

**Pan-Arctic Outlook for September 2012**  
**July Update based on June Data**  
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**Executive Summary:** Using conditions from week 22 of 2012 (ie June 1, 2012), a revised minimum Arctic sea ice extent of 4.11 million km<sup>2</sup> is projected for the week of September 21, 2012. This is substantially lower than the first estimate of 4.32 million km<sup>2</sup>, using week 18 conditions (May 1, 2012), reflecting both lower than average sea ice extent used as initial conditions and a persistent downward trend in sea ice extent over the past decade (and longer). Based on these projections and previous model behavior, the output suggests 2012 will be at or below the previous record minimum September ice extent, set in 2007 and repeated in 2011.

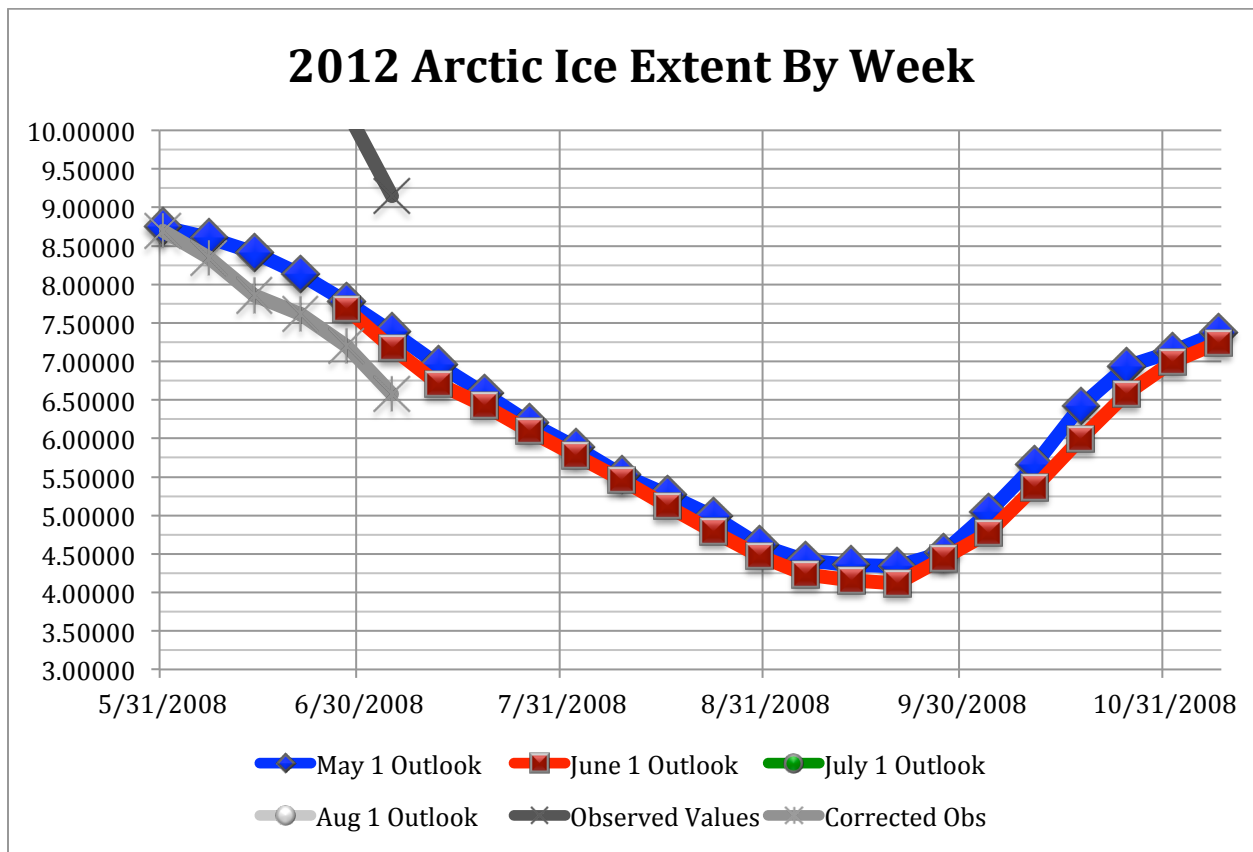


Figure 1: Projected 2012 sea ice extent by week, in millions of square kilometers. The total observed ice extent (SSM/I) and a corrected value (sea ice ice outside the forecast model domain has been removed) for June 1-July 1, 2012, are also indicated.

**Method:** *Statistical.* A multi-linear regression model (NIC-ARIFS), initially developed at University of Colorado (Boulder, CO) and in use at the National Ice Center (Washington, DC), correlates 10 years of historical SSM/I sea ice area (25km EASE grid), NCEP 2m air temperature analyses (global 1.8 degree resolution), NCEP sea level pressure analyses (global 2.5 degree resolution), and freezing degree days based on NCEP 2m air temperatures. The extent of sea ice is calculated by calculating the area with 10% or greater sea ice concentration, consistent with the World Meteorological Organization (WMO) definition and practices by the National Ice Center and Canadian Ice Service. Waters with 0-10% sea ice are defined as “open water”; in order to be “ice free”, there must be no ice of any kind; see, e.g., [http://www.aari.nw.ru/gdsidb/docs/wmo/nomenclature/WMO\\_Nomenclature\\_draft\\_version1-0.pdf](http://www.aari.nw.ru/gdsidb/docs/wmo/nomenclature/WMO_Nomenclature_draft_version1-0.pdf).

Model projections are run from May 1, 2012, conditions providing weekly outlooks from June 1 – October 15, 2012. The minimum sea ice extent occurs the week of September 21, 2012 (figure 1). The most recent projections (based on June 1 conditions) are consistently below the initial projections (based on May 1 conditions). Initial conditions are given in figure 2, and projections for September 21 are shown in figure 3.

In situ measurement from three buoys deployed in the central Arctic show about 20 cm of snow has melted since May 15 (see <http://imb.crrel.usace.army.mil>). In one case (2011M), all of the snow has melted and 15 cm of ice has melted from the surface. 2012D has had additional snowfall in late June. These buoys are deployed as part of the CRREL Ice Mass Balance buoy program.

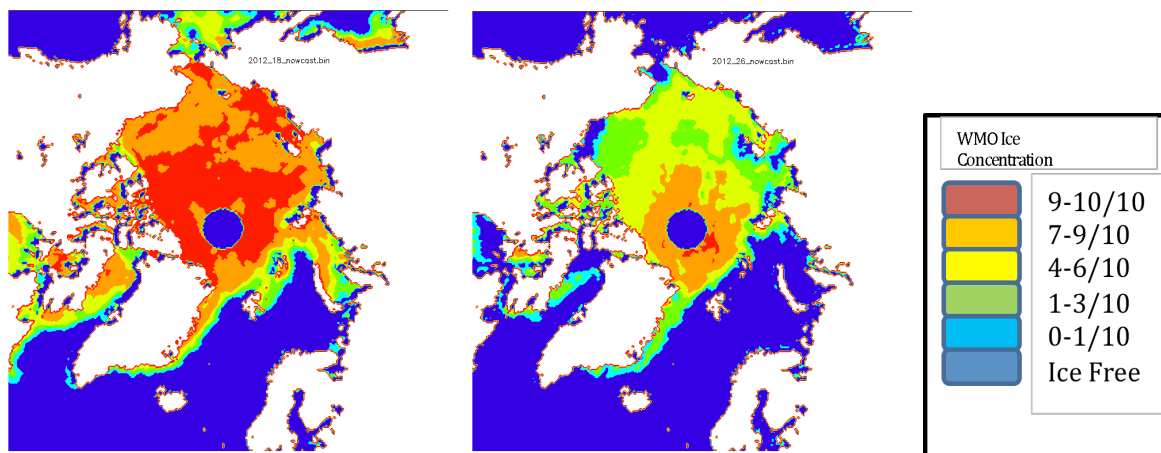


Figure 2: Observed SSM/I sea ice conditions on May 1, 2012 (left) and June 1, 2012 (center) . The WMO color code (right) is used.

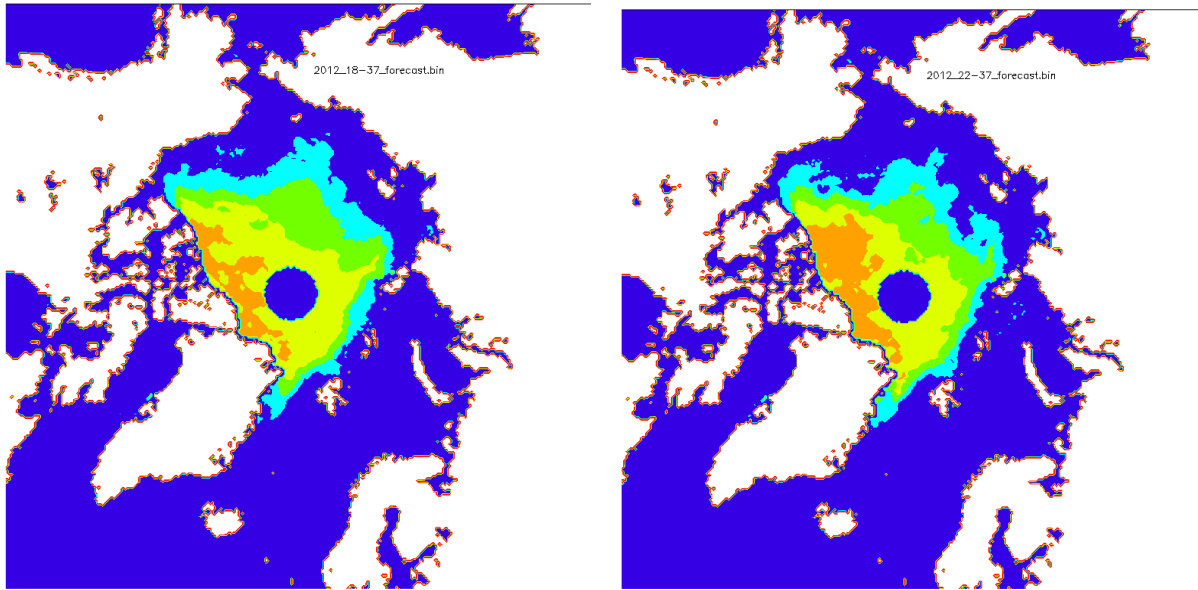


Figure 3: Projected week 37 (September 21, 2012) conditions based on May 1 (left) and June 1 (right). Conditions within the Canadian Arctic Archipelago and near the North Pole are not calculated. Ice extent is the total area within the 1-3/10 (green) contour (and includes the North Pole “hole”); The teal region is considered “open water” and not included in the projection of ice extent.

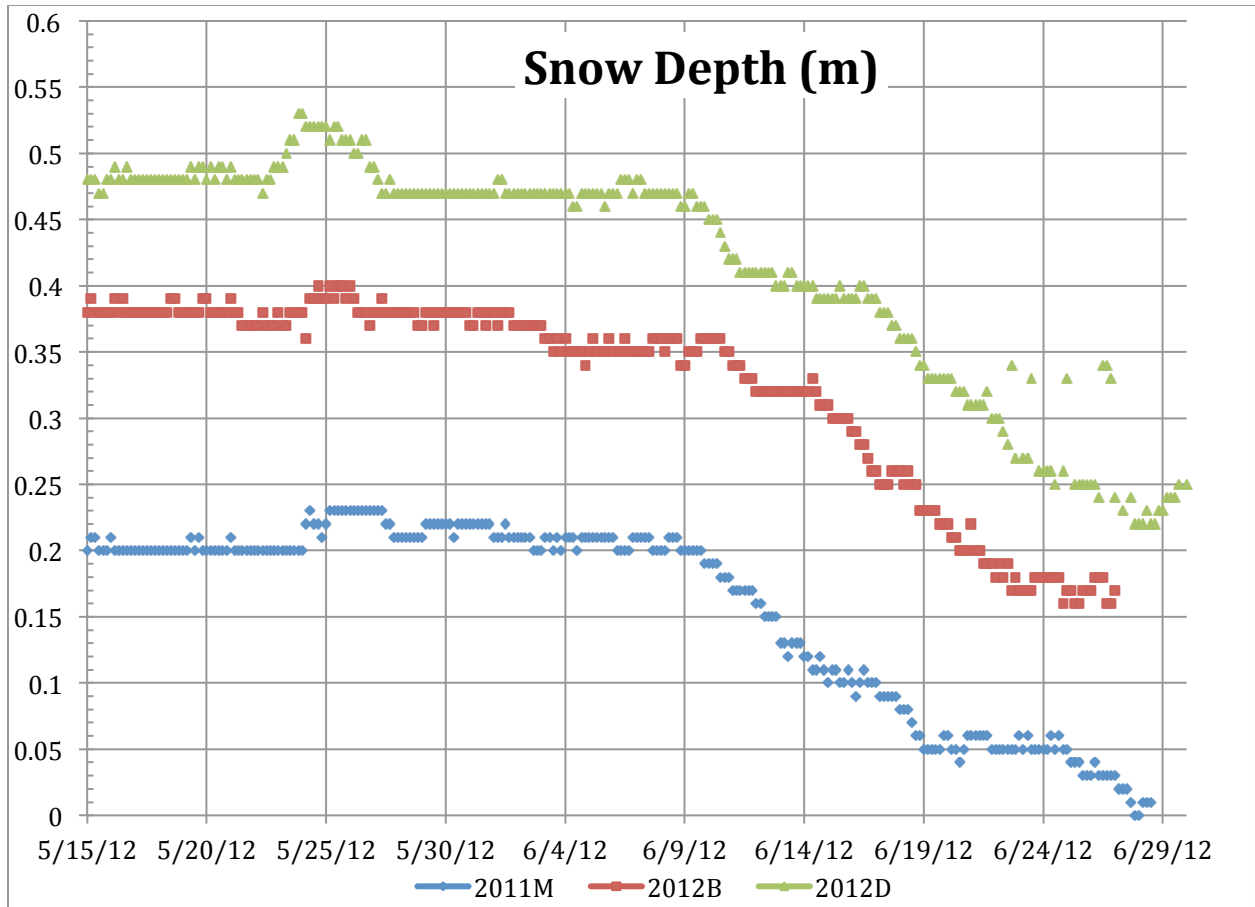


Figure 4: Snow depth (cm) at CRREL IMB buoys 2011M, 2012B, 2012D from May 15, 2012 to June 30, 2012. For buoy locations and other information, see <http://imb.crrel.usace.army.mil/>.