Regional Sea Ice Outlook for the Bering-Chukchi-Beaufort Seas

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Anomalous spring conditions have been observed in the Bering-Chukchi-Beaufort (BCB) Region owing largely to the unusually high winter air temperatures and well above normal water temperatures in the northeast Pacific (see April Sea Ice for Walrus Report and January AOOS post). The National Snow and Ice Data Center reported the 2016 maximum winter extent of Arctic sea ice to be the lowest in the satellite record (1979-present). With reduced winter ice extent this year, the open ocean was able to take up more solar heat during spring, which contributed to a more rapid and extensive ice retreat across the entire BCB region.

At Barrow, Alaska, this open water has resulted in significant input of solar heat that has likely inhibited ice growth rates. Preliminary results from the Barrow Ice Mass Balance (IMB) Site indicate that level shorefast ice thicknesses never exceeded 1 m this year, while the previously observed lowest maximum ice thicknesses were 1.26 and 1.35 +/- 0.03 m in the 2002/03 and 2007/08 seasons, respectively. In addition, ice cores retrieved at Barrow during the last week of May 2016 (mean thickness of 0.85 +/- 0.01m) showed signs of mid-winter episodes of reduced growth rate or potential melt, as well as several weeks of melt back since late April. Water temperature measurements at Barrow during the last week in May were above the freezing point, possibly by more than 0.5 degree C.

The Barrow Sea Ice Radar data suggests that anomalously thin shorefast ice is leading to in situ disintegration and break-up that is unusually early. Major shorefast ice break-out events have already occurred in May, causing Barrow's whaling crews, who hunt eastward migrating bowhead whales from mid-April to mid-May, to pull off the ice. Thin ice off Barrow is not only the result of warmer temperatures but also due to wind-driven events earlier in the winter and spring that blew ice away from shore and inhibited new ice formation (SIZONet local observer Billy Adams).

Due to unusually high pressure over the Beaufort Sea and an Aleutian Low to the south (see Figure 1), the northern Alaska coast experienced anomalously persistent and strong East winds throughout April. Figure 2 summarizes the April mean zonal winds north of Barrow, showing April 2016 as dominated by East winds to an extent previously unobserved within the NCAR reanalysis dating back to 1948. Barrow experienced blizzard like conditions throughout the month

that presented hazards and frustration to hunters. Barrow whaler Billy Adams noted that this spring presented “longest stretch of east winds that I have seen” (see SIZONet database of local observations).

The April winds maintained a large coastal polynya offshore of the northern Chukchi coast (Cape Lisburne to Pt Barrow) and led to large sections of shorefast ice detaching throughout April. The strong anti-cyclonic pattern also led to extensive fracturing of ice within the Beaufort Sea. This early season break-up of ice in the Beaufort lasted well into early May even as changing circulation patterns brought south winds to the region, which in part helped to advect ice northward, leaving a large stretch of open water in the southern Beaufort. Due to the extended polynya regime and a more mobile pack, the May mean monthly ice concentration in the Beaufort dropped to 58%, well below all previous years in the satellite record (see Figure 3).

Air temperatures along Northern Alaska rapidly climbed in early to mid-May leading to an early snowmelt. The NOAA Barrow Observatory’s albedo measurements determined the onset of snowmelt as May 13—the earliest in 73 years since records began (see NOAA’s press release from May 20, 2016). Snow ablation in May was likely preceded by significant wind-driven removal of snow from sea ice in April.

Early season openings in the ice pack are an important element of early ice retreat that is fostered by above-normal input of solar heat (see paper by Perovich et al. 2008). As a result, current ice conditions are helping precondition the ice cover for a record minimum extent in the region, especially if summer weather continues to support export and surface heating.

References

Perovich, D.K., J.A. Richter-Menge, K.F. Jones, and B. Light (2008) Sunlight, water, and ice: Extreme Arctic sea ice melt during the summer of 2007. *Geophys. Res. Lett., 35*, L11501, doi:10.1029/2008GL034007.

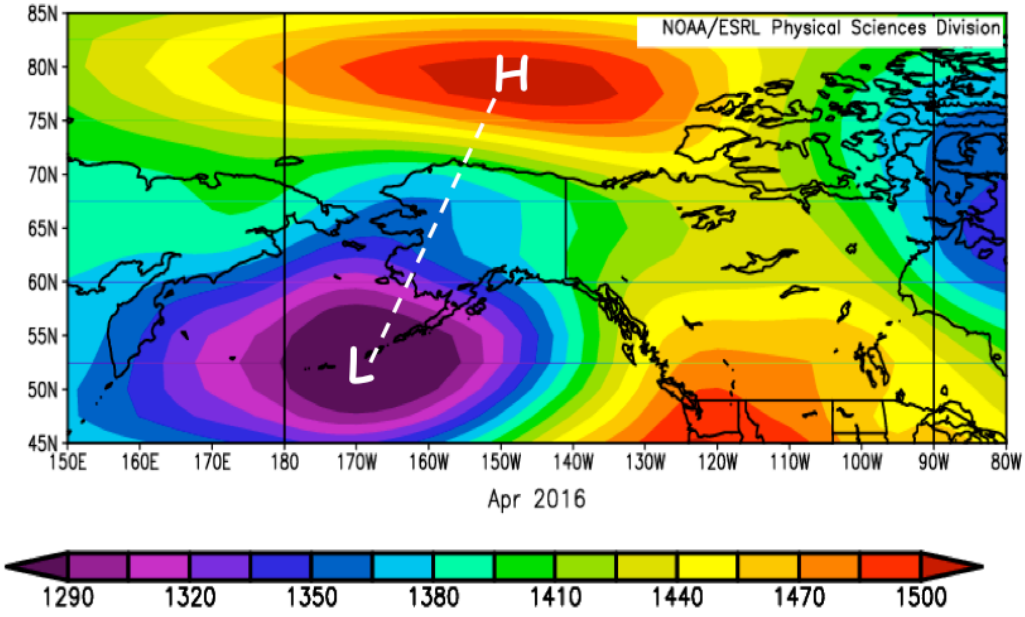

Figure 1. NCEP/NCAR Reanalysis 850mb geopotential height composite mean for April 2016. *Credit: NOAA PSD and Robert Stone (STC).*

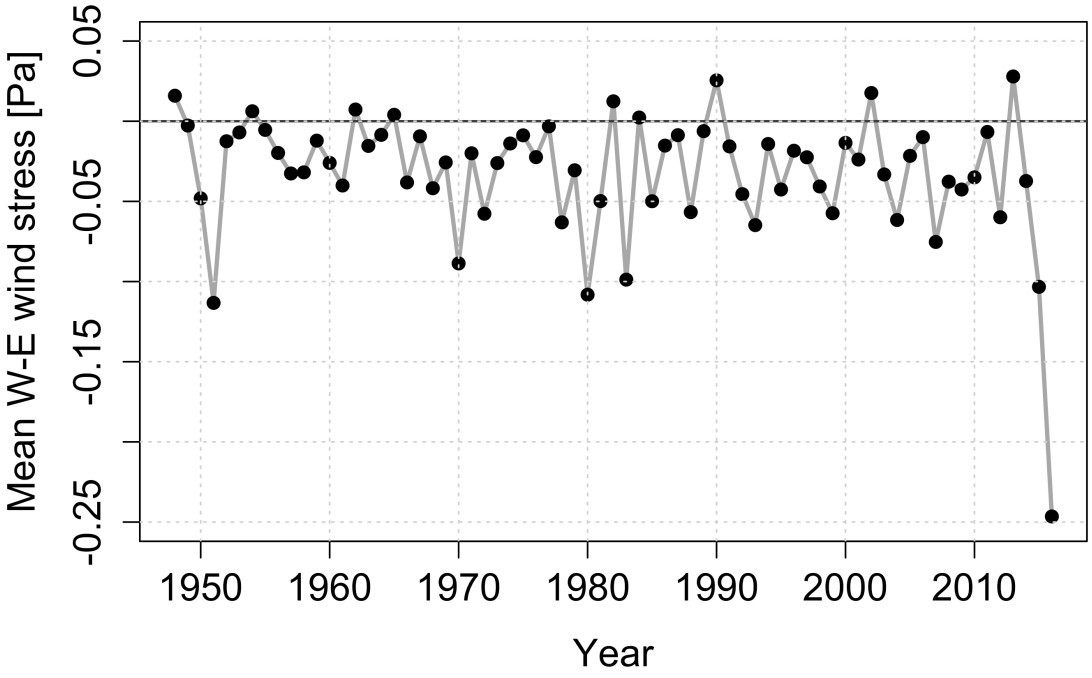

Figure 2. April mean zonal near-surface wind stress north of Pt. Barrow (1948-2016). East wind stress in negative. Source: NCEP reanalysis daily mean zonal near surface wind (72.5°N, -157.5°W and 72.5°N, -155°W).

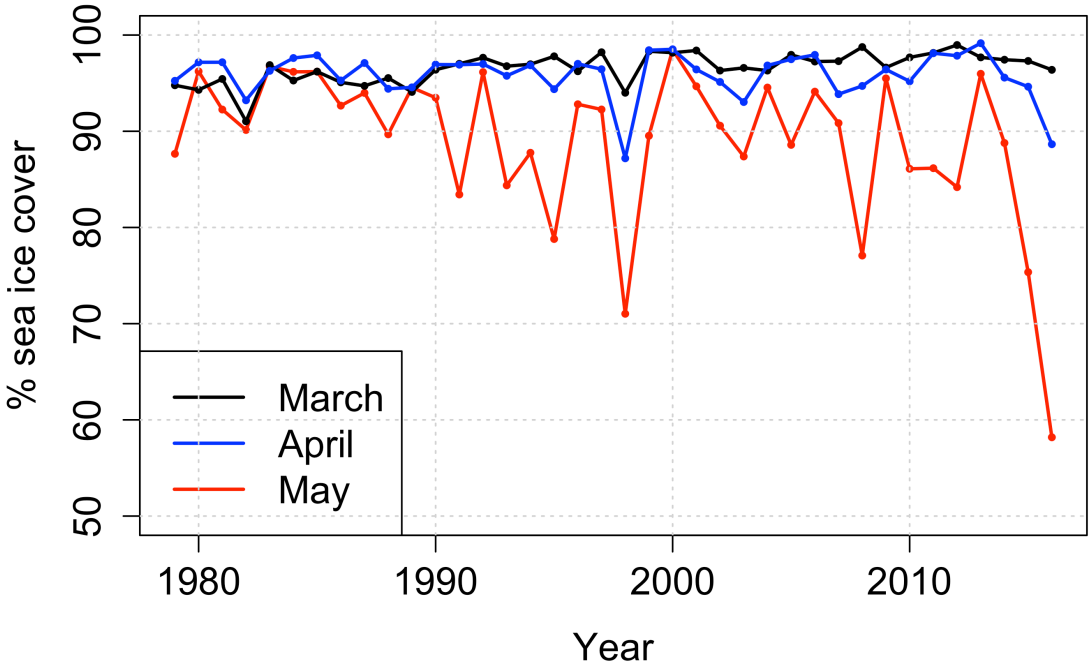

Figure 3. Mean monthly ice concentration in the Beaufort Sea for March, April, and May (1979-2016). Beaufort Sea is defined as extending west-to-east from the longitude at Point Barrow to the eastern edge of Amundsen Gulf proper, and south-to-north from the continental coastline to 74.5°N.