A breakdown of the link between the Arctic and North Atlantic Oscillations in warm climate projections

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The North Atlantic Oscillation (NAO) and the Arctic Oscillation (AO) are climate variability modes significantly affecting temperature and precipitation variability in the mid-latitudes of the Northern hemisphere. In this study, we use both reanalysis data and model historical and warmer climate simulations to show that the relation between the two oscillations may change dramatically in a different climate. In the current climate, these two climate modes are highly correlated, as they are both strongly influenced by downward propagation of stratospheric anomalies into the troposphere. When considering a warmer climate scenario (RCP8.5 in the XXIII century), the correlation between NAO and AO drops significantly, revealing that they become two separate modes of variability. The stratosphere remains an important precursor for NAO, while the AO consistently precede stratospheric anomalies. The analysis suggests that these changes are owed to land-sea thermal contrast intensification in the Pacific region, which becomes more favorable for storm variability.