Regional 2009 Outlook Summary: Western Parry Channel Route of the Northwest Passage

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1. Sea Ice Evolution:

At the start of the 2009 melt season, multi-year ice (MYI) conditions were lighter than average within Western Parry Channel region of the Northwest Passage (Figure 1). The amount of MYI was even less than 2007 when the region cleared for the first time during the satellite era but the initial spatial distribution was different than the light years of 2007 and 2008 (Figure 2). The date of melt onset for 2009 (year day 155) occurred much later than 2008 (year day 142; the earliest on record) but 1-day earlier than 2007 (Figure 3). As the melt season got underway, total sea ice the Western Parry Channel remained near the normal up until September (Figure 4). Below normal decreases occurred in September but still remained well above the low years of 1999, 2007, and 2008. As expected, the high MYI concentrations within the Western Parry Channel delayed breakup compared to 2007 and 2008. When the ice eventually became mobile it slowly drifted towards the M'Clintock Channel which, acts as a sea ice "drain-trap" within the Canadian Arctic Archipelago (Figure 5). The flux of MYI from the Queen Elizabeth Islands via Byam-Martin Channel was minimal in 2009 because of blockage from MYI at the mouth of the M'Clintock Channel. With southward advection limited and temperatures not being sufficient to completely ablate the sea ice, high concentrations remained in the Western Parry Channel throughout the season (Figure 5).

2. Lessons Learned:

The spatial distribution of MYI at the start of the melt season is an important factor to consider with respect to the clearing of the Western Parry Channel. If MYI concentrations are high at the mouth of the M'Clintock Channel this does limit the flow of MYI from the Queen Elizabeth Islands but it also means less sea ice will be transported southward hence, concentrations remains high in the central Western Parry Channel – this was the case in 2009. Conversely, if the mouth of the M'Clintock Channel clears, then MYI can be transported southward but the flux of MYI from the Queen Elizabeth Islands directly across the Western Parry Channel increases – this was the case in 2008. When the region cleared in 2007, the only major difference with respect to 2008 was winds forced MYI streaming through Byam-Martin Channel along the coast of Melville Island rather, than directly across the Western Parry Channel.

3. Implications for 2010:

Although the sea ice has not consolidated within the Western Parry Channel, the MYI spatial distribution should be remain relatively similar leading up to 2010 (Figure 5). Considerable amounts of seasonal first-year ice will be present in the WPC but the mouth M'Clintock Channel will still exhibit high concentrations of MYI. The latter will likely facilitate ice congestion within Western Parry Channel similar to 2009. Currently, there also appears to be high concentrations of MYI at the entrance to the M'Clure Strait that potentially poses another problem to clearing in 2010

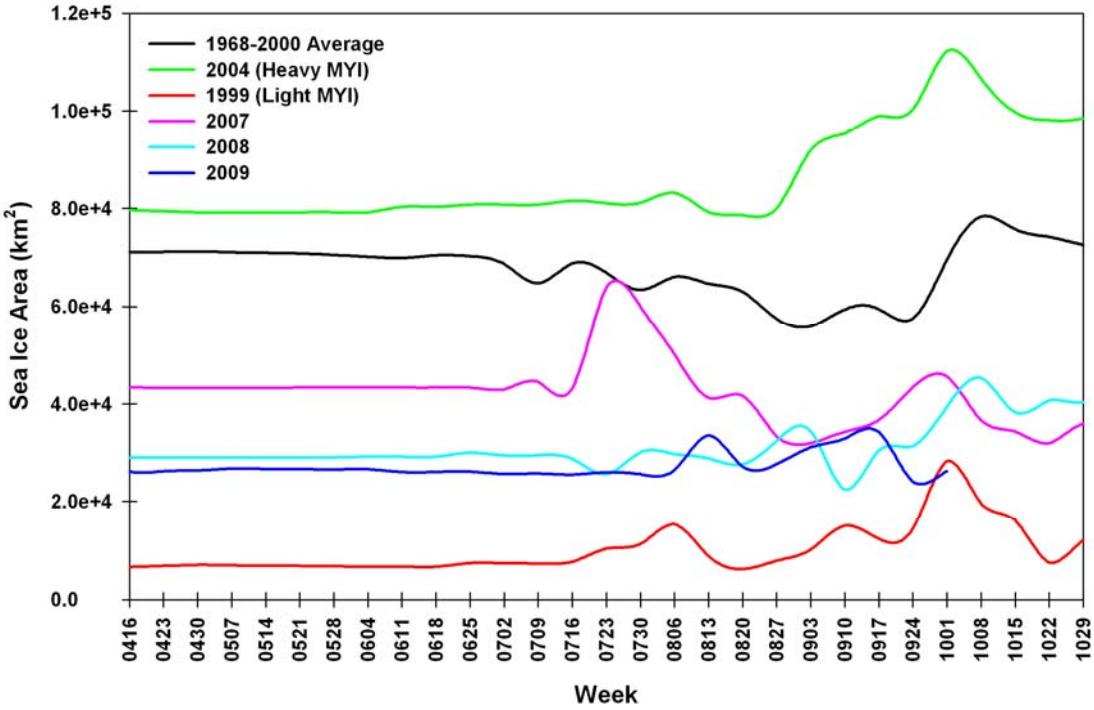

Figure 1. Time series of the evolution of multi-year ice within the Western Parry Channel region of the Northwest Passage. Data is from the Canadian Ice Service.

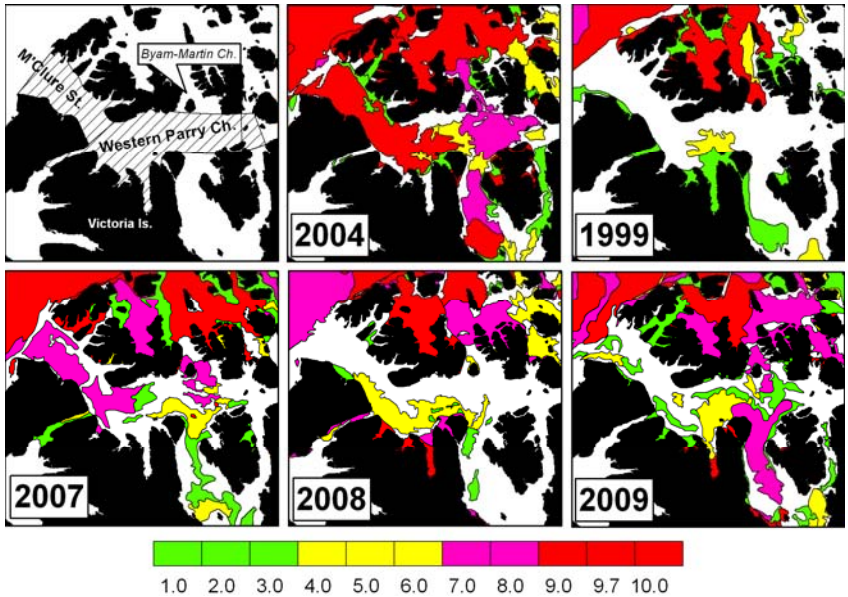

Figure 2. Spatial distribution of multi-year ice (in tenths) within the Western Parry Channel region of the Northwest Passage on May 1st for a heavy ice year (2004), a light year ice (1999) and the last three years. Data is from the Canadian Ice Service.

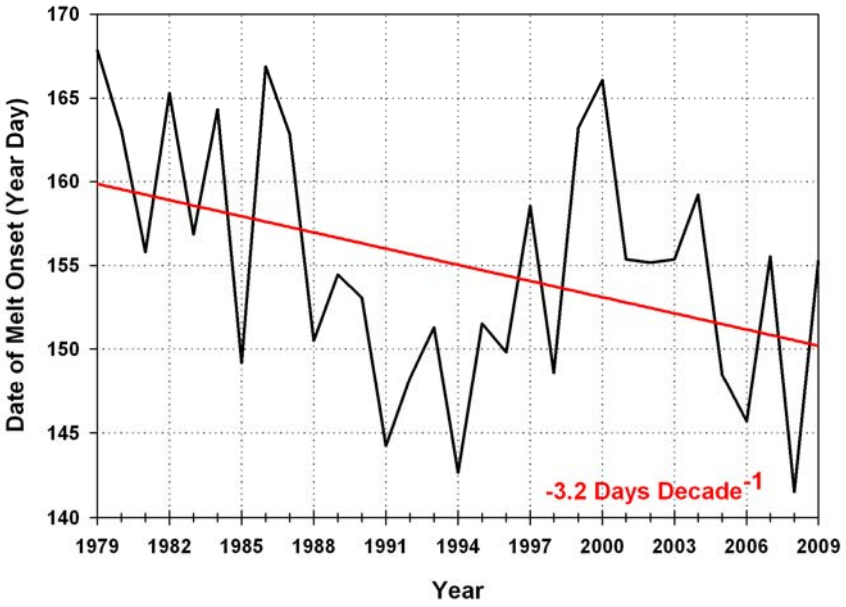

Figure 3. Date of melt onset in the Western Parry Channel region of the Northwest Passage from 1979-2009. Data are from the Defense Meteorological Satellite Program (DMSP) F-series satellite SSM/I and SSMIS sensors. Algorithm provided by Thorsten Markus, Goddard Space Flight Center.

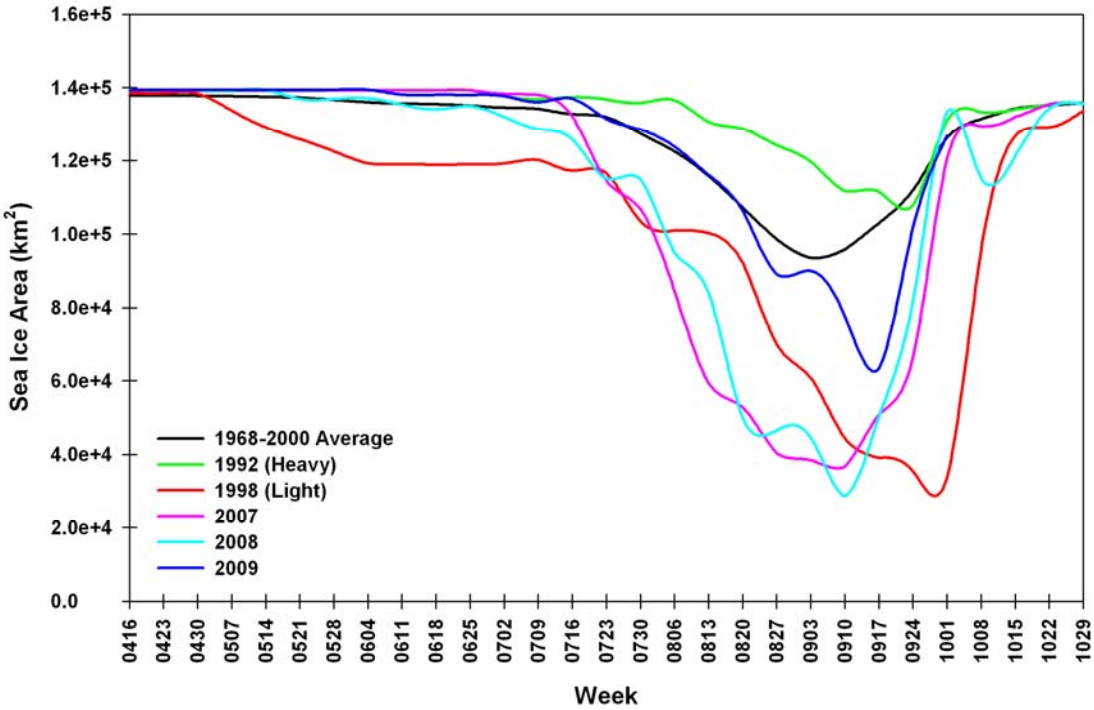

Figure 4. Time series of the evolution of total sea ice within the Western Parry Channel region of the Northwest Passage. Data is from the Canadian Ice Service.

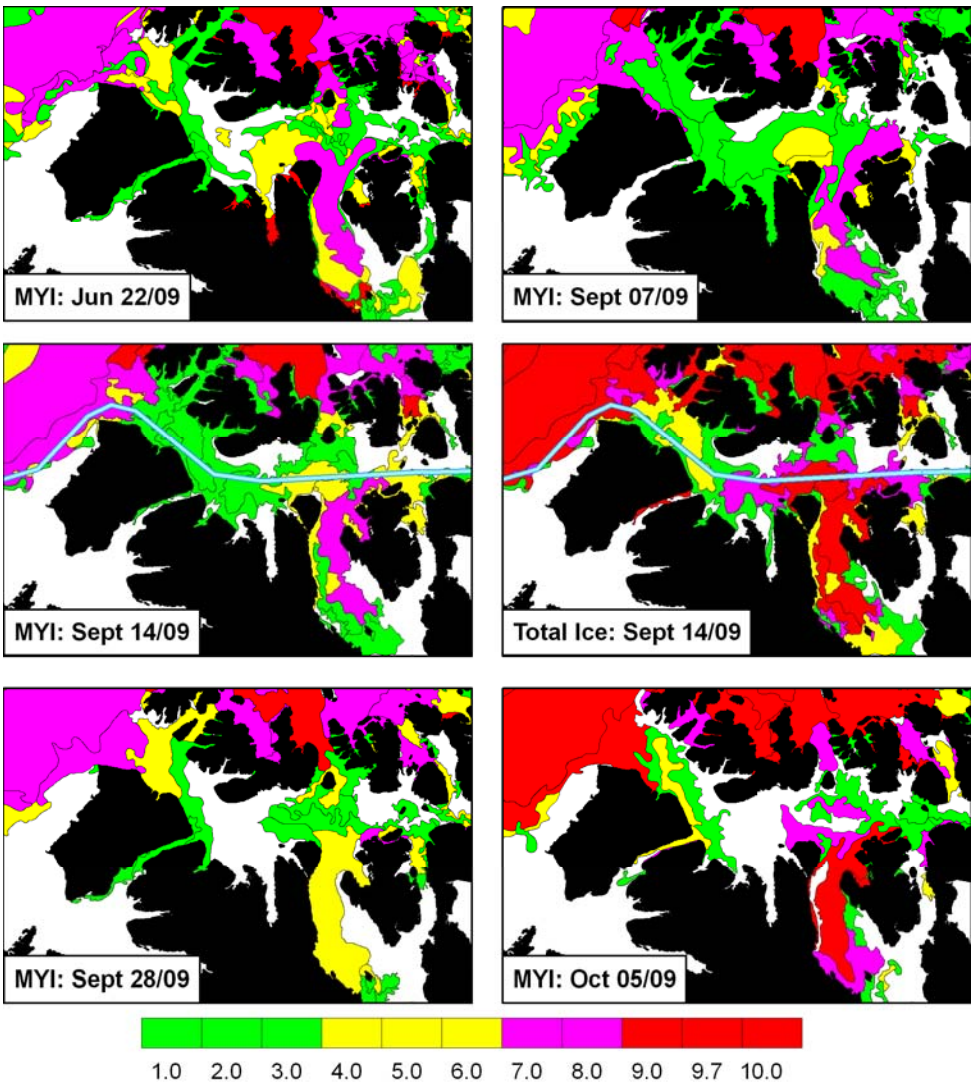

Figure 5. Spatial distribution of sea ice concentration (in tenths) within the Western Parry Channel region of the Northwest Passage on selected days during the 2009 melt season. The minimum total ice area (September 14) within the region is shown on the middle right panel. Data is from the Canadian Ice Service.