

Atmospheric processes and teleconnections associated with expansion of the North American Arctic sea ice melt season

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Arctic sea ice has become younger, thinner, and less extensive over recent decades. Warm-season open water expansion has been pronounced along the North American Arctic (NAA) coast, concomitant with longer melt season duration. However, the identification of preconditioning and feedback processes associated with temporal changes to the beginning and end of the melt season remains a challenge across a region undergoing rapid warming.

Focusing on a marginal sea perspective, atmospheric patterns and teleconnections are linked to the onset and duration of sea ice melt and freeze periods. Physical interactions are first identified between precursor thermodynamic and dynamic factors and the timing of ice melt and formation across Baffin Bay and the Beaufort Sea. In addition to atmospheric mechanisms contributing to temporal shifts in ice cover retreat and advance, sea ice-related feedbacks are explored over NAA and Greenland coastal and tundra areas. A hypothesis is also tested that longer periods of open water on Baffin Bay coupled with local meteorological conditions influence late-season Greenland Ice Sheet melt events. Lastly, sea ice anomalies are connected to overlying polar jet stream patterns and south and downstream weather conditions over North America and Europe, further illustrating the impacts that the Arctic has on human and natural systems at great distances.