**September 2009 Regional Sea Ice Outlook: July Report**
**A regional perspective on ice evolution in the Pacific Arctic sector (SIZONet project)**
**Submitted By: Hajo Eicken, Chris Petrich, and Mette Kaufman on behalf of the Seasonal Ice Zone Observing Network (SIZONet)**

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**(1) Region of interest: Bering-Chukchi-Beaufort Seas**

**(2) Ice development and status in early July 2009**

Ice extent:
• Passive microwave data (SSM/I) distributed by the National Snow and Ice Data Center (NSIDC) indicate above-normal ice extent in the Bering Sea for April 2009 (Figure 1). Starting in early May, vigorous and early melt resulted in rapid northward retreat of the ice edge to below normal extent in June and early July (Figure 2).

Ice thickness and ice characteristics:
• *Eastern Chukchi/Western Beaufort Sea:* End-of-winter ice thickness distribution as presented in our June Report, i.e., much less multiyear ice of thickness comparable to previous years (3.6 m total level ice thickness mode) and first-year ice thicknesses comparable to or thicker than past years (1.7 m total level ice thickness mode with thicker deformed ice).

Coastal sea ice:
• At *Wales*, in Bering Strait, local ice experts reported somewhat more sluggish ice decay. While overall ice retreat was very rapid, large ice floes lingered late into June, aiding coastal communities in gaining access to seals and walrus on the ice. As described by W. Weyapuk Jr. in his daily observations for June 19: "It is unusual to see large floes this late in the season (for recent years) as most have broken into smaller floes by now." On June 26, roughly two weeks later than in previous years, the last remnants of nearshore ice near Wales were pushed north by the winds. Evidence of persistent northward drift is also provided by a surface drifter placed on an ice floe in May at Wales that is now, in early July more than 600 km further north, northeast of Wrangell Island.

• At *Barrow*, the ice cover experienced early melt onset in late April, resulting in much superimposed ice formation similar to Wales (see June Report) and early onset of decay. However, in June, a balance appears to have been struck between the effects of such

early-melt preconditioning and overall cool, and unusually overcast weather conditions. As a result, early onset of ice decay did not result in early break-up of landfast ice. Early ice melt-out near the beach provided hunters with boat access to a coastal channel starting June 18. However, the grounded ridges continue to linger in particular north of town well into July, likely because of reduced solar heating of surface waters and little variability in wind direction. This development is also evident in Figure 3, which puts 2009 as one of the years with lowest surface input of solar radiation over the past decade. An ice mass balance buoy placed on first-year ice in April provides valuable data both on the northward drift of ice in this region but also on the later onset of melt on the pack ice compared to coastal landfast ice and sluggish onset of bottom melt (roughly 10-15 cm in early July; see summary of buoy data by Perovich). At Barrow, with ice lingering near town, hunters are successful at catching bearded seals and walrus.

**(3) Outlook for the summer ice season and potential impacts**

• Break-up and onset of seasonal ice retreat: Due to unusually cloudy and cool weather, we have revised our earlier outlook (based on early melt onset and sunny weather in the first week of June) to suggest **normal to late break-up**. This estimate is based on an experimental break-up forecast combining observed solar heat input and 2-week atmospheric forecasts (see Figure 2; details at http://www.gi.alaska.edu/snowice/sea-lake-ice/Brw09/forecast).

• Summer conditions: As detailed in the June Report, offshore ice retreat is estimated to proceed less rapidly during the initial phase due to cooler weather and thicker first-year ice. However, the lack of multiyear ice will lead to more substantial retreat later in the season, suggesting **lighter ice conditions than in 2008.** Last year, multiyear ice lingered and presented a platform for feeding walrus throughout summer and a hazard for vessels bound for the eastern Beaufort Sea. This year, there is less likelihood of such lingering ice. Sealevel atmospheric pressure patterns so far are developing similar to 2005 and 2007 with persistent high pressure over the Beaufort Sea and easterly sector winds at Barrow. However, in contrast with 2005 and 2007 this year is much cloudier (Figure 3). Nevertheless, typically the Beaufort High breaks down sometime in early to mid-July so it will only become apparent later in the month whether atmospheric circulation is favoring ice retreat.

This outlook is based on heuristics and a statistical model for break-up timing (see website at http://www.gi.alaska.edu/snowice/sea-lake-ice/Brw09/forecast/). Jing Zhang and Jeremy Krieger kindly provided two-week WRF weather forecast model runs (knik.iarc.uaf.edu).

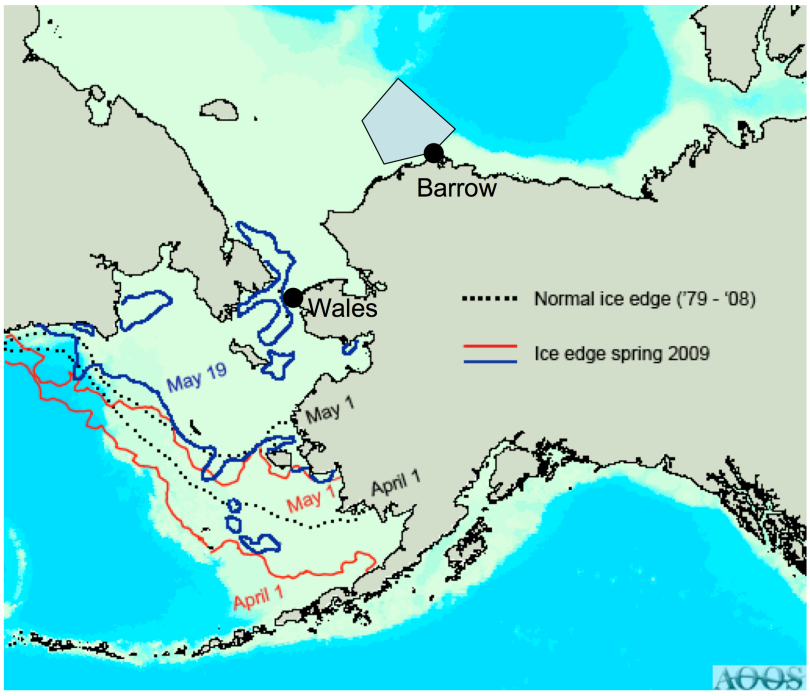


Figure 1. Ice extent derived from passive microwave satellite data (SSM/I, data provided by NSIDC, nsidc.org) for Pacific Arctic sector. Shown are observed ice edges for April and May along with "normal" ice edges (median positions) from 1979 to 2008. Locations of the airborne surveys and coastal stations are also shown.

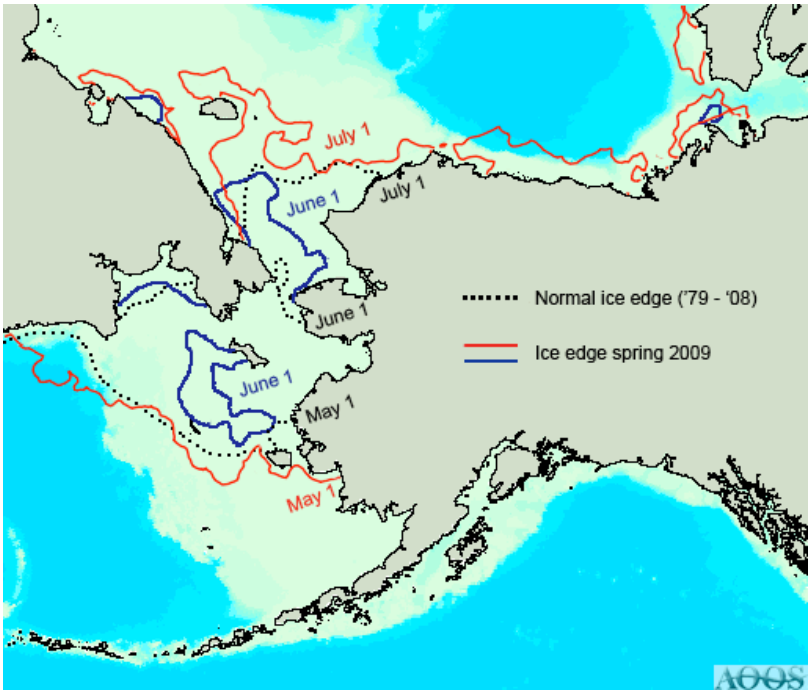


Figure 2. Same as Figure 1, but for ice extent on the first of May, June and July 2009.

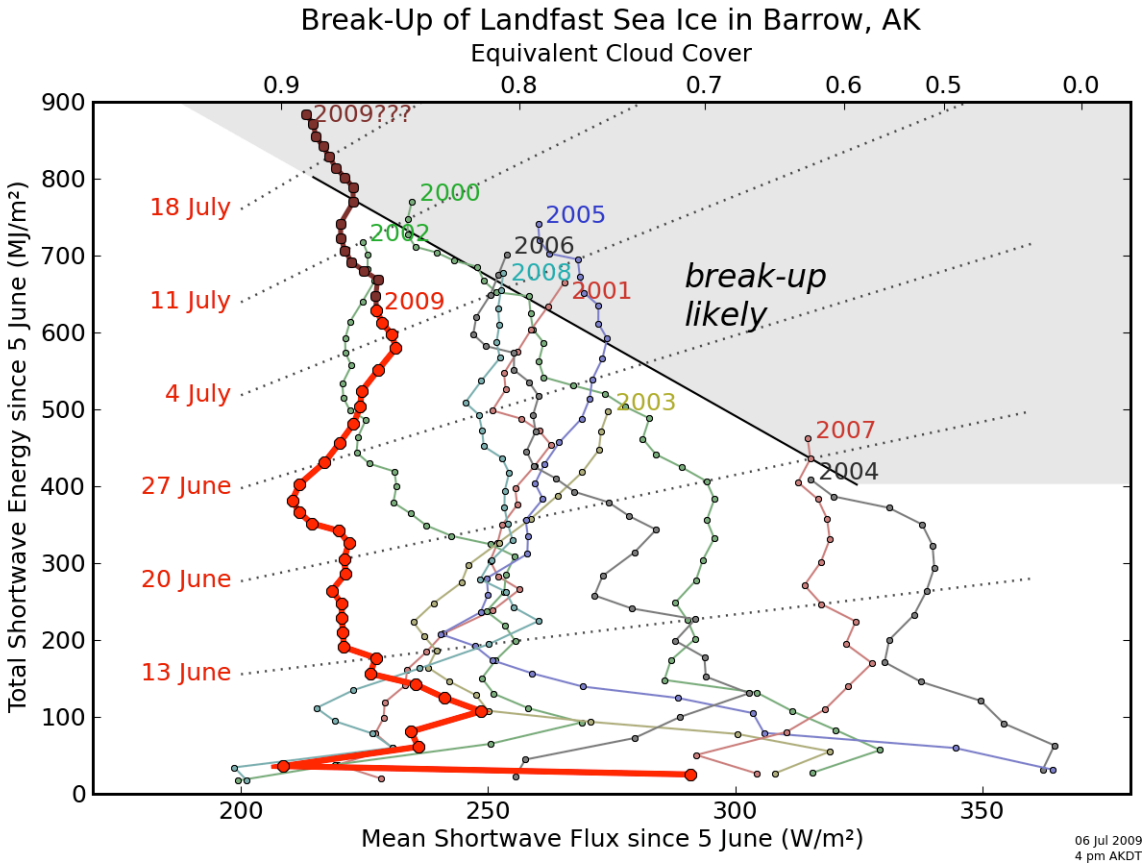


Figure 3. Break-up timing and solar shortwave energy incident at the surface (mean and cumulative shown on bottom and left axis, respectively) for 2009 (thick red line—observed as of July 6; thinner dark red line—forecast) and other recent years. For prior years curves terminate at observed break-up. The shortwave flux is used as an indicator for the combined effect of both radiative and wind forcings. The grey area at the top corresponds to the seasonal stage at which ice break-up is imminent and determined by local sealevel and winds. Details at http://www.gi.alaska.edu/snowice/sea-lake-ice/Brw09/forecast/.