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Control of North Atlantic cyclone variability and impacts by the large-scale atmospheric flow

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Extratropical cyclones are key players in the poleward transport of moisture and heat. This study investigates wintertime cyclone variability to better understand the large-scale controls on their frequency, path and impacts at higher latitudes. One of the main corridors for Arctic-bound cyclones is through the North Atlantic to the Barents Sea, a region that has experienced the greatest retreat of winter sea ice during the past decades. Large-scale atmospheric conditions are found to be decisive, with the strongest surface warming from cyclones originating south of 60N in the North Atlantic and steered northeastward by the upper-level flow. Atmospheric conditions also control cyclone variability in the Arctic proper: months with many cyclones are characterized by an absence of high-latitude blocking and enhanced local baroclinicity, due to the presence of strong upper-level winds and a southwest-northeast tilted jet stream more than changes in sea ice. Due to the large interannual variability in the number of Arctic-bound cyclones, no robust trends are observed over the last 40 years. Our results highlight the importance of accounting for internal variability of the large-scale atmospheric circulation in studies of long-term changes in extratropical cyclones.