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Multidecadal variability and decadal prediction of wintertime surface air temperature over the East Asian winter monsoon domain

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This paper studies the influence of the winter NAO on the multidecadal variability of winter East Asian surface air temperature (EASAT) and its decadal prediction. The observational analysis shows that the winter EASAT and East Asian minimum SAT (EAmSAT) display strong in-phase fluctuations and a significant 60–80-year multidecadal variability, apart from a long-term warming trend. The winter EASAT experienced a decreasing trend in the last two decades, which is conducive to the occurrence of winter extremely cold events in East Asia in recent years. The winter NAO leads the detrended winter EASAT by 12–18 years with a maximumly significant positive correlation at the leading time of 15 years. Further analysis shows that ENSO may affect winter EASAT interannual variability, but does not affect the robust leading relationship between the winter NAO and EASAT. We present the coupled oceanic-atmospheric bridge (COAB) mechanism of the NAO influences on winter EASAT multidecadal variability through its accumulated delayed effect of ~15 years on the Atlantic Multidecadal Oscillation (AMO) and Africa–Asia multidecadal teleconnection (AAMT) pattern. BaseThis paper studies the influence of the winter NAO on the multidecadal variability of winter East Asian surface air temperature (EASAT) and its decadal prediction. The observational analysis shows that the winter EASAT and East Asian minimum SAT (EAmSAT) display strong in-phase fluctuations and a significant 60–80-year multidecadal variability, apart from a long-term warming trend. The winter EASAT experienced a decreasing trend in the last two decades, which is conducive to the occurrence of winter extremely cold events in East Asia in recent years. The winter NAO leads the detrended winter EASAT by 12–18 years with a maximumly significant positive correlation at the leading time of 15 years. Further analysis shows that ENSO may affect winter EASAT interannual variability, but does not affect the robust leading relationship between the winter NAO and EASAT. We present the coupled oceanic-atmospheric bridge (COAB) mechanism of the NAO influences on winter

EASAT multidecadal variability through its accumulated delayed effect of ~15 years on the Atlantic Multidecadal Oscillation (AMO) and Africa–Asia multidecadal teleconnection (AAMT) pattern. Based on the COAB mechanism an NAO-based linear model for predicting winter decadal EASAT is constructed, with good hindcast performance. The winter EASAT for 2020–2034 is predicted to keep on fluctuating downward until ~2025, implying a high probability of occurrence of extremely cold events in coming winters in East Asia, and then turn towards sharp warming. The predicted 2020/21 winter EASAT is almost the same as the 2019/20 winter.d on the COAB mechanism an NAO-based linear model for predicting winter decadal EASAT is constructed, with good hindcast performance. The winter EASAT for 2020–2034 is predicted to keep on fluctuating downward until ~2025, implying a high probability of occurrence of extremely cold events in coming winters in East Asia, and then turn towards sharp warming. The predicted 2020/21 winter EASAT is almost the same as the 2019/20 winter.