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Projected onset of freeze on the Chukchi Sea continental shelf in 2018
National Oceanic and Atmospheric Administration
Pacific Marine Environmental Laboratory
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Projection: freeze onset on the Chukchi Sea continental shelf northwest of Icy Cape will begin between 9 and 14 December 2018 (Fig. 1). This is ~47 days later than the long-term mean (1981-2016). The onset metric is defined by sea-ice concentration reaching 30% as determined by passive microwave observation in the reference area shown in Fig. 2. In 2017 this threshold was crossed by the formation of coastal sea ice rather than progressive freezing of the main Arctic ice pack; this may be expected again this year.

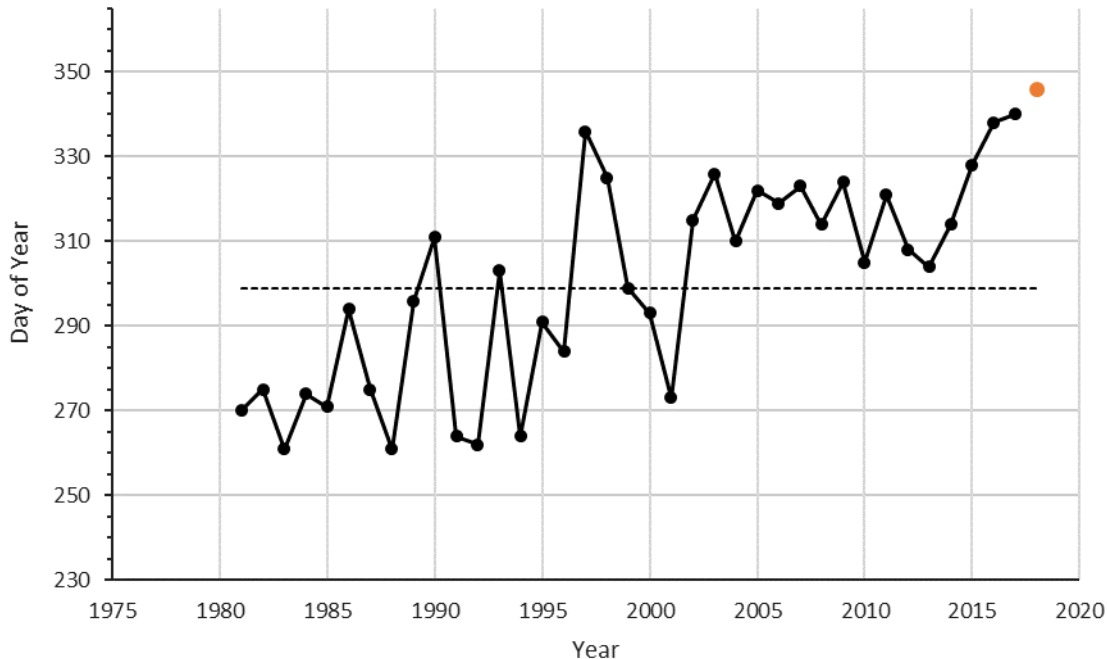


Fig. 1. Observed day of year that sea-ice concentration in the reference area northwest of Icy Cape first reaches 30% concentration, as determined from passive microwave data. The orange marker shows the projected onset of freeze in 2018 (± 3 days). The dashed line shows the long-term mean (1981-2016).

Data considered: 2016, 2017, and 2018 in-situ observations from autonomous profiling floats; aircraft expendable bathythermograph (AXBT) arrays deployed in the region; and aircraft and satellite-derived SST radiometry. Persistence is evaluated using historical ice concentration data from passive microwave satellites.

Rationale: Data from autonomous floats and AXBTs indicate water column temperatures in the Chukchi Sea in 2018 are warmer than 2016 (+5 °C) and 2017 (+3 °C) Bottom-layer temperatures in 2018 are 6.5 °C warmer than 2016 and about 1.5 °C warmer than 2017. AXBT deployments 12-14 September show these conditions are broadly representative between Bering Strait and Point Barrow. Warm water observed subducting into Canada Basin along the

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Chukchi shelf-break is likely to be a factor in delaying freeze-up further to the north (Fig 2). Review of historical data show that freeze-up has been uniformly later than the long-term mean date since 2002, and year-to-year variability has been less. 2018 is likely to be the 5th year of progressively later freeze-up in the reference area northwest of Icy Cape.

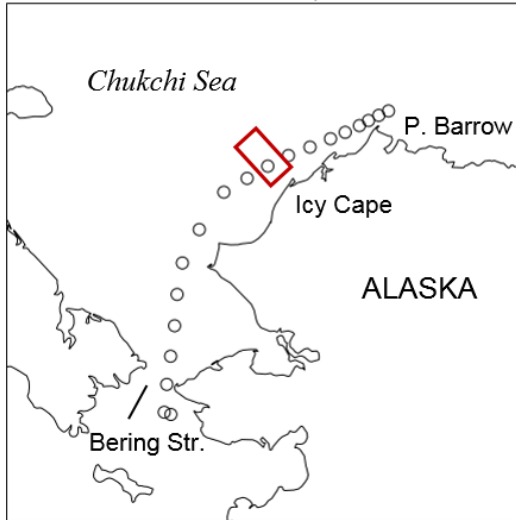
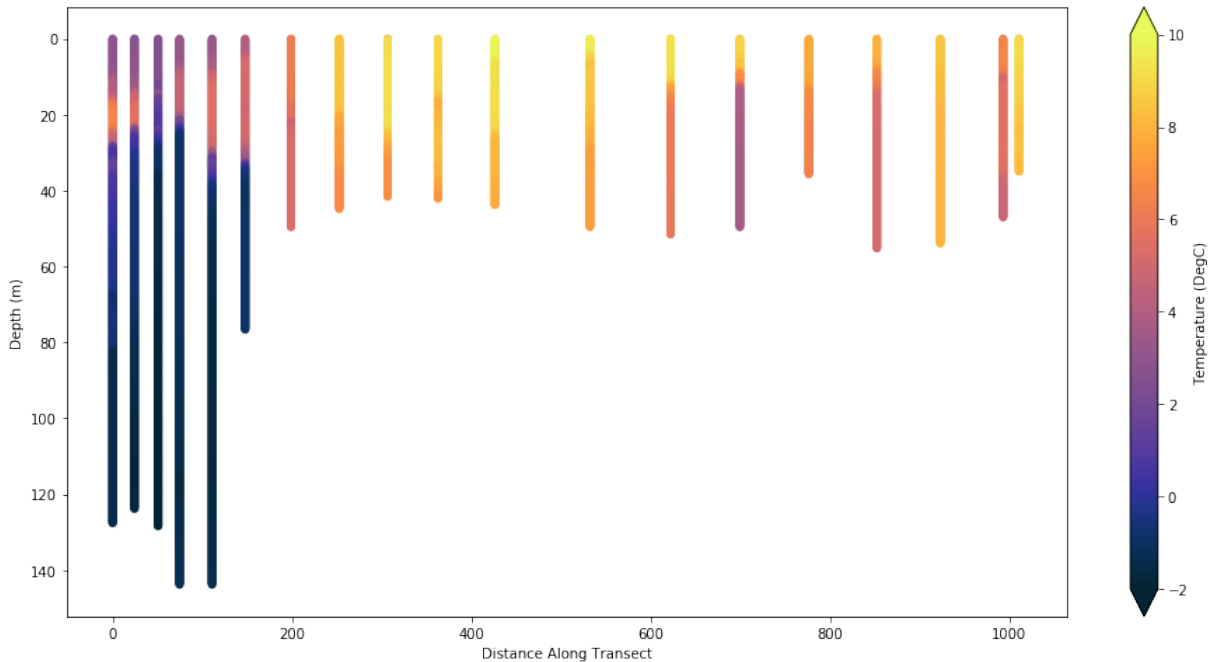


Fig. 2. (Left) Map showing the reference area northwest of Icy Cape adopted for this projection (red box) and the locations where AXBTs were deployed 12-14 September 2018 (open circles), near the date of annual ice minimum in the Arctic. (Bottom) Plot of 19 AXBTs deployed in the positions indicated between Point Barrow and south of Bering Strait. These show warm water column temperatures of 6-10 °C are widespread along the track south of Barrow Canyon. To the north, warm (5-7 °C) Chukchi Sea water is subsiding into Canada Basin in a layer between 10 and 30 m, below fresh surface water and a cold more saline later below, as shown by autonomous profilers in the area.



Data are available at: <https://www.pmel.noaa.gov/arctic-heat/>