

Researchers reveal mechanism triggering Arctic daily warming

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Prof. Ren Baohua and his team from the School of Earth and Space

Sciences, the University of Science and Technology of China (USTC) of the Chinese Academy of Sciences (CAS), uncovered the connection between Arctic daily warming and the equator region as well as Atlantic storms. The series of studies have been published in *npj Climate and Atmospheric Science*, *Environmental Research Letters*, and *Advances in Atmospheric Sciences*.

As one of the coldest places where the average winter temperature is -30°C , the Arctic temperature has reached the [melting point](#) several times, for instance, in late December 2015 and 2022. Those Arctic daily [warming](#) events have drawn growing interest.

Currently, most researchers focus on the long-term growth of the Arctic temperature but pay little attention to Arctic daily warming events. In the series of studies, the research team investigated the influence of the North Atlantic oscillation (NAO), the El Niño-Southern oscillation (ENSO), and the Central Pacific El Niño-Southern oscillation (CP ENSO) on the Arctic daily warming occurrence.

The researchers investigated the impact of the NAO on the Arctic winter daily warming events induced by Atlantic storms, known as the Atlantic pattern-Arctic rapid tropospheric daily warming (Atlantic-RTDW) event.

They discovered that the relationship between the NAO and the Atlantic-RTDW-event frequency has weakened since the mid-1980s, which was attributed to a stronger Atlantic Storm Track (AST) activity intensity. During this period, the strong AST induced an enhanced NAO-related cyclone via transient eddy-mean flow interactions, resulting in the disappearance of southerly and northerly wind anomalies over the NA.

Furthermore, the researchers found that ENSO has urged a stronger Rossby wave due to its heightened intensity since the late 1970s,

allowing El Niño to deepen the Aleutian Low, thus decreasing (increasing) Arctic daily warming events. This model offered a potential link between the equator and the Arctic which can assist in the prediction of extreme Arctic daily warming events. With [global warming](#), this potential relation may be strengthened.

Nevertheless, after the mid-1980s, the planetary wave associated with CP ENSO could not propagate upwards into the stratosphere, cutting the teleconnection between CP ENSO and Iceland Low. As a result, CP ENSO's influence on the occurrence frequency of A-RTDW events was weakened.

The findings provided a new perspective on the weather and climate changes in the Arctic. Those studies can help strengthen the prediction of Arctic daily warming events.

More information: Cen Wang et al, An Interdecadal Change in the Influence of the NAO on Atlantic-Induced Arctic Daily Warming around the Mid-1980s, *Advances in Atmospheric Sciences* (2023). [DOI: 10.1007/s00376-022-2218-8](https://doi.org/10.1007/s00376-022-2218-8)

Cen Wang et al, Change of the CP ENSO's role in the occurrence frequency of Arctic daily warming events triggered by Atlantic storms, *npj Climate and Atmospheric Science* (2023). [DOI: 10.1038/s41612-023-00399-y](https://doi.org/10.1038/s41612-023-00399-y)

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