



The December 2015 and 2016 North Pole Warming Events and the Increasing Occurrence of Such Events

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In late December 2015 and 2016, widespread media interest revolved around forecasts that the surface air temperature at the North Pole would rise above freezing. Although there has been significant interest in the enhanced warming that is occurring at high northern latitudes, a process known as arctic amplification, remarkably little is known about these midwinter warming events at the pole including their frequency, duration and magnitude as well as the environmental conditions responsible for their occurrence. Here we use buoy and radiosonde data along with operational weather forecasts and atmospheric reanalyses to show that such events are associated with surface cyclones near the pole that advect warm and moist air polewards as well as a highly perturbed polar vortex. In addition to 2015 and 2016, a similar event occurred in December 2014 as well. On average, they occur once or twice each decade with the earliest identified event taking place in 1959. In addition, the warmest midwinter temperatures at the North Pole have been increasing at a rate that is twice as large as that for mean midwinter temperatures at the pole. It is argued that this enhanced trend is consistent with the loss of winter sea ice from the Nordic Seas that moves the reservoir of warm air over this region northwards making it easier for weather systems to transport this heat polewards.