

## **Seasonality of sea ice in the Bering and Chukchi Seas from geophysical data and community-based observations**

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Over the past three decades, the Pacific Arctic sector has experienced some of the most pronounced changes in sea-ice cover anywhere in the Arctic. We analyze community-based observations by indigenous ice experts, satellite data and ground-based measurements to assess how such large-scale, decadal change impacts ice conditions and seasonality of the ice cover at the local and regional level. Furthermore, by relying on community-based observations to develop and calibrate key measures of sea-ice seasonality of relevance to people in the region, we can begin to assess impacts of changes in ice cover on coastal communities and ecosystems. Both, passive microwave satellite data and observations by indigenous ice experts in Gambell, Wales and Barrow, Alaska indicate significant delays in the onset of fall freeze-up (by several days per decade) since 1979. Shifts towards earlier dates of onset of spring melt and ice break-up are less pronounced. However, in the past few years a significant increase in the rate of ice retreat was observed, along with changes in the "quality" of the ice (i.e., thickness, morphology, variability, age). These changes have impacted distribution and annual cycle of ice-associated marine mammals, such as walrus, seals and bowhead whales, and subsistence hunting in many Alaskan communities. Analysis of coherent, statistically significant spatial patterns in the satellite data suggests that such changes in the timing of key seasonal ice events can vary substantially between different locations. Data on sea ice and hunting activities can help develop local level models that link seasonal ice concentration and wind anomalies to marine hunting success in specific communities. Such models may then provide a foundation for future projections based on more large-scale climate model output.