

Does the Atlantic windstorms have significant influences on the Arctic warming?

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Over the past decades, the Arctic lower tropospheric temperature has been increased at almost twice the global mean which is referred to as the Arctic amplification. Associated with this warming trend, extreme Arctic warming episodes are also increased. During the northern winter, strong Atlantic windstorms often intrude into the Arctic and play important roles as a moisture supplier into the Arctic: Recently, Arctic experienced unprecedented warming event in early January 2016 in association with the entry of a strong Atlantic windstorm. However, quantitative assessments on the role of Atlantic windstorms on the Arctic warming episodes are rare in the current literatures. Here we provide statistical evidences that strong Atlantic windstorms tend to move northeastward to the Arctic and induce significant Arctic warming. Positive North Atlantic Oscillation (NAO) condition and, thus, intensified upper-level winds and tropospheric instability contributed favorable conditions for the intensification of the stronger storms. Enhanced poleward energy transport by moisture intrusion was observed during the lifecycle of the strong windstorms. The increase of Arctic temperature critically depended on the strength of storm. The abrupt increase of poleward heat and moisture transport driven by stronger storms were well simulated in numerical experiments.

References

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