Canadian Ice Service Contribution

to the

September 2013 Sea Ice Outlook
(August Update)

Environment Canada's Canadian Ice Service (CIS) is predicting the minimum Arctic sea ice extent to be near 4.0 million square kilometres in September, 2013. A predicted value of 4.0 million square kilometres will make the Arctic sea ice extent in September, 2013, the second lowest in the 1979-2012 record. This value lies well below the 1979-2012 average September extent of 6.4 million square kilometres based on the NSIDC sea ice index.

The 2013 forecast was derived by considering a combination of two methods: 1) a heuristic method based on observed end-of-winter Arctic ice thicknesses and extents, as well as an examination of Surface Air Temperature (SAT), Sea Level Pressure (SLP) and vector wind anomaly patterns and trends; and 2) an experimental Optimal Filtering Based (OFB) Model which uses an optimal linear data filter to extrapolate NSIDC's September Arctic Ice Extent time series into the future.

Based on winter sea ice extents and thicknesses, and the progression of summer ice retreat to date, a September 2013 *minimum* ice extent value of **~4.0 million square kilometres** is now heuristically predicted (which is 0.4 million square kilometres more than we first predicted in June). The CIS experimental OFB model continues to predict a September 2013 *average* ice extent of **4.05 million square kilometres**. Therefore, based on a combination of the heuristic and OFB model predictions, the CIS is forecasting a 2013 pan-Arctic September sea ice minimum of **~4.0 million square kilometres**.

Heuristic Forecast

On 05 August 2013, the pan-Arctic sea ice extent was 6.7 million sq. km (using NSIDC's SSMR/I-based sea ice index for >15% concentration). This lies between the extents observed in 2009 and 2010 on this date. In contrast, in 2012, the extent was 6.0 million sq. km. on August 05. This would indicate that while much lower than normal pan-Arctic minimum sea ice extents are likely once again this year, they probably will not break the record set in 2012 (unless a strong unforeseen factor is activated during August or early September).

This summer, the evolution of the pan-Arctic summer ice extent is closely following the progressions observed in 2009 and 2010. In September 2010, the minimum pan-Arctic sea ice extent fell to 4.6 million square km. Because the current ice extent is tracking near 0.7 million sq. km above that observed in 2012, CIS is revising its heuristic forecast for the September minimum extent. The original prediction was for a minimum extent that was 0.2 million sq. km above the 2012 minimum of 3.4 million sq. km (i.e. 3.6 million sq. km). **The new prediction is for a minimum extent that is 0.6 million sq. km above the 2012 minimum (4.0 million sq. km)**. This now brings the heuristic forecast in line with the OFBM forecast, which is predicting a September average extent of 4.05 million sq. km.

One of the main reasons for the less-than record progression of the pan-Arctic ice retreat this year lies in the Canadian Arctic (especially the southeast Beaufort Sea region), where normal to greater-than-normal extents are still being recorded at the beginning of August, 2013 (see Figure below).

Early-August 2013 – progress of Arctic Ice Retreat

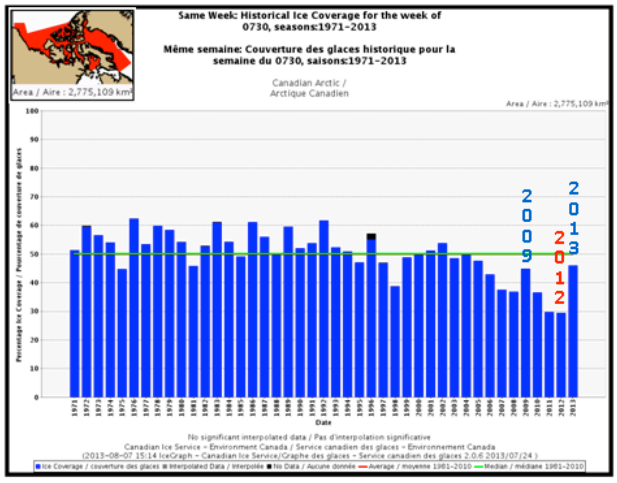
Pan-Arctic

year	Aug 05 extent (million sq. km)	Sept. *min.* extent (million sq. km)
2013	6.7	??
2012	6.0	3.4
2011	6.5	4.35
2010	6.5	4.6
2009	6.9	5.1
2008	7.0	4.6
2007	6.3	4.2
1979-2012 mean of September *Average* Extents		6.4

(data source: NSIDC Sea Ice Index)

- The pan-Arctic sea ice extent as of 05 August, 2013 (using NSIDC's SSMR/I-based sea ice index for >15% concentration) lies between the 2009 and 2010 extents for this date.
- It is 0.7 million sq. km greater than was observed at this time in 2012.
- While a much lower than normal pan-Arctic minimum sea ice extent is likely once again this year, it probably will not break the record set in 2012 (unless a strong unforeseen factor is activated during August or early September).

Canadian Arctic



(data source: CIS Ice Chart Database)

- The Canadian Arctic sea ice coverage on 30 July 2013 (based on the CIS Ice Chart Database) was approximately 15% greater than it was in 2012 on this date.
- This 15% is equal to ~0.4 million sq. km, which indicates that a significant proportion of the pan-Arctic greater-than-2012 ice extent (~0.7 million sq. km) is due to greater extents on the Canadian side of the Arctic Ocean.
- The greater than normal ice coverage in Canadian Waters is primarily being observed in the western Arctic / Beaufort Sea.

Prepared by: Canadian Ice Service, 31 July 2013