NAO implicated as a predictor of the surface air temperature multidecadal variability over East Asia

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Surface air temperature is an important factor for human quality of life and is a key marker of global climate change. Understanding multidecadal changes in surface air temperature, and accurately predicting future trends, are therefore important for economic development. In this work, we explore multidecadal variability in East Asian surface air temperature (EASAT). We find that EASAT shows a strong multidecadal variability between 1900 and 2017. Observational analysis shows that annual EASAT multidecadal variability is highly associated with the North Atlantic Oscillation (NAO) and the NAO leads detrended annual EASAT by 15–20 years. Further analysis illustrates that the NAO precedes annual EASAT multidecadal variability through its leading effect on the Atlantic Multidecadal Oscillation (AMO). The AMO influences annual EASAT multidecadal variability through the Africa–Asia multidecadal teleconnection (AAMT) pattern. An NAO-based linear model is therefore established to predict annual EASAT. The model is able to better hindcast annual EASAT based on different periods of the time-series. Due to the joint influences of NAO multidecadal variability and the forcing associated with anthropogenic greenhouse gas emissions, annual EASAT for 2018–2034 is predicted to remain at its current level or even slightly lower, followed by a period of fast warming over the following decades.