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Origins of Barents-Kara sea-ice interannual variability modulated by the Atlantic pathway of ENSO

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Winter Arctic sea-ice concentration (SIC) decline plays an important role in Arctic amplification which, in turn, influences Arctic ecosystems, midlatitude weather and climate. SIC over the Barents-Kara Seas (BKS) shows large inter- annual variations, whose origin is still unclear. Here we find that interannual variations in winter BKS SIC have significantly strengthened in recent decades likely due to increased amplitudes of the El Niño-Southern Oscillation (ENSO) in a warming climate. La Niña leads to enhanced Atlantic Hadley cell and a positive phase North Atlantic Oscillation-like anomaly pattern, together with concurring Ural blocking, that transports Atlantic ocean heat and atmospheric moisture toward the BKS and promotes sea-ice melting via intensified surface warming. The reverse is seen during El Niño which leads to weakened Atlantic poleward transport and an increase in the BKS SIC. Thus, interannual varia- bility of the BKS SIC partly originates from ENSO via the Atlantic pathway.