

# Sea Ice Outlook | Regional Corner

## Regional Sea Ice Outlook: June Report

Report Released: 24 June 2009

### Introduction

As part of the 2009 Sea Ice Outlook, regional perspectives on ice evolution during the summer have been solicited to synthesize relevant scientific work and to encourage dialog and feedback from different user groups in need of sea ice information.

Six groups responded to this request. The individual contributions indicate that it is highly likely that the Northern Sea Route will be passable this year, while only one passageway of the Northwest Passage is likely to open up, if at all. Ice conditions in the seas north of Alaska are predicted to be milder than normal due to a lack of multiyear ice compared to the past several years.

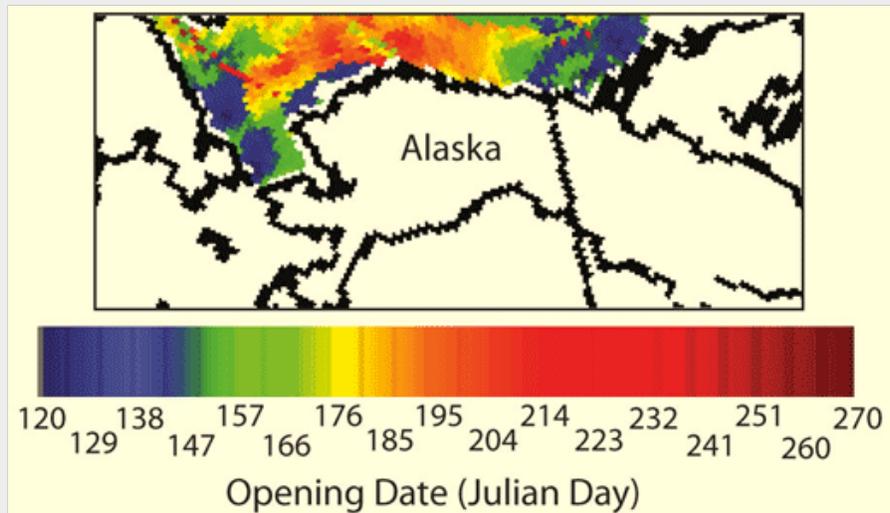
Several of the contributions employed statistical or composite models to arrive at quantitative outlooks for seasonal ice development. It appears that some of these outlooks may be of potential value to different stakeholder groups, but require refinement and calibration through *in-situ* data and feedback from local experts. The single most important variable that the outlooks relied on is the distribution of multi-year ice. As highlighted in the contribution by Arbetter et al., it is mostly the assumptions made about survival of such old, thick ice through the season that dominate the outlook. In this context, ice thickness data for multi-year are of great value, as is information on cumulative melt as a function of latitude (such as from ice mass balance buoys).

### Bering, Chukchi, and Beaufort Seas

#### Contributions from:

- Fowler, Drobot, and Maslanik (3)
- Eicken, Petrich, and Kaufman (2)
- Pokrovsky (5)

Opening dates from a combination of statistical-empirical estimates and observed ice distribution by Fowler, Drobot, and Maslanik (3) indicate early opening of waters in the western Chukchi and eastern Beaufort Seas, in line with observations from the western Chukchi Sea, but predicted too early for the eastern Beaufort (which has shown early-season reductions in ice concentration, however).



**Figure 1.** Projected 2009 opening dates for seas north of Alaska based on a regression of opening dates for the past decade against ice thickness/age and late April 2009 air temperatures (Fowler, Drobot, Maslanik).

For coastal Alaska seas between Bering Strait and Barrow, Eicken, Petrich and Kaufman (2) expect overall lighter than normal ice conditions, mostly due to the comparative lack of multiyear ice. The date of complete meltout and break-up of coastal ice at Barrow is being estimated based on a statistical-empirical model of solar heating of ice and ocean, driven by an experimental 14-day weather forecast model (<http://www.gi.alaska.edu/snowice/sea-lake-ice/Brw09/forecast/>). While this approach has not been proven, it does hold some promise over a limited time scale. In general, thicker first-year ice offshore compared to last year and less open water north of Barrow suggest a more sluggish initial ice retreat, followed by more complete removal of ice due to lack of thick multiyear (MY) ice.

The distribution of MY ice of different age classes derived from remote sensing data by Fowler et al. (3) indicates that the MY ice in the Beaufort and Chukchi Sea is less extensive and younger than in previous years. This is confirmed by ground-based sampling and aerial measurements made by Eicken et al. (2) out of Barrow, suggesting that with comparable melt rates as in previous years, the ice conditions will be lighter than normal. In contrast with the past summer season, which saw thick ice linger in the Chukchi Sea, a more complete meltback is expected. This will likely make for a lack of platforms for marine mammals, such as walrus feeding off the drifting ice, and impact subsistence harvest of walrus and bearded seal. At the same time, the probability of encountering thick or heavy ice during shipping will likely be lower than last year, when a few vessels were very briefly trapped by ice off northwestern Alaska.

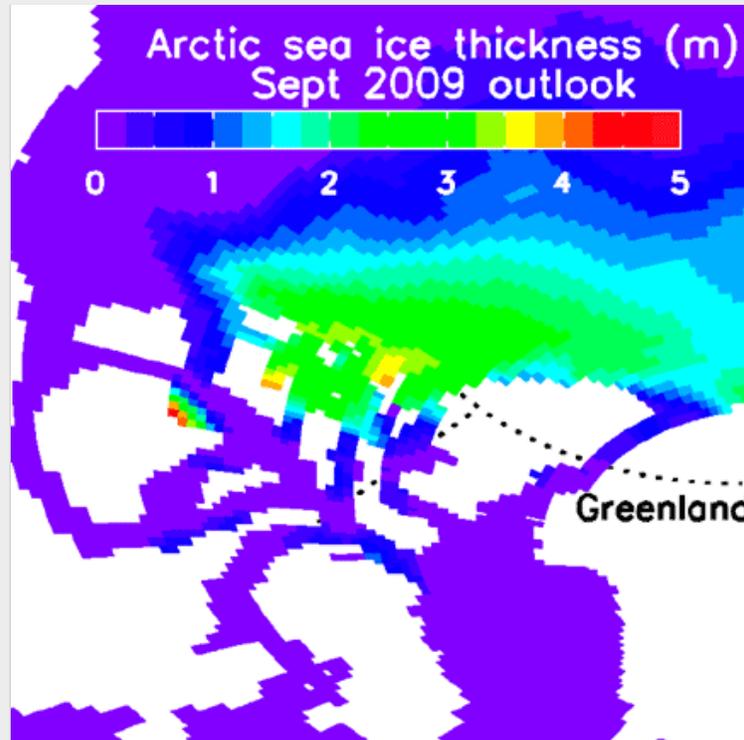
Pokrovsky (5) indicates that the sea surface temperature (SST) distribution in the North Pacific in spring of 2009 is in strong contrast with that of 2007 and similar to that observed in 2008. He suggests that the wind field in late spring and early summer will hence lead to ice circulation and comparatively slow retreat, similar to last year.

## Northwest Passage (NWP)

### Contributions from:

- Howell and Duguay (4)
- Zhang (6)
- Arbetter, Helffrich, Clemente-Colón, and Szorc (1)

In an ensemble prediction from a coupled ice-ocean model, Zhang (6) finds that most of the Northwest Passage will be ice-free by September. The predictions are initialized by a combination of observed ice concentrations and model simulations, and are forced by atmospheric fields for different years, yielding a distribution of potential ice conditions from which the most likely condition is determined.



**Figure 2.** Ensemble prediction of ice thickness in the NWP region for September 2009 (Zhang).

Based on analysis of satellite data for the NWP Parry Channel Route, Howell and Duguay (4) indicate lighter ice conditions for summer 2009 than normal. However, due to the distribution of MY ice in the channel at the start of the melt season, it appears likely that the passage will not be cleared completely. Removal of MY ice and clearing of the passage requires not only high melt rates (such as in the anomalously warm summer of 2007 when the passage cleared for the first time since the advent of satellite remote sensing), but also a surface circulation that prevents replenishment of MY ice from the high arctic ice pack. At present, MY ice on the northern end of these channels is still extensive enough to replenish thick ice into the passage unless anomalous surface wind fields prevent this. In contrast, Zhang's work indicates that there is a significant chance that the southwestern-most channel will open up. This assessment takes into consideration wind forcing, which does not enter into Howell and Duguay's analysis.

The contribution by Arbetter, Helffrich, Clemente-Colón, and Szorc (1) indicates that even under extreme melt conditions a sliver of multiyear ice north of the Parry Channel Route will remain. Thus, this particular location may serve as a touchstone as to the validity and accuracy of the different approaches used in assessing ice conditions in the NWP region.

## High Arctic (Central Arctic/Canada Basin)

### Contributions from:

- Fowler, Drobot, and Maslanik (3)

Ice-age analysis by Fowler et al. (3) indicates that much of the ice cover of the Canada Basin and adjacent western sector of the High Arctic is nearly entirely first-year ice, unlike any prior year in the past three decades. It is expected that most of this area will be reduced to open water or open ice pack (<40% ice) by the end of the summer. Much of the remainder of the High Arctic (north of 85°N) is covered by second-year ice, which is unlikely to melt back completely under normal conditions.

## Northeast Passage/Northern Sea Route

### Contributions from:

- Fowler, Drobot, and Maslanik (3)
- Pokrovsky (5)

The lack of multiyear ice along the Northern Sea Route, according to Fowler et al. (3), makes it likely that this region will open up during the summer as well, provided northward ice transport persists.

Pokrovsky (5) finds that SST's and the Atlantic inflow driving sea ice evolution in summer are much cooler this year than in 2007 in the Atlantic sector of the Arctic, suggesting that atmospheric and surface ocean circulation favor less drastic ice retreat than observed in 2007.