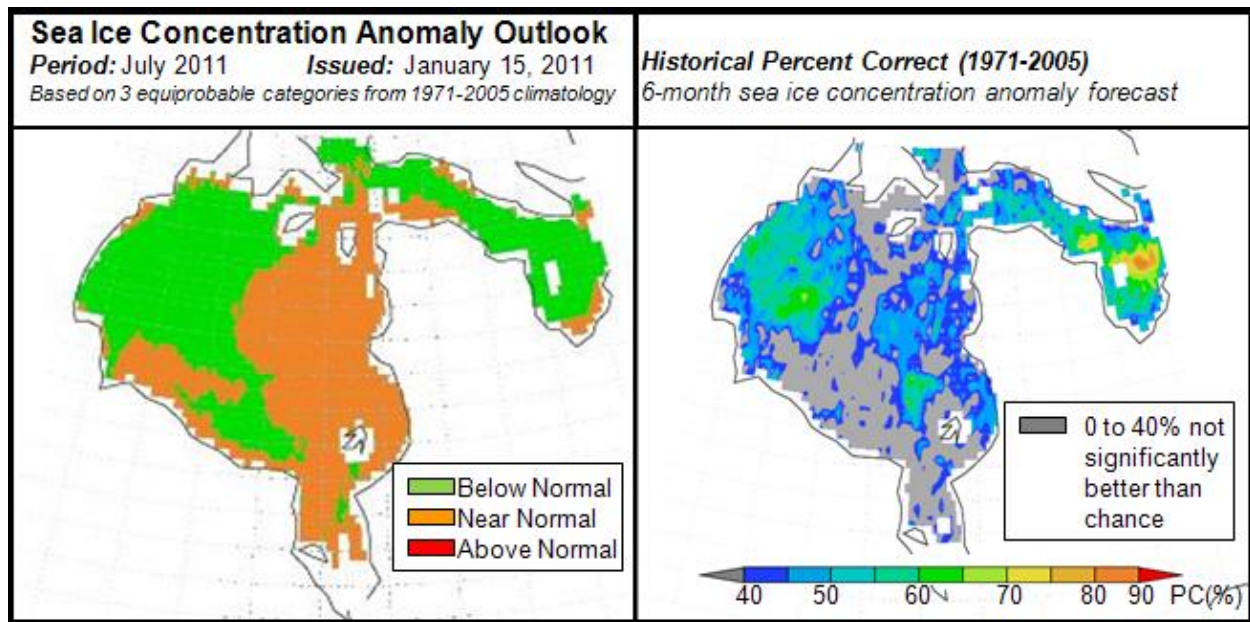


**Figure 1.** Sea ice concentration anomaly outlook for July 2011.

# ARCTIC REGIONS

Sea Ice Parameter: September ice area

Methods/Techniques: Simple persistence; September ice area in each region was correlated with the preceding monthly ice area for all ice and multi-year ice. Multi-year ice concentration data was provided by Jim Maslanik and Chuck Fowler at the University of Colorado. Figure 1 shows the regional boundaries used in the analysis and results from the lagged correlations are shown in Figure 2. Time-series for the actual September ice area in each region is shown in Figure 3.

Estimate of Forecast Skill: The correlation coefficient and root mean square error are used as a measure of uncertainty.

***Beaufort-Chukchi Sea:*** **$1.32 \pm 0.26 *10^6$ km$^2$**, based on May MYI

***East Siberian Sea***: **$0.43 \pm 0.16 *10^6$ km$^2$**, based on September All Ice

***Laptev Sea***: **$0.24 \pm 0.12*10^6$ km$^2$** , based on May All Ice

***Kara-Barents Sea***: **$1.49 \pm 0.11 *10^6$ km$^2$**, based on April MYI

***Greenland Sea***: **$0.26 \pm 0.07*10^6$ km$^2$**, based on February All Ice

***Canadian Arctic Archipelago and Nares Strait:*** Forecast not generated given the high uncertainty in passive microwave derived estimates of ice concentration in the narrow passages of the CAA.
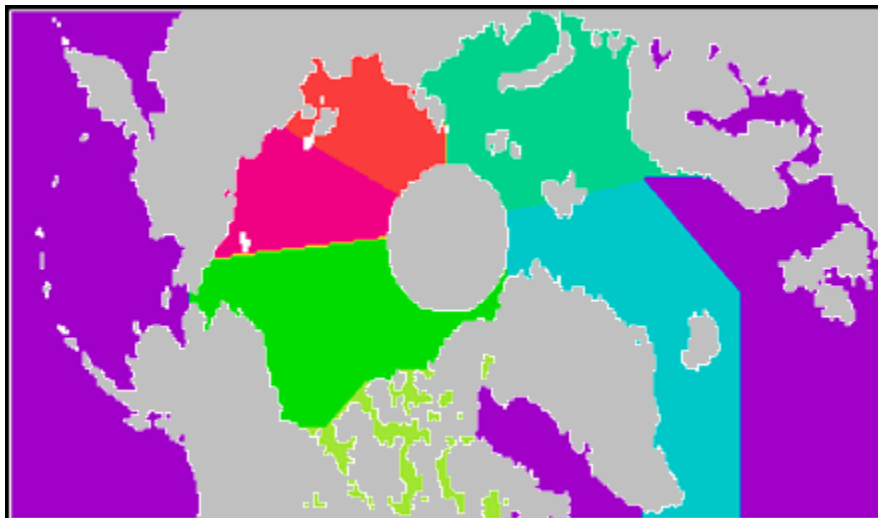


**Figure 1.** Arctic regions used for persistence calculations.

## Regional ice area lagged correlations:  ALL ICE

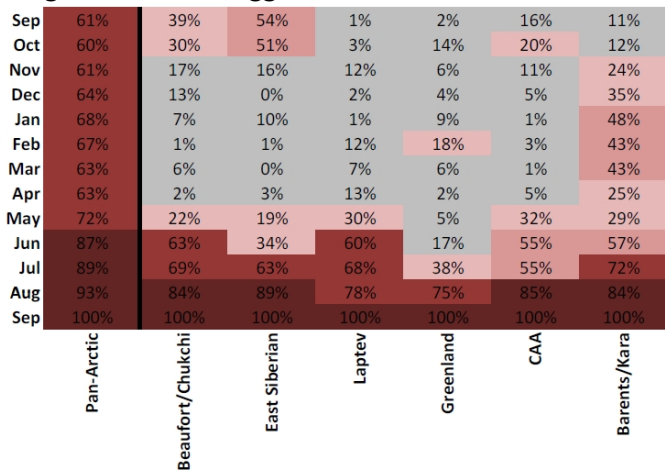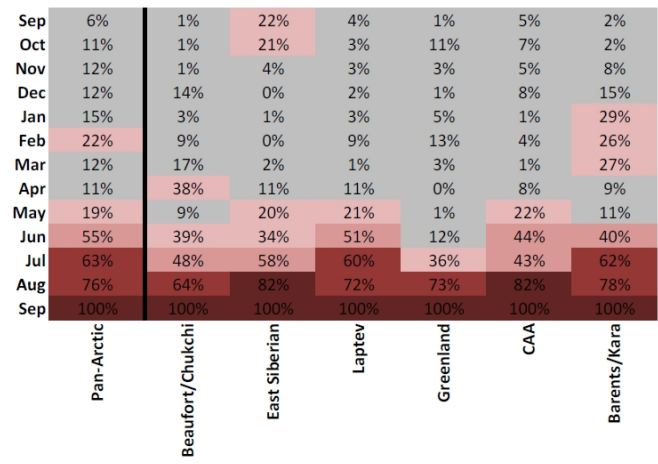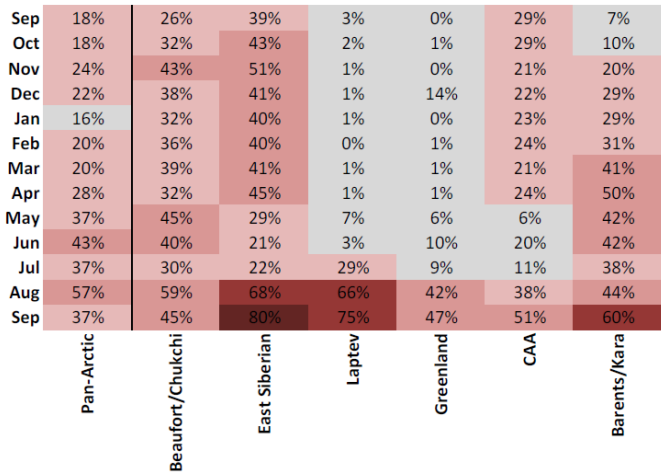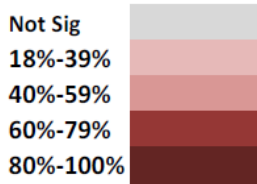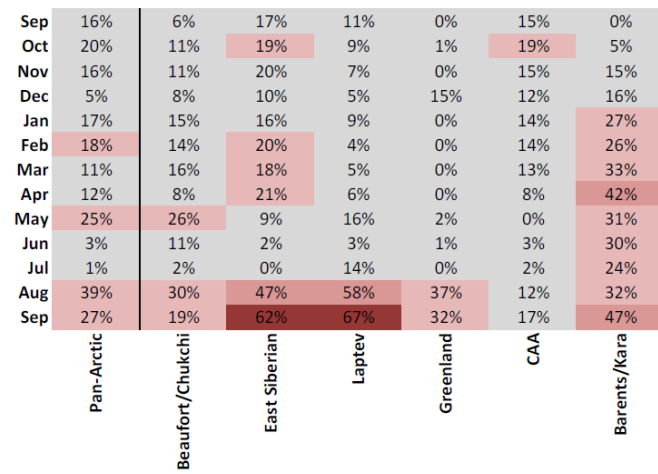| | Pan-Arctic | Beaufort/Chukchi | East Siberian | Laptev | Greenland | CAA | Barents/Kara |
|---|---|---|---|---|---|---|---|
| Sep | 61% | 39% | 54% | 1% | 2% | 16% | 11% |
| Oct | 60% | 30% | 51% | 3% | 14% | 20% | 12% |
| Nov | 61% | 17% | 16% | 12% | 6% | 11% | 24% |
| Dec | 64% | 13% | 0% | 2% | 4% | 5% | 35% |
| Jan | 68% | 7% | 10% | 1% | 9% | 1% | 48% |
| Feb | 67% | 1% | 1% | 12% | 18% | 3% | 43% |
| Mar | 63% | 6% | 0% | 7% | 6% | 1% | 43% |
| Apr | 63% | 2% | 3% | 13% | 2% | 5% | 25% |
| May | 72% | 22% | 19% | 30% | 5% | 32% | 29% |
| Jun | 87% | 63% | 34% | 60% | 17% | 55% | 57% |
| Jul | 89% | 69% | 63% | 68% | 38% | 55% | 72% |
| Aug | 93% | 84% | 89% | 78% | 75% | 85% | 84% |
| Sep | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

## Regional ice area lagged correlations:  ALL ICE DETRENDED

| | Pan-Arctic | Beaufort/Chukchi | East Siberian | Laptev | Greenland | CAA | Barents/Kara |
|---|---|---|---|---|---|---|---|
| Sep | 6% | 1% | 22% | 4% | 1% | 5% | 2% |
| Oct | 11% | 1% | 21% | 3% | 11% | 7% | 2% |
| Nov | 12% | 1% | 4% | 3% | 3% | 5% | 8% |
| Dec | 12% | 14% | 0% | 2% | 1% | 8% | 15% |
| Jan | 15% | 3% | 1% | 3% | 5% | 1% | 29% |
| Feb | 22% | 9% | 0% | 9% | 13% | 4% | 26% |
| Mar | 12% | 17% | 2% | 1% | 3% | 1% | 27% |
| Apr | 11% | 38% | 11% | 11% | 0% | 8% | 9% |
| May | 19% | 9% | 20% | 21% | 1% | 22% | 11% |
| Jun | 55% | 39% | 34% | 51% | 12% | 44% | 40% |
| Jul | 63% | 48% | 58% | 60% | 36% | 43% | 62% |
| Aug | 76% | 64% | 82% | 72% | 73% | 82% | 78% |
| Sep | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

## Regional ice area lagged correlations:  MYI ICE

| | Pan-Arctic | Beaufort/Chukchi | East Siberian | Laptev | Greenland | CAA | Barents/Kara |
|---|---|---|---|---|---|---|---|
| Sep | 18% | 26% | 39% | 3% | 0% | 29% | 7% |
| Oct | 18% | 32% | 43% | 2% | 1% | 29% | 10% |
| Nov | 24% | 43% | 51% | 1% | 0% | 21% | 20% |
| Dec | 22% | 38% | 41% | 1% | 14% | 22% | 29% |
| Jan | 16% | 32% | 40% | 1% | 0% | 23% | 29% |
| Feb | 20% | 36% | 40% | 0% | 1% | 24% | 31% |
| Mar | 20% | 39% | 41% | 1% | 1% | 21% | 41% |
| Apr | 28% | 32% | 45% | 1% | 1% | 24% | 50% |
| May | 37% | 45% | 29% | 7% | 6% | 6% | 42% |
| Jun | 43% | 40% | 21% | 3% | 10% | 20% | 42% |
| Jul | 37% | 30% | 22% | 29% | 9% | 11% | 38% |
| Aug | 57% | 59% | 68% | 66% | 42% | 38% | 44% |
| Sep | 37% | 45% | 80% | 75% | 47% | 51% | 60% |

## Regional ice area lagged correlations:  MYI ICE DETRENDED

| | Pan-Arctic | Beaufort/Chukchi | East Siberian | Laptev | Greenland | CAA | Barents/Kara |
|---|---|---|---|---|---|---|---|
| Sep | 16% | 6% | 17% | 11% | 0% | 15% | 0% |
| Oct | 20% | 11% | 19% | 9% | 1% | 19% | 5% |
| Nov | 16% | 11% | 20% | 7% | 0% | 15% | 15% |
| Dec | 5% | 8% | 10% | 5% | 15% | 12% | 16% |
| Jan | 17% | 15% | 16% | 9% | 0% | 14% | 27% |
| Feb | 18% | 14% | 20% | 4% | 0% | 14% | 26% |
| Mar | 11% | 16% | 18% | 5% | 0% | 13% | 33% |
| Apr | 12% | 8% | 21% | 6% | 0% | 8% | 42% |
| May | 25% | 26% | 9% | 16% | 2% | 0% | 31% |
| Jun | 3% | 11% | 2% | 3% | 1% | 3% | 30% |
| Jul | 1% | 2% | 0% | 14% | 0% | 2% | 24% |
| Aug | 39% | 30% | 47% | 58% | 37% | 12% | 32% |
| Sep | 27% | 19% | 62% | 67% | 32% | 17% | 47% |

Legend:
- Not Sig
- 18%-39%
- 40%-59%
- 60%-79%
- 80%-100%

**Figure 2.**  Lagged correlations with all ice and MYI.
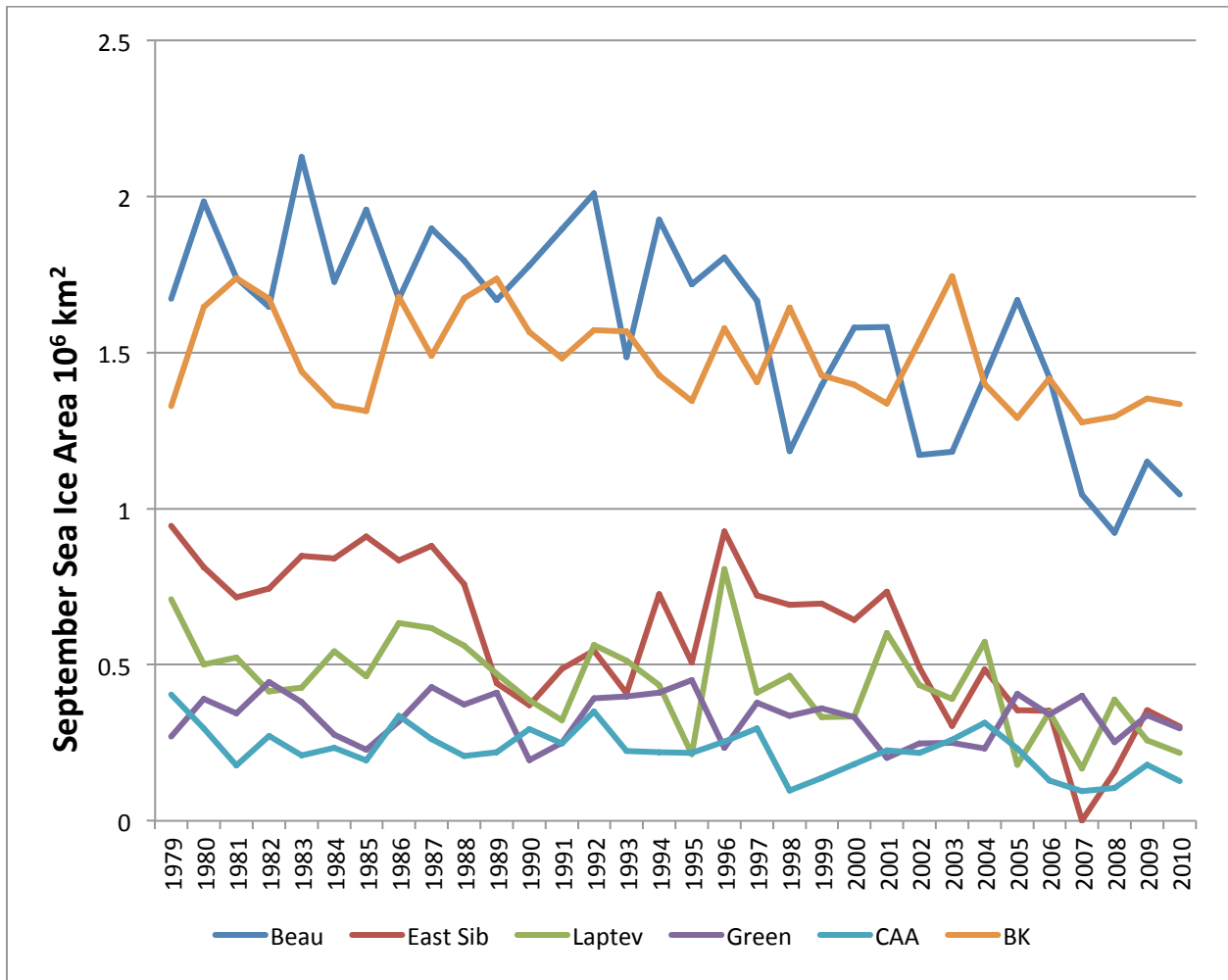
**Figure 3**. Actual September sea ice area by region. Beau: Beaufort/Chukchi Seas, East Sib: East Siberian Sea, Laptev: Laptev Sea, Green: Greenland Sea, CAA: Canadian Arctic Archipelago, BK: Barents/Kara Seas.