Canadian Ice Service (CIS) Contribution

to the

September 2012 Sea Ice Outlook: Post-Season Summary

2012 SEA ICE OUTLOOK SUMMARY QUESTIONS:

The NSIDC value for average September 2012 ice extent was 3.6 million sq. km.

Please send us your thoughts and comments on the results of this year's Outlook. Specifically, comment on any or all of the following:

1. What are the reasons for the record-breaking minimum this year?

CIS1: The reduced overall sea ice thicknesses within the Arctic Ocean pack, and the greater proportion of seasonal (first-year) ice within the pack were the primary reasons for this year's record-breaking minimum. Significant losses of multi-year ice began in 2007, which experienced a winter with large dynamic losses of MYI through Fram Strait and a summer with enhanced in situ ice melt. The MYI pack never fully recovered after the 2007 minimum, and as a result the Arctic pack now comprises a greater proportion of thinner, seasonal ice - most of which melts away completely during the summer melt season. Seasonal ice is also more susceptible to destruction by the winds and waves associated with summer storms passing over the Arctic Ocean.

2. How would you characterize the success of Outlook predictions this year and any differences between methodologies?

CIS2: From the beginning, in June, all of the outlooks were consistent in predicting well-below normal September ice extents (< 5 million sq. km), with several hinting at close-to-record minimum extents (although none of the methods predicted a September minimum extent of below 4 million sq. km). Throughout the summer, the lowest of the predicted values were chiefly produced by statistical models while the highest of the predicted values were chiefly produced by numerical models. This would indicate that statistical models are still outperforming numerical models, in general, when it comes to seasonal sea ice prediction.

3. What do you see as our main "lessons learned" from this year?

CIS3: In general, even with the improvements offered by ensemble techniques and fully coupled models, seasonal predictions of pan-Arctic sea ice extents are still not consistently better than persistence or the predictions made by simple AR models / optimal filters (e.g., the 2012 forecast produced by CIS's experimental Optimal Filtering Based Model – Figure 1). The primary reasons for this are the shortness of our Arctic time series, the lack of high spatial resolution atmospheric and oceanic datasets, the lack of reliable and broad coverage sea ice thickness observations that can be used to initialize deterministic atmosphere-ice-ocean models, and an incomplete understanding of all the feedback processes and their interactions within the Arctic atmosphere - ocean - sea ice system. Furthermore, a single severe weather event can have a significant impact on summer Arctic ice conditions (e.g., the storm that passed over the Canada Basin in August, 2012 – Figure 2). Since predicting a storm months in advance is not possible, the extent of the variability in pan-Arctic ice extents that can be predicted on seasonal time-scales is limited.

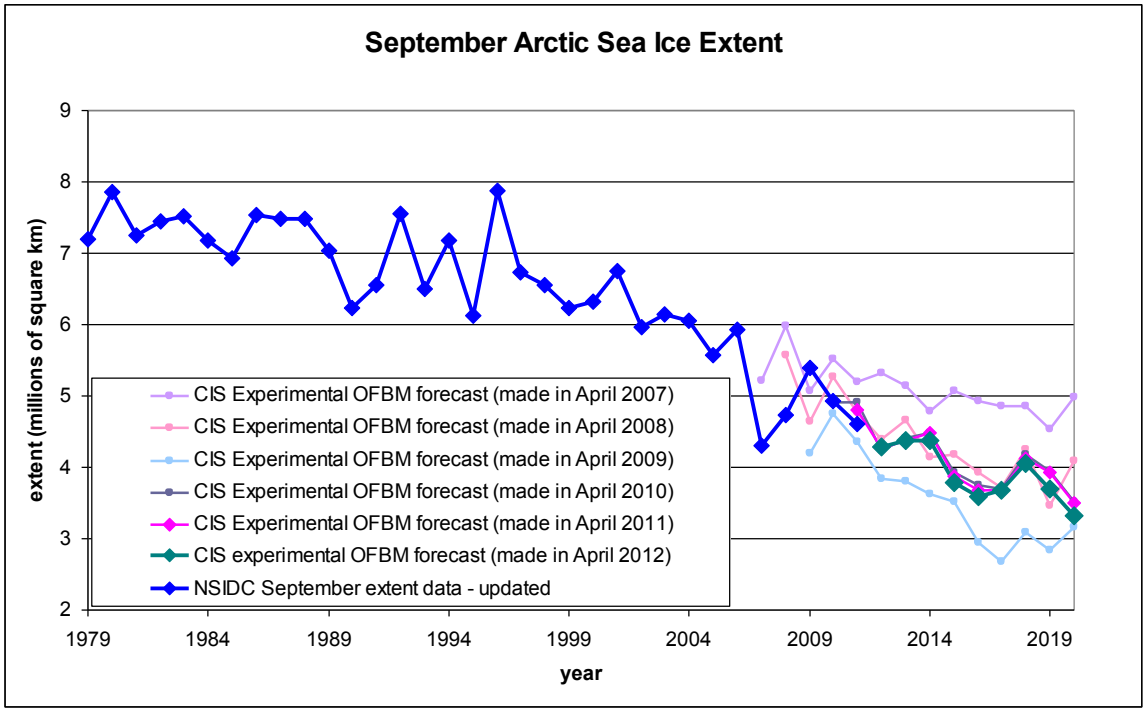

Figure 1. The CIS Optimal Filtering Based model (OFBM) forecast for 2012-2020 (made in April 2012 – turquoise line, based on NSIDC September extent data – blue line). The **2012 forecast** is **$4.3*10^6$ km^2**. The forecasts out to 2020 made in previous years are also shown for comparison. Except for the forecasts made in 2007 and 2009, model predictions have been consistent from year to year.

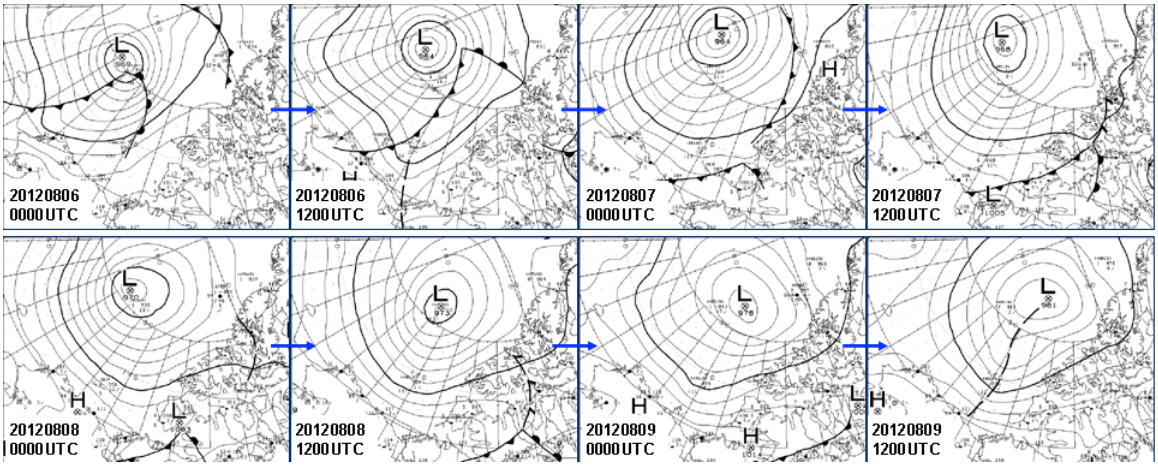

Figure 2. Canadian Meteorological Centre (CMC) surface analyses for August 06-09, 2012, depicting the evolution of an intense storm that passed over the Canada Basin this past summer.